ENCYCLOPÆDIA.

C

C,
Caaba.

C THE third letter, and ſecond conſonant, of the alphabet, is pronounced like *k* before the vowels *a*, *o*, and *u*; and like *ſ* before *e*, *i*, and *y*. C is formed, according to Scaliger, from the ϰ of the Greeks, by retrenching the ſtem or upright line; though others derive it from the ב of the Hebrews, which has in effect the ſame form; allowing only for this, that the Hebrews, reading backwards, and the Latins, &c. forwards, each have turned the letter their own way. However, the C not being the ſame as to ſound with the Hebrew *caph*, and it being certain the Romans did not borrow their letters immediately from the Hebrews or other orientals, but from the Greeks, the derivation from the Greek ϰ is the more probable. Add, that F. Montfaucon, in his Palæographia, gives us ſome forms of the Greek ϰ, which come very near that of our C; thus, for inſtance, ⊏: and Suidas calls the C the Roman kappa. The ſecond ſound of C reſembles that of the Greek Σ; and many inſtances occur of ancient inſcriptions, in which Σ has the ſame form with our C. All grammarians agree, that the Romans pronounced their Q like our C, and their C like our K. F. Mabillon adds, that Charles the Great was the firſt who wrote his name with a C; whereas all his predeceſſors of the ſame name wrote it with a K: and the ſame difference is obſerved in their coins.

As an abbreviature, C ſtands for Caius, Carolus, Cæſar, *condemno*, &c. and CC for *conſulibus*.

As a numeral, C ſignifies 100, CC 200, &c.

C, in muſic, placed after the cliff, intimates that the muſic is in common time, which is either quick or ſlow, as it is joined with allegro or adagio: if alone, it is uſually adagio. If the C be croſſed or turned, the firſt requires the air to be played quick, and the laſt very quick.

CAABA, or CAABAH, properly ſignifies a ſquare ſtone building; but is particularly applied by the Mahometans to the temple of Mecca, built, as they pretend, by Abraham and Iſhmael his ſon.

Before the time of Mahomet, this temple was a place of worſhip for the idolatrous Arabs, and is ſaid to have contained no leſs than 360 different images, equalling in number the days of the Arabian year. They were all deſtroyed by Mahomet, who ſanctified the Caaba, and appointed it to be the chief place of worſhip for all true believers. The temple is in length from north to ſouth about 24 cubits: its breadth from eaſt to weſt is 23; and its height 27. The door, which is on the eaſt ſide, ſtands about four cubits from the ground; the floor being level with the bottom of the door. In the corner next to the door is the *black ſtone*, ſo much celebrated among the Mahometans. On the north ſide of the caaba, within a ſemicircular incloſure 50 cubits long, lies the *white ſtone*, ſaid to be the ſepulchre of Iſhmael, which receives the rain-water from the caaba by a ſpout formerly of wood, but now of gold. The black ſtone, according to the Mahometans, was brought down from heaven by Gabriel at the creation of the world; and originally of a white colour; but contracted the blackneſs that now appears on it, from the guilt of thoſe ſins committed by the ſons of men. It is ſet in ſilver, and fixed in the ſouth-eaſt corner of the caaba, looking towards Baſra, about ſeven ſpans from the ground. This ſtone, upon which there is the figure of a human head, is held in the higheſt eſtimation among the Arabs; all the pilgrims kiſſing it with great devotion, and ſome even calling it the *right hand of God*. Its blackneſs, which is only ſuperficial, is probably owing to the kiſſes and touches of ſo many people. After the Karmatians had taken Mecca, they carried away this precious ſtone, and could by no means be prevailed upon to reſtore it; but finding at laſt that they were unable to prevent the concourſe of pilgrims to Mecca, they ſent it back of their own accord, after having kept it 22 years.

Caaba.

The double roof of the caaba is ſupported within by three octagonal pillars of aloes-wood; between which, on a bar of iron, hang ſome ſilver lamps. The outſide is covered with rich black damaſk, adorned with an embroidered band of gold, which is changed every year, and was formerly ſent by the khalifs, afterwards by the ſultans of Egypt, and is now provided by the Turkiſh emperors. The caaba, at ſome diſtance, is almoſt ſurrounded by a circular incloſure of pillars, joined towards the bottom by a low balluſtrade, and towards the top by bars of ſilver. Juſt without this inner incloſure, on the ſouth, north, and weſt ſides of the caaba, are three buildings, which are the oratories or places where three of the orthodox ſects aſſemble to perform their devotions. Towards the ſouth-eaſt ſtands an edifice which covers the well Zemzem, the treaſury, and the cupola of Al Abbas. Formerly there was another cupola, that went under the name of the *hemicycle*, or *cupola of Judea*: but whether or not any remains of that are now be ſeen is unknown; nor is it eaſy to obtain information in this reſpect, all Chriſtians being denied acceſs to this holy place. At a ſmall diſtance from the caaba, on the eaſt ſide, is the *ſtation* or *place* of Abraham; where is another ſtone much reſpected by the Mahometans; and where they pretend to ſhow the footſteps of the patriarch, telling us he ſtood on it when he built the caaba. Here the fourth ſect of Arabs, *viz.* that of Al Shafei, aſſemble for religious purpoſes.

The ſquare colonnade, or great piazza, that at a conſiderable diſtance incloſes theſe buildings, conſiſts, according to Al Jannabi, of 448 pillars, and has no leſs than 38 gates. Mr Sale compares this piazza to that of the royal exchange at London, but allows it to be much larger. It is covered with ſmall domes or cupolas, from the four corners of which riſe as many minarets or ſteeples, with double galleries, and adorned with gilded ſpires and creſcents after the Turkiſh manner, as are alſo the cupolas which cover the piazza and other buildings. Between the columns of both incloſures hang a great number of lamps, which are conſtantly lighted at night. The firſt foundations of this ſecond incloſure were laid by Omar the ſecond khalif, who built no more than a low wall, to prevent the court of the caaba from being incroached upon by private buildings; but by the liberality of ſucceeding princes, the whole has been raiſed to that ſtate of magnificence in which it appears at preſent.

This temple enjoys the privilege of an aſylum for all ſorts of criminals; but it is moſt remarkable for the pilgrimages made to it by the devout muſſelmans, who pay ſo great a veneration to it, that they believe a ſingle ſight of its ſacred walls, without any particular act of devotion, is as meritorious, in the ſight of God, as the moſt careful diſcharge of one's duty, for the ſpace of a whole year, in any other temple.

CAAMINI, in botany, a name given by the Spaniards and others to the fineſt ſort of Paraguayan tea. It is the leaf of a ſhrub which grows on the mountains of Maracaya, and is uſed in Chili and Peru as the tea is with us. The mountains where this ſhrub grows naturally are far from the inhabited parts of Paraguay; but the people of the place know ſo well the value and uſe of it, that they conſtantly furniſh themſelves with great quantities of it from the ſpot. They uſed to go out on theſe expeditions many thouſands together; leaving their country in the mean time expoſed to the inſults of their enemies, and many of themſelves periſhing by fatigue. To avoid theſe inconveniences, they have of late planted theſe trees about their habitations; but the leaves of theſe cultivated ones have not the fine flavour of thoſe that grow wild. The king of Spain has permitted the Indians of Paraguay to bring to the town of Saintfoy 12,000 arobes of the leaves of this tree every year, but they are not able to procure ſo much of the wild leaves annually: about half the quantity is the utmoſt they bring of this: the other half is made up of the leaves of the trees in their own plantations; and this ſells at a lower price, and is called *pabos*. The arobe is about 25 pound weight; the general price is four piaſtres; and the money is always divided equally among the people of the colony.

CAANA, or Kaana, a town in Upper Egypt, ſeated on the eaſtern banks of the river Nile, from whence they carry corn and pulſe for the ſupply of Mecca in Arabia. E. Long. 32. 23. N. Lat. 24. 30. Here are ſeveral monuments of antiquity yet remaining, adorned with hieroglyphics.

CAB, an Hebrew dry meaſure, being the ſixth part of a ſeah or ſatum, and the 18th part of an ephah. A cab contained $2\frac{5}{6}$ pints of Engliſh corn-meaſure: a quarter cab was the meaſure of dove's dung, or more properly a ſort of chick-peaſe called by this name, was ſold at Samaria, during the ſiege of that city, for five ſhekels.

CABAL, an apt name currently given to the infamous miniſtry of Charles II. compoſed of five perſons, Clifford, Aſhley, Buckingham, Arlington, and Lauderdale; the firſt letters of whoſe names, in this order, furniſhed the appellation by which they were diſtinguiſhed.

CABALIST, in French commerce, a factor or perſon who is concerned in managing the trade of another.

CABALLARIA, in middle-age writers, lands held by the tenure of furniſhing a horſeman, with ſuitable equipage, in time of war, or when the lord had occaſion for him.

CABALLEROS, or Cavalleros, are Spaniſh wools, of which there is a pretty conſiderable trade at Bayonne in France.

CABALLINE, denotes ſomething belonging to horſes; thus caballine aloes is ſo called, from its being chiefly uſed for purging horſes; and common brimſtone is called *ſulphur caballinum* for a like reaſon.

CABALLINUM (anc. geog.), a town of the Ædui in Gallia Celtica; now *Challon ſur Saone*, which ſee.

CABALLINUS (anc. geog.), a very clear fountain of mount Helicon in Bœotia; called *Hippocrene* by the Greeks, becauſe opened by Pegaſus on ſtriking the rock with his hoof, and hence called *Pegaſius*.

CABALLIO, or Cabellio (anc. geog.), a town of the Cavares in Gallia Narbonnenſis, ſituated on the Druentia. One of the Latin colonies, in the Notitiæ called *Civitas Cabellicorum*. Now *Cavaillon* in Provence.

CABBAGE, in botany. See Brassica; and Agriculture, n° 40, and 169. In the Georgical eſſays, we find this plant greatly recommended as an excellent food for cattle, producing much dung, and being an excellent ſubſtitute for hay. The author prefers the Scotch kind, as being moſt durable, and preferable on all other accounts. He alſo recommends autumn-ſowed plants in preference to thoſe ſowed in the ſpring; the former producing a much more weighty crop than the latter. The expence of raiſing an acre of good cabbages he values at 14*l.* 15*s.* and its produce at 34*l.*

Cabbage-Tree, or *True Cabbage-Palm.* See Areca.

Cabbage-bark Tree. See Geoffræa.

CABBALA, according to the Hebrew ſtyle, has a very diſtinct ſignification from that wherein we underſtand it in our language. The Hebrew cabbala ſignifies tradition; and the Rabbins, who are called *cabbaliſts*, ſtudy principally the combination of particular words, letters, and numbers, and by this means pretend to diſcover what is to come, and to ſee clearly into the ſenſe of many difficult paſſages of ſcripture. There are no ſure principles of this knowledge, but it depends upon ſome particular traditions of the ancients; for which reaſon it is termed *cabbala*.

The cabbaliſts have abundance of names which they call *ſacred*, theſe they make uſe of in invoking of ſpirits, and imagine they receive great light from them.

They

They tell us, that the ſecrets of the cabbala were diſcovered to Moſes on mount Sinai; and that theſe have been delivered to them down from father to ſon, without interruption, and without any uſe of letters; for to write them down, is what they are by no means permitted to do. This is likewiſe termed the *oral law*, becauſe it paſſed from father to ſon, in order to diſtinguiſh it from the written laws.

There is another cabbala, called *artificial*, which conſiſts in ſearching for abſtruſe and myſterious ſignifications of a word in Scripture, from whence they borrow certain explanations, by combining the letters which compoſe it: this cabbala is divided into three kinds, the gematrie, the notaricon, and the temura or themurah. The firſt whereof conſiſts in taking the letters of a Hebrew word for ciphers or arithmetical numbers, and explaining every word by the arithmetical value of the letters whereof it is compoſed. The ſecond ſort of cabbala, called *notaricon*, conſiſts in taking every particular letter of a word for an entire diction; and the third, called *themura*, i. e. change, conſiſts in making different tranſpoſitions or changes of letters, placing one for the other, or one before the other.

Among the Chriſtians, likewiſe, a certain ſort of magic is, by miſtake, called *cabbala;* which conſiſts in uſing improperly certain paſſages of Scripture for magic operations, or in forming magic characters or figures with ſtars and taliſmans.

Some viſionaries among the Jews believe, that Jeſus Chriſt wrought his miracles by virtue of the myſteries of the cabbala.

CABBALISTS, the Jewiſh doctors who profeſs the ſtudy of the cabbala.

In the opinion of theſe men, there is not a word, letter, or accent in the law, without ſome myſtery in it. The Jews are divided into two general ſects: the karaites, who refuſe to receive either tradition or the talmud, or any thing but the pure text of ſcripture; and the rabbiniſts, or talmudiſts, who, beſides this, receive the traditions of the ancients, and follow the talmud.

The latter are again divided into two other ſects; pure rabbiniſts, who explain the ſcripture in its natural ſenſe, by grammar, hiſtory, and tradition; and cabbaliſts, who, to diſcover hidden myſtical ſenſes, which they ſuppoſe God to have couched therein, make uſe of the cabbala, and the myſtical methods abovementioned.

CABECA, or Cabesse, a name given to the fineſt ſilks in the Eaſt Indies, as thoſe from 15 to 20 *per cent.* inferior to them are called *barina*. The Indian workmen endeavour to paſs them off one with the other; for which reaſon, the more experienced European merchants take care to open the bales, and to examine all the ſkaines one after another. The Dutch diſtinguiſh two ſorts of cabecas; namely, the moor cabeca, and the common cabeca. The former is ſold at Amſterdam for about $21\frac{1}{2}$ ſchellinghen Flemiſh, and the other for about $18\frac{1}{2}$.

Cabeca de Vide, a ſmall ſea-port town of Alentejo in Portugal, with good walls, and a ſtrong caſtle. W. Long. 6. 43. N. Lat. 39. 0.

CABENDA, a ſea-port of Congo in Africa, ſituated in E. Long. 12. 2. S. Lat. 4. 5.

CABES, or Gabes, a town of Africa, in the kingdom of Tunis, ſeated on a river near the gulph of the ſame name. E. Long. 10. 55. N. Lat. 33. 40.

CABEZZO, a province of the kingdom of Angola, in Africa; having Oacco on the north, Lubolo on the ſouth, the Coanza on the north-eaſt, and the Reinba on the ſouth-weſt. It is populous, and well ſtored with cattle, &c. and hath a mine of iron on a mountain from thence called the *iron mountain*, which yields great quantities of that metal; and this the Portugueſe have taught the natives to manufacture. This province is watered by a river called *Rio Longo*, and other ſmall rivulets, lakes, &c. The trees here are vaſtly large; and they have one ſort not unlike our apple-trees, the bark of which being ſlaſhed with a knife, yields an odoriferous reſin of the colour and conſiſtency of wax, and very medicinal in its nature, only a little too hot for Europeans, unleſs qualified by ſome cooling drug.

CABIDOS, or Cavidos, a long meaſure uſed at Goa, and other places of the Eaſt Indies belonging to the Portugueſe, to meaſure ſtuffs, linens, &c. and equal to $\frac{4}{7}$ths of the Paris ell.

CABIN, a room or apartment in a ſhip where any of the officers uſually reſide. There are many of theſe in a large ſhip; the principal of which is deſigned for the captain or commander. In ſhips of the line this chamber is furniſhed with an open gallery in the ſhip's ſtern, as alſo a little gallery on each quarter. The apartments where the inferior officers or common ſailors ſleep and meſs are uſually called Births; which ſee.

The bed-places built up for the ſailors at the ſhip's ſide in merchantmen are alſo called *cabins*.

CABINDA, the chief port of the kingdom of Angoy in Loango in Africa. It is ſituated at the mouth of a river of the ſame name about five leagues north of Cape Palmerino, on the north ſide of the mouth of the river Zaire. The bay is very commodious for trade, wooding, and watering.

CABINET, the moſt retired place in the fineſt part of a building, ſet apart for writing, ſtudying, or preſerving any thing that is precious.

A complete apartment conſiſts of a hall, anti-chamber, chamber, and cabinet, with a gallery on one ſide. Hence we ſay, a cabinet of paintings, curioſities, &c.

Cabinet, alſo denotes a piece of joiner's workmanſhip, being a kind of preſs or cheſt, with ſeveral doors and drawers.

There are common cabinets of oak or of cheſnut, varniſhed cabinets of China and Japan, cabinets of inlaid work, and ſome of ebony, or the like ſcarce and precious woods. Formerly the Dutch and German cabinets were much eſteemed in France; but are now quite out of date, as well as the cabinets of ebony which came from Venice.

Cabinet is alſo uſed in ſpeaking of the more ſelect and ſecret councils of a prince or adminiſtration. Thus we ſay, the ſecrets, the intrigues of the cabinet. To avoid the inconveniences of a numerous council, the policy of Italy and practice of France firſt introduced cabinet councils. King Charles I. is charged with firſt eſtabliſhing this uſage in England. Beſides his privy council, that prince erected a kind of cabinet council, or junto, under the denomination of a council of ſtate; compoſed of archbiſhop Laud, the earl of

Strafford, and lord Collington, with the ſecretaries of ſtate. Yet ſome pretend to find the ſubſtance of a cabinet council of much greater antiquity, and even allowed by parliament, who anciently ſettled a quorum of perſons moſt confided in, without whoſe preſence no arduous matter was to be determined; giving them power to act without conſulting the reſt of the council. As long ſince as the 28th of Henry III. a charter paſſed in affirmance of the ancient rights of the kingdom; which provided, that four great men, choſen by common conſent, who were to be conſervators of the kingdom, among other things, ſhould ſee to the diſpoſing of monies given by parliament, and appropriated to particular uſes: and parliaments were to be ſummoned as they ſhould adviſe. But even of theſe four, any two made a quorum; and generally the chief juſtice of England, and chancellor, were of the number of the conſervators. Matth. Par. 28. Hen. III. In the firſt of Henry VI. the parliament provides, that the quorum for the privy council be ſix, or four at leaſt; and that in all weighty conſiderations, the dukes of Bedford and Glouceſter, the king's uncles, ſhould be preſent; which ſeems to be erecting a cabinet by law.

CABIRI, a term in the theology of the ancient Pagans, ſignifying great and powerful gods; being a name given to the gods of Samothracia. They were alſo worſhipped in other parts of Greece, as Lemnos and Thebes, where the cabiria were celebrated in honour of them; theſe gods are ſaid to be, in number, four, viz. Axieros, Axiocerſa, Axiocerſus, and Caſmilus.

CABIRIA, feſtivals in honour of the Cabiri, celebrated in Thebes and Lemnos, but eſpecially in Samothracia, an iſland conſecrated to the Cabiri. All who were initiated into the myſteries of theſe gods, were thought to be ſecured thereby from ſtorms at ſea, and all other dangers. The ceremony of initiation was performed by placing the candidate, crowned with olive branches, and girded about the loins with a purple ribband, on a kind of throne, about which the prieſts, and perſons before initiated, danced.

CABLE, a thick, large, ſtrong rope, commonly of hemp, which ſerves to keep a ſhip at anchor.

There is no merchant-ſhip, however weak, but has at leaſt three cables; namely, the chief cable, or cable of the ſheet-anchor, a common cable, and a ſmaller one.

Cable is alſo ſaid of ropes, which ſerve to raiſe heavy loads, by the help of cranes, pullies, and other engines. The name *cable* is uſually given to ſuch as have, at leaſt, three inches in circumference; thoſe that are leſs are only called *ropes*, of different names according to their uſe.

Every cable, of whatſoever thickneſs it be, is compoſed of three ſtrands: every ſtrand of three ropes; and every rope of three twiſts: the twiſt is made of more or leſs threads, according as the cable is to be thicker or thinner.

In the manufacture of cables, after the ropes are made, they uſe ſticks, which they paſs firſt between the ropes of which they make the ſtrands, and afterwards between the ſtrands of which they make the cable, to the end that they may all twiſt the better, and be more regularly wound together; and alſo, to prevent them from entwining or entangling, they hang, at the end of each ſtrand and of each rope, a weight of lead or of ſtone.

The number of threads each cable is compoſed of is always proportioned to its length and thickneſs; and it is by this number of threads that its weight and value are aſcertained: thus, a cable of three inches circumference, or one inch diameter, ought to conſiſt of 48 ordinary threads, and to weigh 192 pounds; and on this foundation is calculated the following table, very uſeful for all people engaged in marine commerce, who fit out merchantmen for their own account, or freight them for the account of others.

A table of the number of threads and weight of cables of different circumferences.

Circumf.	Threads.	Weight.
3 inches	48	192 pounds.
4	77	308
5	121	484
6	174	696
7	238	952
8	311	1244
9	393	1572
10	485	1940
11	598	2392
12	699	2796
13	821	3284
14	952	3808
15	1093	4372
16	1244	4976
17	1404	5616
18	1574	6296
19	1754	7016
20	1943	7772

Sheet-Anchor CABLE is the greateſt cable belonging to a ſhip.

Stream CABLE, a hawſer or rope, ſomething ſmaller than the bowers, and uſed to moor the ſhip in a river, or haven, ſheltered from the wind and ſea, &c.

Serve or Plate the CABLE, is to bind it about with ropes, clouts, &c. to keep it from galling in the hawſe.

To ſplice a CABLE, is to make two pieces faſt together, by working the ſeveral threads of the rope the one into the other.

Pay more CABLE, is to let more out of the ſhip. *Pay cheap the Cable*, is to hand it out apace. *Veer more Cable*, is to let more out, &c.

CABLE'*s Length*, a meaſure of 120 fathoms, or of the uſual length of the cable.

CABLED, in heraldry, a term applied to a croſs formed of the two ends of a ſhip's cable; ſometimes alſo to a croſs covered over with rounds of rope; more properly called a *croſs corded*.

CABLED *Flute*, in architecture, ſuch flutes as are filled up with pieces in the form of a cable.

CABO DE ISTRIA, the capital town of the province of Iſtria, in the territory of Venice; and the ſee of a biſhop. It is ſeated on a ſmall iſland in the gulf of Venice, and is joined to the main land by draw-bridges. E. Long. 14. 22. N. Lat. 45. 49.

CABOCHED, in heraldry, is when the heads of beaſts are borne without any part of the neck, full-faced.

CABOLETTO, in commerce, a coin of the republic of Genoa, worth about 3d. ſterling.

CABOT (Sebaſtian), the firſt diſcoverer of the continent of America, was the ſon of John Cabot a Venetian. He was born at Briſtol in 1477; and was taught by his father arithmetic, geometry, and coſmography.

graphy. Before he was 20 years of age he made ſeveral voyages. The firſt of any conſequence ſeems to have been made with his father, who had a commiſſion from Henry VII. for the diſcovery of a north-weſt paſſage to India. They ſailed in the ſpring of 1497; and proceeding to the north-weſt they diſcovered land, which for that reaſon they called *Primaviſta* or *Newfoundland*. Another ſmaller iſland they called *St John*, from its being diſcovered on the feaſt of St John Baptiſt; after which, they ſailed along the coaſt of America as far as Cape Florida, and then returned to England with a good cargo, and three Indians aboard. Stowe and Speed aſcribe theſe diſcoveries wholly to Sebaſtian, without mentioning his father. It is probable that Sebaſtian, after his father's death, made ſeveral voyages to theſe parts, as a map of his diſcoveries, drawn by himſelf, was hung up in the privy garden at Whitehall. However, hiſtory gives but little account of his life for near 20 years; when he went to Spain, where he was made pilot-major, and intruſted with reviewing all projects for diſcoveries, which were then very numerous. His great capacity and approved integrity induced many eminent merchants to treat with him about a voyage by the new found ſtraits of Magellan to the Moluccas. He therefore ſailed in 1525, firſt to the Canaries; then to the Cape Verd iſlands; thence to St Auguſtine and the iſland of Patos; when ſome of his people beginning to be mutinous, and refuſing to paſs through the ſtraits, he laid aſide the deſign of ſailing to the Moluccas; left ſome of the principal mutineers upon a deſert iſland; and, ſailing up the rivers of Plate and Paraguay, diſcovered, and built forts in, a large tract of fine country, that produced gold, ſilver, and other rich commodities. He thence diſpatched meſſengers to Spain for a ſupply of proviſions, ammunition, goods for trade, and a recruit of men: but his requeſt not being readily complied with, after ſtaying five years in America, he returned home; where he met with a cold reception, the merchants being diſpleaſed at his not having purſued his voyage to the Moluccas, while his treatment of the mutineers had given umbrage at court. Hence he returned to England; and being introduced to the duke of Somerſet, then lord protector, a new office was erected for him: he was made governor of the myſtery and company of the merchant adventurers for the diſcovery of regions, dominions, iſlands, and places unknown; a penſion was granted him, by letters patent, of 166l. 13s. 4d. per annum; and he was conſulted in all affairs relative to trade. In 1522, by his intereſt, the court fitted out ſome ſhips for the diſcovery of the northern parts of the world. This produced the firſt voyage the Engliſh made to Ruſſia, and the beginning of that commerce which has ever ſince been carried on between the two nations. The Ruſſia company was now founded by a charter granted by Philip and Mary: and of this company Sebaſtian was appointed governor for life. He is ſaid to be the firſt who took notice of the variation of the needle, and who publiſhed a map of the world. The exact time of his death is not known, but he lived to be above 70 years of age.

CABRA, a town of the kingdom of Tombut in Africa. It is a large town, but without walls; and is ſeated on the river Niger, about 12 miles from Tombut. The houſes are built in the ſhape of bells; and the walls are made with ſtakes or hurdles, plaſtered with clay, and covered with reeds after the manner of thatch. This place is very much frequented by negroes who come here by water to trade. The town is very unhealthy, which is probably owing to its low ſituation. The colour of the inhabitants is black, and their religion a ſort of Mahometaniſm. They have plenty of corn, cattle, milk, and butter; but ſalt is very ſcarce. The judge who decides controverſies is appointed by the king of Tombut. E. Long. 0. 50. N. Lat. 14. 21.

CABUL, or Gaboul, a city of Aſia, and capital of the province of Cabuliſtan. It lies in E. Long. 68. 15. N. Lat. 33. 30. on the frontiers of Great Bukharia, on the ſouth ſide of the mountains which divide the territories of the Mogul from that part of Great Tartary. It is one of the fineſt places in that part of the world; large, rich, and very populous. As it is conſidered as the key of the Great Mogul's dominions on that ſide, great care is taken to keep its fortifications in repair, and a numerous garriſon is maintained for its ſecurity. It lies on the road between Samarcand and Lahor; and is much frequented by the Tartars, Perſians, and Indians. The Uſbec Tartars drive there a great trade in ſlaves and horſes, of which it is ſaid that no fewer are ſold than 60,000 annually. The Perſians bring black cattle and ſheep, which renders proviſions very cheap. They have alſo wine, and plenty of all ſorts of eatables. The city ſtands on a little river which falls into the Indus, and thereby affords a ſhort and ſpeedy paſſage for all the rich commodities in the country behind it, which, when brought to Cabul, are there exchanged for ſlaves and horſes, and then conveyed by merchants of different countries to all parts of the world. The inhabitants are moſt of them Indian pagans, though the officers of the Mogul and moſt of the garriſon are Mahometans.

CABULISTAN, a province of Aſia, formerly belonging to the Great Mogul; but ceded in 1739 to Kouli Khan, who at that time governed Perſia. It is bounded on the north by Bukharia, on the eaſt by Caſchmire, on the weſt by Zabuliſtan and Candahar, and on the ſouth by Multan. It is 250 miles in length, 240 in breadth, and its chief town is Cabul. This country in general is not very fruitful; but in the vales they have good paſture-lands. The roads are much infeſted with banditti; which obliges the natives to have guards for the ſecurity of travellers. The religion of the Cabuliſtans is pagan, and their extraordinary time of devotion is the full moon in February, and continues for two days. At this time they are clothed in red, make their offerings, dance to the ſound of the trumpet, and make viſits to their friends in maſquerade dreſſes. They ſay, their god Cruſman killed a giant, who was his enemy, and that he appeared like a little child; in memory of which, they cauſe a child to ſhoot at the figure of a giant. Thoſe of the ſame tribe make bonefires, and feaſt together in a jovial manner. The moral part of their religion conſiſts in charity; for which reaſon they dig wells and build houſes for the accommodation of travellers. They have plenty of proviſions, mines of iron, myrobolans, aromatic woods, and drugs of many kinds. They carry on a great trade with the neighbouring countries; by which means they are very rich, and are ſupplied with plenty of all things.

CABURNS, on ſhip-board, are ſmall lines made of ſpun yarn, to bind cables, ſeize tackles, or the like.

CACALIA, in botany; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants. The receptacle is naked; the pappus hairy; the calyx cylindrical, oblong, and caliculated, or having a ſmall calyx of very ſhort ſcales only at the baſe.

Species. 1. The ſuaveolens, with a herbaceous ſtalk, is a native of North America. It hath a perennial creeping root which ſends out many ſtalks, garniſhed with triangular ſpear-ſhaped leaves ſharply ſawed on their edges, of a pale green on their under ſide, but a deep ſhining green above, placed alternately. The ſtalks riſe to the height of ſeven or eight feet, and are terminated by umbels of white flowers, which are ſucceeded by oblong ſeeds covered with down. It flowers in Auguſt, and the ſeeds ripen in October. The ſtalks decay in autumn, and new ones riſe in the ſpring. This plant multiplies greatly by its ſpreading roots, as alſo by the ſeeds, which are ſpread to a great diſtance by the wind, the down which adheres to them being greatly aſſiſting to their conveyance. The roots which have been caſt out of Chelſea garden, being carried by the tide to a great diſtance, have fixed themſelves to the banks of the river, and increaſed ſo much, that in a few years this ſpecies may probably appear as a native of England. 2. The ficoides is a native of the Cape of Good Hope. It riſes with ſtrong round ſtalks to the height of ſeven or eight feet, woody at bottom, but ſoft and ſucculent upward, ſending out many irregular branches, garniſhed more than half their length with thick, taper, ſucculent leaves, a little compreſſed on two ſides, ending in points, covered with a whitiſh glaucous farina, which comes off when handled. Theſe, when broken, emit a ſtrong odour of turpentine, and are full of a viſcous juice; at the extremity of the branches the flowers are produced in ſmall umbels; they are white, tubulous, and cut into five parts at the top. The leaves of this plant are pickled by the French, who eſteem them much; and in doing this they have a method of preſerving the white farina upon them, which adds greatly to the beauty of the pickle when brought to table. 3. The kleinia, with a compound ſhrubby ſtalk, grows naturally in the Canary iſlands, but has long been cultivated in the Engliſh gardens. It riſes with a thick fleſhy ſtem divided at certain diſtances, as it were, into ſo many joints. Each of theſe diviſions ſwell much larger in the middle than they do at each end; and the ſtalks divide into many irregular branches of the ſame form, which, toward their extremities, are garniſhed with long, narrow, ſpear-ſhaped leaves of a glaucous colour, ſtanding all round the ſtalks without order. As they fall off, they leave a ſcar at the place, which always remains on the branches. The flowers are produced in large cluſters at the extremity of the branches, which are tubulous, and of a faint carnation colour. They appear in Auguſt and September, but continue great part of October, and are not ſucceeded by ſeeds in England. There have been ſtones and foſſils dug up at a very great depth in ſome parts of England having very perfect impreſſions of this plant upon them; from whence Dr Woodward has ſuppoſed the plants were lodged there at the univerſal deluge; and finding the impreſſions of many other plants and animals which are natives of thoſe iſlands, he concludes that the water flowed hither from the ſouth-weſt. This plant has been called the *cabbage-tree*, from the reſemblance which the ſtalk of it has to the cabbage: others have intitled it *carnation-tree*, from the ſhape of the leaves and the colour of the flowers. Beſides theſe, there are ſeven other ſpecies, viz. the alpina, with kidney-ſhaped leaves; the glabra, with ſmooth leaves; the atriplicifolia, with heart-ſhaped ſinuated leaves; the papillaris, with a ſhrubby ſtalk guarded on every ſide with broken rough footſtalks; the ante-euphorbium, with oblong oval leaves; the ſonchifolia, with lyre-ſhaped indented leaves; and the lutea, with leaves divided into five acute parts.

Culture. The three ſpecies deſcribed above are very eaſily propagated. The firſt will propagate itſelf, as already mentioned, either by roots or ſeeds. The ſecond is eaſily propagated by cuttings during the ſummer months: Theſe ſhould be cut from the plants and laid to dry a fortnight, that the wound may be healed over before they are planted. Moſt people plunge the pots in which theſe are planted into an hot-bed, to promote their putting out roots; but if planted in June or July, they will root as well in the open air. Even branches broken off by accident have frequently put out roots when fallen on the ground, without any care. Theſe branches may be kept ſix months out of the ground, and will take root if planted. This ſhould have a light ſandy earth, and in winter be placed in an airy glaſs-caſe, where they may enjoy the ſun and air in mild weather, but muſt be protected from froſt. During the winter ſeaſon the plants muſt have but little water; and in ſummer, when they are placed in the open air, it ſhould not be given to them too often, nor in great quantity. The third is alſo propagated by cuttings, and the plants require the ſame culture; but muſt have a dry warm glaſs-caſe in winter, and very little water, being ſubject to rot with wet. In ſummer they muſt be placed in the open air in a warm ſheltered ſituation, and in very dry weather refreſhed moderately with water. With this management the plants will flower annually, and grow to the height of eight or ten feet.

CACAO. See Theobroma.

CACCOONS. See Flevillea.

CACERES, a town of Spain, in the province of Eſtremadura, is ſeated on the river Saler, and noted for the exceding fine wool which the ſheep bear in the neighbourhood. Between this town and Brocos, there is a wood, where the allies defeated the rear-guard of the duke of Berwick, on the 7th of April 1706. E. Long. 6. 47. N. Lat. 39. 15.

CACHALOT, in ichthyology. See Physeter.

CACHAN, or Cashan, a conſiderable town of Perſia in Irac Agemi, where they carry on an extenſive trade in ſilks, ſilver, and gold brocades, and fine earthern ware. It is ſituated in a vaſt plain, 55 miles from Iſaphan. E. Long. 50. 2. N. Lat. 34. 10.

CACHAO, a province of the kingdom of Tonquin in Aſia, ſituated in the heart of the kingdom, and ſurrounded by the other ſeven. Its ſoil is fertile, and in ſome places mountainous, abounding with variety of trees, and particularly that of varniſh. Moſt of theſe provinces carry on ſome branch of the ſilk manufacture, but this moſt of all. It takes its name from the capital, which is alſo the metropolis of the whole kingdom, though in other reſpects hardly comparable to a Chineſe one of the third rank.

Cachao, a city of the province of that name, in the kingdom of Tonquin in Aſia, ſituated in E. Long. 105.

105. 31. N. Lat. 22. 10. at about 80 leagues diſtance from the ſea. It is prodigiouſly crowded with people, inſomuch that the ſtreets are hardly paſſable, eſpecially on market days. Theſe vaſt crowds, however, come moſtly from the neighbouring villages; upon which account theſe villages have been allowed their halls in particular parts of the city, where they bring and diſpoſe of their wares. The town itſelf, though the metropolis of the whole Tonquineſe kingdom, hath neither walls nor fortifications. The principal ſtreets are wide and airy, but the reſt of them narrow and ill-paved; and except the palace royal and arſenal, the town hath little elſe worth notice. The houſes are low and mean, moſtly built of wood and clay, and not above one ſtory high. The magazines and warehouſes belonging to foreigners are the only edifices built of brick; and which, though plain, yet, by reaſon of their height and more elegant ſtructure, make a conſiderable ſhow among thoſe rows of wooden huts. From the combuſtibility of its edifices, this city ſuffers frequent and dreadful conflagrations. Theſe ſpread with ſuch ſurpriſing velocity, that ſome thouſands of houſes are often laid in aſhes before the fire can be extinguiſhed. To prevent theſe ſad conſequences, every houſe hath either in its yard or even in its centre, ſome low building of brick, in form of an oven, into which the inhabitants on the firſt alarm convey their moſt valuable goods. Beſides this precaution, which every family takes to ſecure their goods, the government obliges them to keep a ciſtern, or ſome other capacious veſſel, always full of water on the top of their houſe, to be ready on all occaſions of this nature; as likewiſe a long pole and bucket, to throw water from the kennel upon the houſes. If theſe two expedients fail of ſuppreſſing the flames, they immediately cut the ſtraps which faſten the thatch to the walls, and let it fall in and waſte itſelf on the ground. The king's palace ſtands in the centre of the city; and is ſurrounded with a ſtout wall, within whoſe cincture are ſeen a great number of apartments two ſtories high, whoſe fronts and portals have ſomething of the grand taſte. Thoſe of the king and his wives are embelliſhed with variety of carvings and gildings after the Indian manner, and all finely varniſhed. In the outer court are a vaſt number of ſumptuous ſtables for the king's horſes and elephants. The appearance of the inner courts can only be conjectured; for the avenues are not only ſhut to all ſtrangers, but even to the king's ſubjects, except thoſe of the privy council, and the chief miniſters of ſtate: yet we are told, that there are ſtair-caſes by which people may mount up to the top of the walls, which are about 18 or 20 feet high; from whence they may have a diſtant view of the royal apartments, and of the fine parterres and fiſh-ponds that are between the cincture and them. The front wall hath a large gate, well ornamented, which is never opened but when the king goes in and out; but at ſome diſtance from it on each ſide there are two poſterns, at which the courtiers and ſervants may go in and out. This cincture, which is of a vaſt circumference, is faced with brick within and without, and the whole ſtructure is terminated by wide ſpacious gardens; which, though ſtored with great variety of proper ornaments, are deſtitute of the grandeur and elegance obſerved in the palaces of European princes. Beſides this palace, the ruins of one ſtill more magnificent are to be obſerved, and are called *Libatvia*. The circumference is ſaid to have been betwixt ſix and ſeven miles: ſome arches, porticoes, and other ornaments, are ſtill remaining; from which, and ſome of its courts paved with marble, it may be concluded to have been as magnificent a ſtructure as any of the eaſtern parts can ſhow. The arſenal is likwiſe a large and noble building, well ſtored with ammunition and artillery The Engliſh factory is ſituated on the north ſide of the city, fronting the river *Song-koy*. It is a handſome low-built houſe, with a ſpacious dining-room in the centre; and on each ſide are the apartments of the merchants, factors, and ſervants. At each end of the building are ſmaller houſes for other uſes, as ſtore-houſes, kitchen, &c. which form two wings with the ſquare in the middle, and parallel with the river, near the bank of which ſtands a long flag-ſtaff, on which they commonly diſplay the Engliſh colours on Sundays and all remarkable days. Adjoining to it, on the ſouth ſide, is the Daniſh factory, which is neither ſo large nor ſo handſome. On the ſame ſide of the river runs a long dike, whoſe timber and ſtones are ſo firmly faſtened together, that no part of it can be ſtirred without moving the whole. This work was raiſed on thoſe banks to prevent the river, during the time of their vaſt rains, from overflowing the city; and it has hitherto anſwered its end; for though the town ſtands high enough to be in no danger from land-floods, it might yet have been otherwiſe frequently damaged, if not totally laid under water, by the overflowing of that river. Some curious obſervations have been communicated to the royal ſociety concerning differences between the tides of thoſe ſeas and thoſe of Europe, viz. that on the Tonquineſe coaſt ebbs and flows but once in 24 hours; that is, that the tide is riſing during the ſpace of 12 hours, and can be eaſily perceived during two of the moon's quarters, but can hardly be obſerved during the other two. In the ſpring tides, which laſt 14 days, the waters begin to riſe at the riſing of the moon; whereas in the low tides, which continue the ſame number of days, the tide begins not till that planet is got below the horizon. Whilſt it is paſſing through the ſix northern ſigns, the tides are obſerved to vary greatly, to riſe ſometimes very high, and ſometimes to be very low; but when it is once got into the ſouthern part of the zodiac, they are then found to be more even and regular,

CACHECTIC, ſomething partaking of the nature of, or belonging to, a cachexy.

CACHEO, a town of Negroland in Africa, ſeated on the river St Domingo. It is ſubject to the Portugueſe, who have three forts there, and carry on a great trade in wax and ſlaves. W. Long. 14. 55. N. Lat. 12. 0.

CACHEXY, in medicine, a vicious ſtate of the humours and whole habit. See (the Index ſubjoined to) MEDICINE.

CACHRYS, in botany: A genus of the digynia order belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The fruit is ſubovate, angled, and cork or ſpongy rinded.

There are five ſpecies, viz. the trifida, with bipinnated leaves; the ſicula, with double winged leaves; the libanotis, with ſmooth furrowed ſeeds; the linearia, with plain channelled fruit; and the hungarica, with a plain, fungous, channelled ſeed. All theſe are perennial

ennial plants, riſing pretty high, and bearing large umbels of yellow flowers, and may be propagated by ſeeds which ought to be ſown ſoon after they are ripe; for if they are kept out of the ground till the next ſpring, they often miſcarry. They muſt alſo be ſown in a ſhady border where they are to remain: for the plants, having long top-roots, will not bear tranſplanting ſo well as many others. The Hungarians in the neighbourhood of Erlaw, and thoſe who border on Tranſylvania, Servia, &c. eat the root of the fifth ſpecies in a ſcarcity of corn for want of other bread.

CACHUNDE, the name of a medicine, highly celebrated among the Chineſe and Indians, and made of ſeveral aromatic ingredients, the perfumes, medicinal earth, and precious ſtones: they make the whole into a ſtiff paſte, and form out of it ſeveral figures according to their fancy, which are dried for uſe: theſe are principally uſed in the Eaſt Indies, but are ſometimes brought over to Portugal. In China, the principal perſons uſually carry a ſmall piece in their mouths, which is a continued cordial, and gives their breath a very ſweet ſmell. It is a highly valuable medicine alſo, in all nervous complaints; and is eſteemed a prolonger of life, and a provocative to venery, the two great intentions of moſt of the medicines in uſe in the Eaſt.

CACOCHYLIA, or CACOCHYMIA, a vicious ſtate of the vital humours, eſpecially of the maſs of blood; ariſing either from a diſorder of the ſecretions or excretions, or from external contagion. The word is Greek, compound of κακος *ill*, and χυμος *juice*.

CACOPHONIA, in grammar and rhetoric, the meeting of two letters, or ſyllables, which yield an uncouth and diſagreeable ſound. The word is compounded of κακος *evil*, and φωνη, *voice*.

CACOPHONIA, in medicine, denotes a voice or deprivation of the voice or ſpeech; of which there are two ſpecies, *aphonia* and *dyſphonia*.

CACTUS, in botany: A genus of the monogynia order, belonging to the icoſandria claſs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The calyx is monophyllous; ſuperior, or above the receptacle of the fruit imbricated; the corolla polypetalous; the fruit an unilocular, polyſpermous berry. To this genus Linnæus has added the cereus and opuntia. There are 24 ſpecies, all natives of the Weſt Indies and Mexico.

The cacti are plants of a ſingular ſtructure, but eſpecially the larger kinds of them; which appear like a large, fleſhy, green melon, with deep ribs, ſet all over with ſtrong ſharp thorns; and, when the plants are cut through the middle, their inſide is a ſoft, pale-green, fleſhy ſubſtance, very full of moiſture. The fruit of all the ſpecies is frequently eaten by the inhabitants of the Weſt Indies. The fruits are about three quarters of an inch in length, of a taper form, drawing to a point at the bottom toward the plant, but blunt at the top where the empalement of the flower was ſituated. The taſte is agreeably acid, which in a hot country muſt render the fruit more grateful.

The cochineal animals are ſupported on a ſpecies called *cactus cochenillifer*.—The flower of the cactus grandiflora (one of the creeping cereuſes) is ſaid to be as grand and beautiful as any in the vegetable ſyſtem: It begins to open in the evening about ſeven o'clock, is in perfection about eleven, and fades about four in the morning: ſo that the ſame flower only continues in perfection about ſix hours. The calyx when expanded is about a foot in diameter, of a ſplendid yellow within, and a dark brown without; the petals are many, and of a pure white; and the great number of recurved ſtamina, ſurrounding the ſtyle in the centre of the flower, make a grand appearance, to which may be added the fine ſcent, which perfumes the air to a conſiderable diſtance. It flowers in July.

CACUS, in fabulous hiſtory, an Italian ſhepherd upon mount Aventine. As Hercules was driving home the herd of king Geryon whom he had ſlain, Cacus robbed him of ſome of his oxen, which he drew backward into his den leſt they ſhould be diſcovered. Hercules at laſt finding them out by their lowing, or the robbery being diſcovered to him, killed Cacus with his club. He was Vulcan's ſon, of prodigious bulk, and half man half ſatyr.

CADAN, a town of Bohemia, in the circle of Zats, ſeated on the northern bank of the river Egra, in E. Long. 13. 34. N. Lat. 50. 20.

CADARI, or KADARI, a ſect of Mahometans, who aſſert free-will; attribute the actions of men to men alone, not to any ſecret power determining the will; and deny all abſoute decrees, and predeſtination. The author of this ſect was Mabed ben Kaled Al Gihoni, who ſuffered martyrdom for it. The word comes from the Arabic, קדר, *cadara*, *power*. Ben Aun calls the Cadarians the Magi, or Manichees of the Muſſulmen.

CADE, a cag, caſk, or barrel. A cade of herrings is a veſſel containing the quantity of 500 red herrings, or 1000 ſprats.

CADE Lamb, a young lamb weaned, and brought up by hand, in a houſe; called *pet-lamb*.

CADE-Oil, in the *Materia Medica*, a name given to an oil much in uſe in ſome parts of France and Germany. The phyſicians call it *oleum cadæ*, or *oleum de cada*. This is ſuppoſed by ſome to be the the piſſelæum of the ancients, but improperly; it is made of the fruit of the oxycedrus, which is called by the people of theſe places *cada*.

CADE-Worm, in zoology, the maggot or worm of a fly called *phryganea*. It is uſed as a bait in angling. See PHRYGANEA.

CADEA, or THE LEAGUE OF THE HOUSE OF GOD, is one of thoſe that compoſe the republic of the Griſons, and the moſt powerful and extenſive of them all. It contains the biſhopric of Coire, the great valley of Engadine, and that of Bragail or Pregal. Of the 11 great, or 21 ſmall communities, there are but two that ſpeak the German language; that of the reſt is called the *Rhetic*, and is a dialect of the Italian. The Proteſtant religion is moſt prevalent in this league, which has been allied to the Swiſs cantons ever ſince the year 1498. Coire is the capital town.

CADENAC, a town of France in Querci, on the confines of Rouergue, ſeated on the river Lot, in E. Long. 2. 12 N. Lat. 44. 36.

CADENCE, or REPOSE, in muſic, (from the Latin *cadere* to *fall* or *deſcend*); the termination of an harmonical phraſe on a repoſe, or on a perfect chord. See MUSIC, art. 73—76, and 132—137.

CADENCE, in reading, is a falling of the voice below the key-note at the cloſe of every period. In reading, whether proſe or verſe, a certain tone is aſſumed which is called the *key-note*; and in this tone the bulk of the words are ſounded; but this note is generally lowered towards the cloſe of every ſentence.

CADENCE, in the manage, an equal meaſure or proportion, obſerved by a horſe in all his motions; ſo that his times have an equal regard to one another, the one does not embrace or take in more ground than the other, and the horſe obſerves his ground regularly.

CADENE, one of the ſorts of carpets which the Europeans import from the Levant. They are the worſt ſort of all, and are ſold by the piece from one to two piaſtres per carpet.

CADENET, a town of France in Provence, and in the Viguirie of Apt. E. Long. 5. 30. N. Lat. 43. 40.

CADES, or KADESH, (anc. geog.) a town in the Wilderneſs of Zin, in Arabia Petræa; the firſt encampment of the Iſraelites, after their departure from Eziongeber; and from which the Wilderneſs of Zin was called Cades; the burial-place, of Miriam, with the rock and water of Meribah in it. Another *Cades* a town of the tribe of Judah, Joſhua xv. 23. *Cadeſbarnea*, called alſo *Cades*.

CADESBARNEA, (anc. geog.) a town of the Wilderneſs of Paran, on the confines of Canaan, from which the ſpies were ſent out; ſometimes ſimply called *Cades*, but diſtinct from the Cades in the Wilderneſs of Zin.

CADET, the younger ſon of a family, is a term naturalized in our language from the French. At Paris, among the citizens, the cadets have an equal patrimony with the reſt. At Caux in Normandy, the cuſtom, as in England, is to leave all to the eldeſt, except a ſmall portion to the cadets. In Spain, it is uſual for one of the cadets in great families to take the mother's name.

CADET is alſo a military term denoting a young gentleman who chooſes to carry arms in a marching regiment as a private man. His views are, to acquire ſome knowledge in the art of war, and to obtain a commiſſion in the army. Cadet differs from volunteer, as the former takes pay, whereas the latter ſerves without pay.

CADI, or CADHI, a judge of the civil affairs in the Turkiſh empire. It is generally taken for the judge of a town; judges of provinces being diſtinguiſhed by the appellation of *moulas*.

We find numerous complaints of the avarice, iniquity, and extortion, of the Turkiſh cadis; all juſtice is here venal; the people bribe the cadis, the cadis bribe the moulas, the moulas the cadileſchers, and the cadileſchers the mufti. Each cadi has his ſerjeants, who are to ſummon perſons to appear and anſwer complaints. If the party ſummoned fails to appear at the hour appointed, ſentence is paſſed in favour of his adverſary. It is uſually vain to appeal from the ſentences of the cadi, ſince the affair is never heard anew, but judgment is paſſed on the caſe as ſtated by the cadi. But the cadis are often caſhiered and puniſhed for crying injuſtice with the baſtinado and mulcts; the law, however, does not allow them to be put to death. Conſtantinople has had cadis ever ſince the year 1390, when Bajazet I. obliged John Paleologus, Emperor of the Greeks, to receive cadis into the city to judge all controverſies happening between the Greeks and the Turks ſettled there. In ſome countries of Africa, the cadis are alſo judges of religious matters. Among the Moors, cadis is the denomination of their higher order of prieſts or doctors, anſwering to the rabbins among the Jews.

CADIACI, the Turkiſh name of Chalcedon. See CHALCEDON.

CADILESCHER, a capital officer of juſtice among the Turks, anſwering to a chief juſtice among us.

It is ſaid, that this authoriry was originally confined to the ſoldiery; but that, at preſent, it extends itſelf to the determination of all kinds of law-ſuits; yet is nevertheleſs ſubject to appeals.

There are but three cadileſchers in all the grand ſignior's territories: the firſt is that of Europe; the ſecond, of Natolia; and the third reſides at Grand Cairo. This laſt is the moſt conſiderable: they have their ſeats in the divan next to the grand vizir.

CADILLAC, a town of France in Guienne, and in Bazadois, near the river Garonne, with a handſome caſtle, ſituated in W. Long. 0. 15. N. Lat. 44. 37.

CADIZ, a city and port town of Andaluſia in Spain, ſituated on the iſland of Leon, oppoſite to Port St Mary on the continent, about 60 miles ſouth-weſt of Seville, and 40 north-weſt of Gibraltar. W. Long. 6. 40. N. Lat. 36. 30.

It occupies the whole ſurface of the weſtern extremity of the iſland, which is compoſed of two large circular parts, joined together by a very narrow bank of ſand, forming altogether the figure of a chain-ſhot. At the ſouth-eaſt end, the ancient bridge of Suaco, thrown over a deep channel or river, affords a communication between the iſland and the continent; a ſtrong line of works defends the city from all approaches along the iſthmus; and, to render them ſtill more difficult, all the gardens and little villas on the beach were in 1762 cleared away, and a dreary ſandy glacis left in their room, ſo that now there is ſcarce a tree on the whole iſland.

Except the *Calle Ancha*, all the ſtreets are narrow, ill-paved, and inſufferably ſtinking. They are all drawn in ſtraight lines, and moſt of them interſect each other at right angles. The ſwarms of rats that in the nights run about the ſtreets are innumerable; whole droves of them paſs and repaſs continually, and theſe their midnight revels are extremely troubleſome to ſuch as walk late. The houſes are lofty, with each a veſtibule, which being left open till night, ſerve paſſengers to retire to; this cuſtom, which prevails throughout Spain, renders theſe places exceedingly offenſive. In the middle of the houſe is a court like a deep well, under which is generally a ciſtern, the breeding-place of gnats and muſquitos; the ground floors are warehouſes, the firſt ſtories compting-houſes or kitchen, and the principal apartment up two pair of ſtairs. The roofs are flat, covered with an impenetrable cement, and few are without a *mirador* or turret for the purpoſe of commanding a view of the ſea. Round the parapet-wall at top are placed rows of ſquare pillars, meant either for ornament according to ſome traditional mode of decoration, or to fix awnings to, that ſuch as ſit there for the benefit of the ſea-breeze may be ſheltered from the rays of the ſun; but the moſt common uſe made of them, is to faſten ropes for drying linen upon. High above all theſe pinnacles, which give Cadiz a moſt ſingular appearance, ſtands the

the tower of ſignals. Here flags are hung out on the firſt ſight of a ſail, marking the ſize of the ſhip, the nation it belongs to, and, if a Spaniſh Indiaman, the port of the Indies it comes from. The ſhips are acquainted with the proper ſignals to be made, and theſe are repeated by the watchmen of the tower: as painted liſts are in every houſe, perſons concerned in commerce ſoon learn the marks.

The city is divided into twenty-four quarters, under the inſpection of as many commiſſioners of police; and its population is reckoned at one hundred and forty thouſand inhabitants, of which twelve thouſand are French, and at leaſt as many more Italians. The ſquare of Saint Antonio is large, and tolerably handſome, and there are a few ſmaller openings of no great note. The public walk, or Alameda, is pleaſant in the evening: it is fenced off the coach-road by a marble rail. The ſea air prevents the trees from thriving, and deſtroys all hopes of future ſhade.

From the Alameda, continuing your walk weſtwards, you come to the Campoſanto, a large eſplanade, the only airing-place for coaches; it turns round moſt part of the weſt and ſouth ſides of the iſland, but the buildings are ſtraggling and ugly; the only edifice of any ſhow is the new orphan-houſe; oppoſite to it is the fortreſs of St Sebaſtian, built on a neck of land running out into the ſea. The round tower at the extremity is ſuppoſed to have ſaved the city, in the great earthquake of 1755, from being ſwept away by the fury of the waves. The building proved ſufficiently ſolid to withſtand the ſhock, and break the immenſe volume of water that threatened deſtruction to the whole iſland. In the narrow part of the iſthmus the ſurge beat over with amazing impetuoſity, and bore down all before it; among the reſt the grandſon of the famous tragic-poet Racine, who ſtrove in vain to eſcape by urging his horſe to the utmoſt of his ſpeed. On St Sebaſtian's feaſt, a kind of wake or fair is held in the fort; an aſtoniſhing number of people then paſſing and repaſſing, on a ſtring of wooden bridges laid from rock to rock, makes a very lively moving picture.

From hence to the wooden circus where they exhibit the bull-feaſts, you keep turning to the left cloſe above the ſea, which on all this ſide daſhes over large ledges of rock; the ſhore ſeems here abſolutely inacceſſible. On this ſhore ſtands the cathedral, a work of great expence, but carried on with ſo little vigour, that it is difficult to gueſs at the term of years it will require to bring it to perfection. The vaults are executed with great ſolidity. The arches, that ſpring from the cluſtered pilaſters to ſupport the roof of the church, are very bold; the minute ſculpture beſtowed upon them ſeems ſuperfluous, as all the effect will be loſt from their great height, and from the ſhade that will be thrown upon them by the filling up of the interſtices. From the ſea, the preſent top of the church reſembles the carcaſe of ſome huge monſter caſt upon its ſide, rearing its gigantic blanched ribs high above the buildings of the city. The outward caſings are to be of white marble, the bars of the windows of bronze.

Next, croſſing before the land-gate and barracks, a ſuperb edifice for ſtrength, convenience, and cleanlineſs, you come down to the ramparts that defend the city on the ſide of the bay. If the proſpect to the ocean is ſolemn, that towards the main land is animated in the higheſt degree; the men of war ride in the eaſtern boſom of the bay; lower down the merchantmen are ſpread far and near; and cloſe to the town an incredible number of barks; of various ſhapes and ſizes, cover the ſurface of the water, ſome moored and ſome in motion, carrying goods to and fro. The oppoſite ſhore of Spain is ſtudded with white houſes, and enlivened by the towns of St Mary's, Port-real, and others, behind which, eaſtward, on a ridge of hills, ſtands Medina Sidonia, and further back riſe the mountains of Granada. Weſtward, Rota cloſes the horizon, near which was anciently the iſland and city of Tarteſſus, now covered by the ſea, but at low-water ſome part of the ruins are ſtill to be diſcerned. In a large baſtion, jutting out into the bay, they have built the cuſtom-houſe, the firſt ſtory of which is level with the walk upon the walls. When it was reſolved to erect a building ſo neceſſary to this great emporium of trade, the marquis di Squillace gave orders that no expence ſhould be ſpared, and the moſt intelligent architects employed, in order to erect a monument, which by its taſte and magnificence might exite the admiration of poſterity: the reſult of theſe precautions proved a piece of vile architecture, compoſed of the worſt of materials.

The ſtir here is prodigious during the laſt months of the ſtay of the flota. The packers poſſeſs the art of preſſing goods in great perfection; but, as they pay the freight according to the cubic palms of each bale, they are apt to ſqueeze down the cloths and linens ſo very cloſe and hard, as ſometimes to render them unfit for uſe. The exportation of French luxuries in dreſs is enormous; Lyons furniſhes moſt of them; England ſends out bale goods; Brittany and the north, linens. Every commercial nation has a conſul reſident at Cadiz; thoſe of England and France are the only ones not allowed to have any concern in trade.

In 1596, Cadiz was taken, pillaged, and burnt by the Engliſh; but in 1702 it was attempted, in conjunction with the Dutch, without ſucceſs.

CADIZADELITES, a ſect of Mahometans very like the ancient ſtoics. They ſhun feaſts and diverſions, and affect an extraordinary gravity in all their actions; they are continually talking of God, and ſome of them make a jumble of Chriſtianity and Mahometaniſm; they drink wine, even in the faſt of the ramazan; they love and protect the Chriſtians; they believe that Mahomet is the Holy Ghoſt, practiſe circumciſion, and juſtify it by the example of Jeſus Chriſt.

CADMEAN LETTERS, the ancient Greek or Ionic characters, ſuch as they were firſt brought by Cadmus from Phœnicia; whence Herodotus alſo calls them *Phœnician letters.*——According to ſome writers, Cadmus was not the inventor, nor even importer of the Greek letters, but only the modeller and reformer thereof; and it was hence they acquired the appellation *Cadmean* or *Phœnician letters;* whereas before that time they had been called *Pelaſgian letters.*

CADMIA. See CALAMINE.

CADMUS, in fabulous hiſtory, king of Thebes, the ſon of Agenor king of Phœnicia, and the brother of Phœnix, Cilix, and Europa. He carried into Greece the 16 ſimple letters of the Greek alphabet; and there built Thebes, in the Bœotia. The poet ſay, that

that he left his native country in ſearch of his ſiſter Europa, whom Jupiter had carried away in the form of a bull; and that, inquiring of the Delphic oracle for a ſettlement, he was anſwered, that he ſhould follow the direction of a cow, and build a city where ſhe lay down. Having arrived among the Phocenſes, he was met by a cow, who conducted him through Bœotia to the place where Thebes was afterwards built: but as he was about to ſacrifice his guide to Pallas, he ſent two of his company to the fountain Dirce for water; when they being devoured by a ſerpent or dragon, he ſlew the monſter, and afterwards, by the advice of Pallas, ſowed his teeth, when there ſprung up a number of armed ſoldiers, who prepared to revenge the death of the ſerpent; but on his caſting a ſtone among theſe upſtart warriors, they turned their weapons againſt each other with ſuch animoſity, that only five ſurvived the combat, and theſe aſſiſted Cadmus in founding his new city. Afterwards, to recompence his labours, the gods gave him Harmonia, or Hermione, the daughter of Mars and Venus; and honoured his nuptials with preſents and peculiar marks of favour. But at length reſigning Thebes to Pentheus, Cadmus and Hermione went to govern the Ecclellenſes: when grown old, they were transformed into ſerpents; or, as others ſay, ſent to the Elyſian fields, in a chariot drawn by ſerpents. See THEBES.

CADMUS of Miletum, a celebrated Greek hiſtorian, was, according to Pliny, the firſt of the Greeks who wrote hiſtory in proſe. He flouriſhed about 550 before Chriſt.

CADORE, or PIEVE DE CADORE, a town of Italy, in the territory of Venice, and capital of a diſtrict called *Cadorino;* famous for the birth of Titian the painter. E. Long. 13. 45. N. Lat. 46. 25.

CADORINO, a province of Italy, in the territory of Venice; bounded on the eaſt by Friuli Proper, on the ſouth and weſt by the Bellunese, and by the biſhopric of Brixen on the north. It is a very mountainous country, but pretty populous. The only town is Pieve de Cadore.

CADRITES, a ſort of Mahometan friars, who once a-week ſpend a great part of the night in turning round, holding each others hand, and repeating inceſſantly the word *hai,* which ſignifies *living,* and is one of the attributes of God; during which one of them plays on a flute. They never cut their hair, nor cover their heads; and always go barefooted: they have liberty to quit their convent when they pleaſe, and to marry.

CADSAND, an iſland on the coaſt of Dutch Flanders, ſituated at the mouth of the Scheld, whereby the Dutch command the navigation of that river.

CADUCEUS, in antiquity, Mercury's rod or ſceptre, being a wand entwiſted by two ſerpents borne by that deity as the enſign of his quality and office, given him according to the fable by Apollo, for his ſeven-ſtringed harp. Wonderful properties are aſcribed to this rod by the poets; as laying men aſleep, raiſing the dead, &c.

It was alſo uſed by the ancients as a ſymbol of peace and concord: the Romans ſent the Carthaginians a javelin and a caduceus, offering them their choice either of war or peace. Among that people, thoſe who denounced war were called *feciales;* and thoſe who went to demand peace, *caduceatores,* becauſe they bore a caduceus in their hand.

The caduceus found on medals is a common ſymbol, ſignifying good conduct, peace, and proſperity. The rod expreſſes power, the two ſerpents prudence, and the two wings diligence.

CADUCI, (from *cado* to "fall"); the name of a claſs in Linnæus's *calycina,* conſiſting of plants whoſe calyx is a ſimple perianthium, ſupporting a ſingle flower or fructification, and falling off either before or with the petals. It ſtands oppoſed to the *claſſes perſiſtentes* in the ſame method, and is exemplified in muſtard and ranunculus.

CADURCI, CADURCUM, *Cadurcus,* and *Cadurx,* (anc. geog.), a town of the Cadurci, a people of Aquitania; ſituated between the rivers Oldus, running from the north, and the Tarnis from the ſouth, and falling into the Garumna: now *Cahors,* capital of the territory of the Querci, in Guienne. A part of the Cadurci to the ſouth next the Tarnis, were called *Eleutheri.*

CADUS, in antiquity, a wine veſſel of a certain capacity, containing 80 amphoræ or firkins; each of which, according to the beſt accounts, held nine gallons.

CADUSII, (anc. geog.) a people of Media Atropatene, ſituated to the weſt in the mountains, and reaching to the Caſpian ſea; between whom and the Medes, perpetual war and enmity continued down to the time of Cyrus.

CÆCILIA, in zoology, a genus of ſerpents belonging to the amphibia claſs. The cæcilia has no ſcales; it is ſmooth, and moves by means of lateral rugæ or prickles. The upper lip is prominent, and furniſhed with two tentacula. It has no tail. There are but two ſpecies of this ſerpent, *viz.* 1. The tentaculata has 135 rugæ. It is about a foot long, and an inch in circumference, preſerving an uniform cylindrical ſhape from the one end to the other. The teeth are very ſmall. It has ſuch a reſemblance to an eel, that it may eaſily be miſtaken for one; but as it has neither fins nor gills, it cannot be claſſed with the fiſhes. It is a native of America, and its bite is not poiſonous. 2. The glutinoſa, has 340 rugæ or prickles above, and 10 below, the anus. It is of a browniſh colour, with a white line on the ſide, and is a native of the Indies.

CÆCUM, or COECUM, the blind gut. See ANATOMY, N° 93.

CÆLIUM, (anc. geog.) an inland town of Peucetia, a diviſion of Apulia, a place four or five miles above Barium or Bari; and which ſtill retains that name.

CÆLIUS MONS, (Itinerary); a town of Vindelicia, on the right or weſt ſide of the Ilargus. Now *Kelmuntz,* a ſmall town of Suabia, on the Iller.

CÆLIUS MONS at Rome. See COELIUS.

CÆLIUS, (Aurelianus) an ancient phyſician, and the only one of the ſect of the methodiſts of whom we have any remains. He was of Sicca, a town of Numidia; but in what age he lived, cannot be determined: it is probable, however, that he lived before Galen; ſince, though he carefully mentions all the phyſicians before him, he takes no notice of Galen. He had read over very diligently the ancient phyſicians of all ſects; and we are indebted to him for the knowledge of many dogmas which are not to be found but in his books *de celeribus et tardis paſſionibus*. He wrote, as he himſelf tells us, ſeveral other works; but they are all periſhed.

CAEN, an handſome and conſiderable town of France, capital of Lower Normandy, with a celebrated univerſity, and an academy of literature. It contains 60 ſtreets and 12 pariſhes. It has a caſtle with four towers, which were built by the Engliſh. The town-houſe is a large building with four great towers. The royal ſquare is the handſomeſt in all Normandy, and has fine houſes on three ſides of it; and in the middle is the ſtatue of Louis XIV. in a Roman habit, ſtanding on a marble pedeſtal, and ſurrounded with an iron balluſtrade. It is ſeated in a pleaſant country on the river Orne, about eight miles from the ſea. William the conqueror was buried here, in the abbey of St Stephen, which he founded. W. Long. 0. 27. N. Lat. 49. 11.

CÆRE, (anc. geog.) a town of Etruria, the royal reſidence of Mezentius. Its ancient name was *Argyllæ*. In Strabo's time not the leaſt veſtige of it remained, except the baths called *cæretana*. From this town the Roman cenſor's tables were called *cærites tabulæ*. In theſe were entered the names of ſuch as for ſome miſdemeanor forfeited their right of ſuffrage, or were degraded from a higher to a leſs honourable tribe. For the people of Cære hoſpitably receiving thoſe Romans who, after the taking of Rome by the Gauls, fled with their gods and the ſacred fire of Veſta, were, on the Romans recovering themſelves from this diſaſter, honoured with the privilege of the city, but without a right of voting.

CÆRITES TABULÆ. See the preceding article.

CAERFILLY, a town of Glamorganſhire in South Wales, ſeated between the rivers Taff and Rumney, in a mooriſh ground, among the hills. It is thought the walls, now in ruins, were built by the Romans; there being often Roman coins dug up there. W. Long. 3. 12. N. Lat. 51. 25.

CAERLEON, a town of Monmouthſhire in England, and a place of great antiquity. It was a Roman town, as is evident from the many Roman antiquities found here. It is commodiouſly ſituated on the river Uſk, over which there is a large wooden bridge. The houſes are generally built of ſtone, and there are the ruins of a caſtle ſtill to be ſeen. W. Long. 3. 0. N. Lat. 51. 40.

CAERMARTHEN-SHIRE, a county of Wales, bounded on the north by Severn ſea or St George's Channel, Cardiganſhire on the ſouth, the ſhires of Brecknock and Glamorgan on the eaſt, and Pembrokeſhire on the weſt. Its greateſt length is between 30 and 40 miles, and its breadth upwards of 20. The air is wholeſome, and the ſoil leſs rocky and mountainous than moſt other parts of Wales, and conſequently is proportionably more fertile both in corn and paſture. It has alſo plenty of wood, and is well ſupplied with coal and limeſtone. The moſt conſiderable rivers are the Towy, the Cothy, and the Tave: of which the firſt abounds with excellent ſalmon. The principal towns are Caermarthen the capital. Kidwely, Lanimdovery, &c. This county abounds with ancient forts, camps, and tumuli or barrows. Near to Caermarthen towards the eaſt may be ſeen the ruins of Kaſtelk Karrey, which was ſituated on a ſteep and inacceſſible rock; and alſo ſeveral vaſt caverns, ſuppoſed to have been copper-mines of the Romans. Near this ſpot is a fountain which ebbs and flows twice in 24 hours like the ſea.

CAERMARTHEN, a town of Wales, and capital of the county of that name. It is ſituated on the river Fowey, over which it has a fine ſtone-bridge. It is of great antiquity, being the Maridunum of Ptolemy. It is a populous, thriving, and polite place, many of the neighbouring gentry reſiding there in the winter. It is a corporation and county of itſelf, with power to make by-laws. Here were held the courts of chancery and exchequer for South Wales, till the whole was united to England in the reign of Henry VIII. Here was born the famous conjurer Merlin; and near the town is a wood called *Merlin's grove*, where he is ſaid to have often retired for contemplation. Many of his pretended prophecies are ſtill preſerved in the country. The town gives the title of *marquis* to his grace the duke of Leeds. It ſends one member to parliament, and the county another.

CAERNARVON-SHIRE, a county of Wales, bounded on the north and weſt by the ſea, on the ſouth by Merionethſhire, and on the eaſt it is divided from Denbighſhire by the river Conway. It is about 40 miles in length, and 20 in breadth; and ſends one member to parliament for the ſhire, and another for the borough of Caernarvon. The air is very piercing; owing partly to the ſnow that lies ſeven or eight months of the year upon ſome of the mountains, which are ſo high that they are called the *Britiſh Alps*; and partly to the great number of lakes, which are ſaid not to be fewer than 50 or 60. The ſoil in the valleys on the ſide next Ireland is pretty fertile, eſpecially in barley; great numbers of black cattle, ſheep, and goats, are fed on the mountains; and the ſea, lakes, and rivers, abound with variety of fiſh. The higheſt mountains in the county are thoſe called *Snowdon hills*, and *Pen-maen-mawr*, which laſt hangs over the ſea. There is a road cut out of the rock on the ſide next the ſea, guarded by a wall running along the edge of it on that ſide; but the traveller is ſometimes in danger of being cruſhed by the fall of pieces of the rock from the precipices above. The river Conway, though its courſe from the lake out of which it iſſues to its mouth is only 12 miles, yet is ſo deep, in conſequence of the many brooks it receives, that it is navigable by ſhips of good burden for eight miles. Pearls are found in a large black muſcle taken in this river. The principal towns are Bangor, Caernarvon the capital, and Conway. In this county is an ancient road ſaid to have been made by Helena the mother of Conſtantine the Great; and Matthew of Weſtminſter aſſerts, that the body of Conſtantius the father of the ſame Conſtantine was found at Caernarvon in the year 1283, and interred in the pariſh-church there by order of Edward I.

CAERNARVON, a town of Wales, and capital of the county of that name. It was built by Edward I. near the ſite of the ancient Segontium, after his conqueſt of the country in 1282, the ſituation being well adapted to overawe his new ſubjects. It had natural requiſites for ſtrength; being bounded on one ſide by the arm of the ſea called the *Menai*; by the eſtuary of the

Seiont on another, exactly where it receives the tide from the former; on a third ſide, and a part of the fourth, by a creek of the Menai; and the remainder has the appearance of having the inſulation completed by art. Edward undertook this great work immediately after his conqueſt of the country in 1282, and completed the fortifications and caſtle before 1284; for his queen, on April 25th in that year, brought forth within its walls Edward, firſt prince of Wales of the Engliſh line. It was built within the ſpace of one year, by the labour of the peaſants, and at the coſt of the chieftains of the country, on whom the conqueror impoſed the hateful taſk. The external ſtate of the walls and caſtle, Mr Pennant informs us, are at preſent exactly as they were in the time of Edward. The walls are defended by numbers of round towers, and have two principal gates: the eaſt, facing the mountains; the weſt, upon the Menai. The entrance into the caſtle is very auguſt, beneath a great tower, on the front of which appears the ſtatue of the founder, with a dagger in his hand, as if menacing his new-acquired unwilling ſubjects. The gate had four portculliſes, and every requiſite of ſtrength. The towers are very beautiful. The Eagle tower is remarkably fine, and has the addition of three ſlender angular turrets iſſuing from the top. Edward II. was born in a little dark room in this tower, not twelve feet long nor eight in breadth: ſo little did, in thoſe days, a royal conſort conſult either pomp or conveniency. The gate through which the affectionate Eleanor entered, to give the Welſh a prince of their own, who could not ſpeak a word of Engliſh, is at the fartheſt end, at a vaſt height above the outſide ground; ſo could only be approached by a draw-bridge. The quay is a moſt beautiful walk along the ſide of the Menai, and commands a moſt agreeable view.

Caernarvon is deſtitute of manufactures, but has a briſk trade with London, Briſtol, Liverpool, and Ireland, for the ſeveral neceſſaries of life. It is the reſidence of numbers of genteel families, and contains ſeveral very good houſes. Edward I. beſtowed on this town its firſt royal charter, and made it a free borough. Among other privileges, none of the burgeſſes could be convicted of any crime committed between the rivers Conway and Dyfe, unleſs by a jury of their own townſmen. It is governed by a mayor, who, by patent, is created governor of the caſtle. It has one alderman, two bailiffs, a town-clerk, and two ſerjeants at mace. The repreſentative of the place is elected by its burgeſſes, and thoſe of Conway, Pwllheli, Neſyn, and Crickaeth. The right of voting is in every one, reſident or non-reſident, admitted to their freedom. The town gives title of *earl* and *marquis* to the duke of Chandos, and has a good tide-harbour.

CAERWIS, a market-town of Flintſhire in North Wales, ſituated in W. Long. 3. 25. N. Lat. 53. 20.

CÆSALPINIA Braſiletto, or *Braſil-wood:* a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 33d order, *Lomentaceæ*. The calyx is quinquefid, with the loweſt ſegment larger in proportion. There are five petals, with the loweſt more beautiful than the reſt. It is a leguminous plant. Of this there are three ſpecies, the moſt remarkable of which is the braſilienſis, commonly called *Braſiletto*. It grows naturally in the warmeſt parts of America, from whence the wood is exported for the dyers, who uſe it much. The demand has been ſo great, that none of the large trees are left in any of the Britiſh plantations: ſo that Mr Cateſby owns himſelf ignorant of the dimenſions to which they grow. The largeſt remaining are not above two inches in thickneſs, and eight or nine feet in height. The branches are ſlender and full of ſmall prickles; the leaves are pinnated; the lobes growing oppoſite to one another, broad at their ends, with one notch. The flowers are white, papilionaceous, with many ſtamina and yellow apices, growing in a pyramidal ſpike, at the end of a long ſlender ſtalk; the pods incloſe ſeveral ſmall round ſeeds. The colour produced from this wood is greatly improved by ſolution of tin in aqua regia.[*] The ſecond ſort is a native of the ſame countries with the firſt, but is of a larger ſize. It ſends out many weak irregular branches, armed with ſhort, ſtrong, upright thorns. The leaves branch out in the ſame manner as the firſt; but the lobes, or ſmall leaves, are oval and entire. The flowers are produced in long ſpikes like thoſe of the former, but are variegated with red. Theſe plants may be propagated in England from ſeeds, which ſhould be ſown in ſmall pots filled with light rich earth early in the ſpring, and plunged in a bed of tanner's bark. Being tender, they require to be always kept in the ſtove, and to be treated in the ſame manner as other exotics of that kind.

Plate CXV.

CÆSALPINUS of Arezzo, profeſſor at Piſca, and afterwards phyſician to pope Clement VIII. one of the capital writers in botany. See BOTANY, p. 419. 420.

CÆSAR, (Julius) the illuſtrious Roman general and hiſtorian, was of the family of the Julii, who pretended they were deſcended from Venus by Æneas. The deſcendants of Aſcanius ſon of Æneas and Creuſa, and ſurnamed *Julius*, lived at Alba till that city was ruined by Tullus Hoſtilius king of Rome, who carried them to Rome, where they flouriſhed. We do not find that they produced more than two branches. The firſt bore the name of *Tullus*, the other that of *Cæſar*. The moſt ancient of the Cæſars were thoſe who were in public employments in the 11th year of the firſt Punic war. After that time we find there was always ſome of that family who enjoyed public offices in the commonwealth, till the time of Caius Julius Cæſar, the ſubject of this article. He was born at Rome the 12th of the month Quintilis, year of the city 653, and loſt his father an. 669. By his valour and eloquence he ſoon acquired the higheſt reputation in the field and in the ſenate. Beloved and reſpected by his fellow-citizens, he enjoyed ſucceſſively every magiſterial and military honour the republic could beſtow conſiſtent with its own free conſtitution. But at length having ſubdued Pompey the great rival of his growing power, his boundleſs ambition effaced the glory of his former actions: for, purſuing his favourite maxim, "that he had rather be the firſt man in a village than the ſecond in Rome," he procured himſelf to be choſen perpetual dictator: and, not content with this unconſtitutional power, his faction had reſolved to raiſe him to the imperial dignity; when the friends of the civil liberties of the republic raſhly aſſaſſinated him in the ſenate-houſe, where they ſhould only have ſeized him and brought him to a legal trial for uſurpation. By this

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[*] See *Colour making* and *Dyeing*.

impolitic meaſure they defeated their own purpoſe, involving the city in conſternation and terror, which produced general anarchy, and paved the way to the revolution they wanted to prevent; the monarchial government being abſolutely founded on the murder of Julius Cæſar. He fell in the 56th year of his age, 43 years before the Chriſtian æra. His commentaries contain a hiſtory of his principal voyages, battles, and victories. The London edition in 1712, in folio, is preferred.

The detail of Cæſar's tranſactions (ſo far as is conſiſtent with the limits of this work) being given under the article ROME, we ſhall here only add a portrait of him as drawn by a philoſopher.*

“ If, after the lapſe of 18 centuries, the truth may be publiſhed without offence, a philoſopher might, in the following terms, cenſure Cæſar without calumniating him, and applaud him without exciting his bluſhes.

“ Cæſar had one predominant paſſion: it was the love of glory; and he paſſed 40 years of his life in ſeeking opportunities to foſter and encourage it. His ſoul, entirely abſorbed in ambition, did not open itſelf to other impulſes. He cultivated letters; but he did not love them with enthuſiaſm, becauſe he had not leiſure to become the firſt orator of Rome. He corrupted the one half of the Roman ladies, but his heart had no concern in the fiery ardours of his ſenſes. In the arms of Cleopatra, he thought of Pompey; and this ſingular man, who diſdained to have a partner in the empire of the world, would have bluſhed to have been for one inſtant the ſlave of a woman.

“ We muſt not imagine, that Cæſar was born a warrior, as Sophocles and Milton were born poets. For, if nature had made him a citizen of Sybaris, he would have been the moſt voluptuous of men. If in our days he had been born in Pennſylvania, he would have been the moſt inoffenſive of quakers, and would not have diſturbed the tranquillity of the new world.

“ The moderation with which he conducted himſelf after his victories, has been highly extolled; but in this he ſhowed his penetration, not the goodneſs of his heart. Is it not obvious, that the diſplay of certain virtues is neceſſary to put in motion the political machine? It was requiſite that he ſhould have the appearance of clemency, if he inclined that Rome ſhould forgive him his victories. But what greatneſs of mind is there in a generoſity which follows on the uſurpation of ſupreme power?

“ Nature, while it marked Cæſar with a ſublime character, give him alſo that ſpirit of perſeverance which renders it uſeful. He had no ſooner begun to reflect, than he admired Sylla; hated him, and yet wiſhed to imitate him. At the age of 15, he formed the project of being dictator. It was thus that the preſident Monteſquieu conceived, in his early youth, the idea of the ſpirit of laws.

“ Phyſical qualities, as well as moral cauſes, contributed to give ſtrength to his character. Nature, which had made him for command, had given him an air of dignity. He had acquired that ſoft and inſinuating eloquence, which is perfectly ſuited to ſeduce vulgar minds, and has a powerful influence on the moſt cultivated. His love of pleaſure was a merit with the fair ſex; and women, who even in a republic can draw to them the ſuffrages and attention of men, have the higheſt importance in degenerate times. The ladies of his age were charmed with the proſpect of having a dictator whom they might ſubdue by their attractions.

“ In vain did the genius of Cato watch for ſome time to ſuſtain the liberty of his country. It was unequal to contend with that of Cæſar. Of what avail were the eloquence, the philoſophy, and the virtue of this republican, when oppoſed by a man who had the addreſs to debauch the wife of every citizen whoſe intereſt he meant to engage; who, poſſeſſing an enthuſiaſm for glory, wept, becauſe, at the age of 30, he had not conquered the world like Alexander; and who, with the haughty temper of a deſpot, was more deſirous to be the firſt man in a village than the ſecond in Rome.

“ Cæſar had the good fortune to exiſt in times of trouble and civil commotions, when the minds of men are put into a ferment; when opportunities of great actions are frequent; when talents are every thing, and thoſe who can only boaſt of their virtues are nothing. If he had lived an hundred years ſooner, he would have been no more than an obſcure villain; and, inſtead of giving laws to the world, would not have been able to produce any confuſion in it.

“ I will here be bold enough to advance an idea, which may appear paradoxical to thoſe who weakly judge of men from what they atchieve, and not from the principle which leads them to act. Nature formed in the ſame mould Cæſar, Mahomet, Cromwell, and Kouli Khan. They all of them united to genius that profound policy which renders it ſo powerful. They all of them had an evident ſuperiority over thoſe with whom they were ſurrounded; they were conſcious of this ſuperiority, and they made others conſcious of it. They were all of them born ſubjects, and became fortunate uſurpers. Had Cæſar been placed in Perſia, he would have made the conqueſt of India; in Arabia, he would have been the founder of a new religion; in London, he would have ſtabbed his ſovereign, or have procured his aſſaſſination under the ſanction of the laws. He reigned with glory over men whom he had reduced to be ſlaves; and, under one aſpect, he is to be conſidered as a hero; under another, as a monſter. But it would be unfortunate, indeed, for ſociety, if the poſſeſſion of ſuperior talents gave individuals a right to trouble its repoſe. Uſurpers accordingly have flatterers, but no friends; ſtrangers reſpect them; their ſubjects complain and ſubmit; it is in their own families that humanity finds her avengers. Cæſar was aſſaſſinated by his ſon, Mahomet was poiſoned by his wife, Kouli Khan was maſſacred by his nephew, and Cromwell only died in his bed becauſe his ſon Richard was a philoſopher.

“ Cæſar, the tyrant of his country; Cæſar, who deſtroyed the agents of his crimes, if they failed in addreſs; Cæſar, in fine, the huſband of every wife, and the wife of every huſband; has been accounted a great man by the mob of writers. But it is only the philoſopher who knows how to mark the barrier between celebrity and greatneſs. The talents of this ſingular man, and the good fortune which conſtantly attended him till the moment of his aſſaſſination, have concealed the enormity of his actions.”

CÆSAR, in Roman antiquity, a title borne by all the

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* From the *Melanges Philoſophiques* of M. Ophellot.

the emperors, from Julius Cæſar to the deſtruction of the empire. It was alſo uſed as a title of diſtinction for the intended or preſumptive heir of the empire, as *king of the Romans* is now uſed for that of the German empire.

This title took its riſe from the ſurname of the firſt emperor, C. Julius Cæſar, which, by a decree of the ſenate, all the ſucceeding emperors were to bear. Under his ſucceſſor, the appellation of *Auguſtus* being appropriated to the emperors in compliment to that prince, the title *Cæſar* was given to the ſecond perſon in the empire, though ſtill it continued to be given to the firſt; and hence the difference betwixt Cæſar uſed ſimply, and Cæſar with the addition of Imperator Auguſtus.

The dignity of Cæſar remained to the ſecond of the empire, till Alexius Comnenus having elected Nicephorus Meliſſenus Cæſar, by contract; and it being neceſſary to confer ſome higher dignity on his own brother Iſaacius, he created him Sebaſtocrator, with the precedency over Meliſſenus; ordering, that in all acclamations, &c. Iſaacius Sebaſtocrator ſhould be named the ſecond, and Meliſſenus Cæſar the third.

Cæsar (Sir Julius), a learned civilian was deſcended by the female line from the duke de Ceſarini in Italy; and was born near Tottenham in Middleſex, in the year 1557. He was educated at Oxford, and afterwards ſtudied in the univerſity of Paris, where, in the year 1581, he was created doctor of the civil law, and two years after was admitted to the ſame degree at Oxford, and alſo became doctor of the canon law. He was advanced to many honourable employments, and for the laſt 20 years of his life was maſter of the rolls. He was remarkable for his extenſive bounty and charity to all perſons of worth, ſo that he ſeemed to be the almoner-general of the nation. He died 1639, in the 79th year of his age. It is very remarkable that the manuſcripts of this lawyer were offered (by the executors of ſome of his deſcendants) to a cheeſemonger for waſte-paper; but being timely inſpected by Mr Samuel Patterſon, this gentleman diſcovered their worth, and had the ſatiſfaction to find his judgment confirmed by the profeſſion, to whom they were ſold in lots for upwards of 500*l.* in the the year 1757.

Cæsar Auguſta, or *Cæſarea Auguſta*, (anc. geog.) a Roman colony ſituated on the river Iberus in the hither Spain, before called *Salduba*, in the territories of the Edetani. Now commonly thought to be Saragoſa.

CÆSAREA, the name of ſeveral ancient cities, particularly one on the coaſt of Phenice. It was very conveniently ſituated for trade; but had a very dangerous harbour, ſo that no ſhips could be ſafe in it when the wind was at ſouth-weſt. Herod the Great king of Judea remedied this inconveniency at an immenſe expence and labour, making it one of the moſt convenient havens on that coaſt. He alſo beautified it with many buildings, and beſtowed 12 years in the finiſhing and adorning it.

CÆSARIAN operation. See Midwifery.

CÆSARIANS, *Cæſarienſes*, in Roman antiquity, were officers or miniſters of the Roman emperors: They kept the account of the revenues of the emperors; and took poſſeſſion, in their name, of ſuch things as devolved or were confiſcated to them.

CÆSARODUNUM, (anc. geog.) a town of the Turones in Celtic Gaul; now *Tours*, the capital of Touraine. See Tours.

CÆSAROMAGUS, (anc. geog.) a town of the Trinobantes in Britain; by ſome ſuppoſed to be *Chelmſford*, by others *Brentford*, and by others *Burſtet*.

CÆSENA, (anc. geog.) a town of Gallia Ciſpadana, ſituated on the rivers Iſapis and Rubicon; now Cæsena, which ſee.

CÆSIA sylva, (anc. geog.) a wood in Germany, part of the great Sylva Hercynia, ſituated partly in the duchy of Cleves, and partly in Weſtphalia between Weſel and Kesfield..

CÆSONES, a denomination given to thoſe cut out of their mother's wombs. Pliny ranks this as an auſpicious kind of birth; the elder Scipio Africanus, and the firſt family of Cæſars, were brought into the world in this way.

CÆSTUS, in antiquity, a large gantlet made of raw hide, which the wreſtlers made uſe of when they fought at the public games.—This was a kind of leathern ſtrap, ſtrengthened with lead or plates of iron, which encompaſſed the hand, the wriſt, and a part of the arm, as well to defend theſe parts as to enforce their blows.

Cæstus, or *Cæſtum*, was alſo a kind of girdle, made of wool, which the huſband untied for his ſpouſe the firſt day of mariage, before they went to bed.

This relates to Venus's girdle, which Juno borrowed of her to entice Jupiter to love her. See Cestus.

CÆSURA, in the ancient poetry, is when, in the ſcanning of a verſe, a word is divided ſo, as one part ſeems cut off, and goes to a different foot from the reſt; as,

Menti|ri ne|li, nun|quam men|dacia |proſunt.

where the ſyllables *ri*, *li*, *quam*, and *men*, are cæſuras.

Cæsure, in the modern poetry, denotes a reſt or pauſe towards the midle of an Alexandrian verſe, by which the voice and pronunciation are aided, and the verſe, as it were, divided into two hemiſtichs. See Pause.

CÆTERIS paribus, a Latin term in frequent uſe among mathematical and phyſical writers. The words literally ſignify, *the reſt* (or *other things*) *being alike or equal.* Thus we ſay the heavier the bullet, *cæteris paribus*, the greater the range; *i. e.* by how much the bullet is heavier, if the length and diameter of the piece and ſtrength of the powder be the ſame, by ſo much will the utmoſt range or diſtance of a piece of ordnance be the greater. Thus alſo, in a phyſical way, we ſay, the velocity and quantity circulating in a given time through any ſection of any artery, will, *cæteris paribus*, be according to its diameter, and nearneſs to or diſtance from the heart.

CÆTOBRIX, (anc. geog.) a town of Luſitania, near the mouth of the Tagus on the eaſt ſide; now extinct. It had its name from its fiſhery; and there are ſtill extant fiſh-ponds on the ſhore, done with plaſter of Paris, which illuſtrate the name of the ruined city.

CAFFA, in commerce, painted cotton-cloths manufactured in the Eaſt Indies, and ſold at Bengal.

Caffa, or *Kaffa*, a city and port-town of Crim Tartary, ſituated on the ſouth-eaſt part of that peninſula. E. Long. 37. 0. N. Lat. 44. 55.

It is the moſt conſiderable town in the country, and gives name to the ſtraits of Caffa, which runs from the Euxine or black Sea, to the Palus Meotis, or ſea of Azoph.

CAFFILA, a company of merchants or travellers, who join together in order to go with more ſecurity through the dominions of the Grand Mogul, and through other countries on the continent of the Eaſt Indies.

The Caffila differs from a caravan, at leaſt in Perſia: for the caffila belongs properly to ſome ſovereign, or to ſome powerful company in Europe, whereas a caravan is a company of particular merchants, each trading upon his own account. The Engliſh and Dutch have each of them their caffila at Gambrow. There are alſo ſuch caffilas, which croſs ſome parts of the deſarts of Africa, particularly that called the *ſea of ſand*, which lies between the kingdom of Morocco and thoſe of Tombut and Gaigo. This is a journey of 400 leagues; and takes up two months in going, and as many in coming back; the caffila travelling only by night, on account of the exceſſive heat of that country. The chief merchandize they bring back conſiſts in gold duſt, which they call *atibar*, and the Europeans *tibir*.

CAFFILA on the coaſt of Guzerat or Cambaya, ſignifies a ſmall fleet of merchant-ſhips.

CAFFRARIA, the country of the Caffres or Hottentots, in the moſt ſoutherly parts of Africa, lying in the form of a creſcent about the inland country of Monomopata, between 35° ſouth latitude and the tropic of Capricorn: and bounded on the eaſt, ſouth, and weſt by the Indian and Atlantic oceans. See HOTTENTOTS.

Moſt of the ſea-coaſts of this country are ſubject to the Dutch, who have built a fort near the moſt ſouthern promontory, called the *Cape of Good Hope*.

CAG, or KEG, a barrel or veſſel, that contains from four to five gallons.

CAGANUS, or CACANUS, an appellation anciently given by the Huns to their kings. The word appears alſo to have been formerly applied to the princes of Muſcovy, now called *czar*. From the ſame alſo, probably, the Tartar title *cham* or *can*, had its origin.

CAGE, an incloſure made of wire, wicker, or the like interwoven lattice-wiſe, for the confinement of birds or wild beaſts. The word is French, *cage*, formed from the Italian *gaggia*, of the Latin *cavea*, which ſignifies the ſame: *a caveis theatralibus in quibus includebantur feræ*.

Beaſts were uſually brought to Rome ſhut up in oaken or beechen cages, artfully formed, and covered or ſhaded with boughs, that the creatures, deceived with the appearance of a wood, might fancy themſelves in their foreſt. The fiercer ſort were pent in iron cages, leſt wooden priſons ſhould be broke through. In ſome priſons there are iron cages for the cloſer confinement of criminals. The French laws diſtinguiſh two ſorts of bird-cages, viz. high or ſinging cages, and low or dumb-cages; thoſe who expoſe birds to ſale are obliged to put the hens in the latter, and the cocks in the former, that perſons may not be impoſed on by buying a hen for a cock.

CAGES, (*caveæ*) denote alſo places in the ancient amphitheatres, wherein wild beaſts were kept, ready to be let out for ſport. The *caveæ* were a ſort of iron cages different from dens, which were under ground and dark; whereas the *caveæ* being airy and light, the beaſts ruſhed out of them with more alacrity and fierceneſs than if they had been pent under ground.

CAGE, in carpentry, ſignifies an outer-work of timber, encloſing another within it. In this ſenſe we ſay, *the cage of a wind-mill*. The cage of a ſtair-caſe denotes the wooden ſides or walls which incloſe it.

CAGEAN, or CAGAYAN, a province of the iſland of Lytzen, or Manila, in the Eaſt Indies. It is the largeſt in the iſland, being 80 leagues in length, and 40 in breadth. The principal city is called *New Segovia*, and 15 leagues eaſtward from this city lies cape Bajador. Doubling that cape, and coaſting along 20 leagues from north to ſouth, the province of Cagean ends, and that of Illocos begins. The peaceable Cageans who pay the tribute are about 9000; but there are a great many not ſubdued. The whole province is fruitful: the men apply themſelves to agriculture, and are of a martial diſpoſition; and the women apply to ſeveral works in cotton. The mountains afford food for a vaſt number of bees; in conſequence of which wax is ſo plenty, that all the poor burn it inſtead of oil. They make their candles after the following manner: they leave a ſmall hole at each end of a hollow ſtick for the wick to run through; and then, ſtopping the bottom, fill it with wax at the top: when cold, they break the mould, and take out the candle. On the mountains there is abundance of braſil, ebony, and other valuable woods. In the woods are ſtore of wild beaſts, as boars; but not ſo good as thoſe of Europe. There are alſo abundance of deer, which they kill for their ſkins and horns to ſell to the Chineſe.

CAGLI, an ancient epiſcopal town of Italy, in the duchy of Urbino, ſituated at the foot of the Apennine mountains. E. Long. 14. 12. N. Lat. 43. 30.

CAGLIARI, (Paolo) called *Paulo Veroneſe*, an excellent painter, was born at Verona in the year 1532. Gabriel Cagliari his father was a ſculptor, and Antonio Badile his uncle was his maſter in painting. He was not only eſteemed the beſt of all the Lombard painters, but for his extenſive talents in the art was peculiarly ſtyled *Il pittor felice*, "the happy painter;" and there is ſcarcely a church in Venice where ſome of his performances are not to be ſeen. De Piles ſays, that "his picture of the marriage at Cana, in the church of St George, is to be diſtinguiſhed from his other works, as being not only the triumph of Paul Veroneſe, but almoſt the triumph of painting itſelf." When the ſenate ſent Grimani, procurator of St Mark, to be their ambaſſador at Rome, Paul attended him, but did not ſtay long, having left ſome pieces at Venice unfiniſhed. Philip II. king of Spain, ſent for him to paint the Eſcurial, and made him great offers; but Paul excuſed himſelf from leaving his own country, where his reputation was ſo well eſtabliſhed, that moſt of the princes of Europe ordered their ſeveral ambaſſadors to procure ſomething of his hand at any rate. He was indeed highly eſteemed by all the principal men in his time; and ſo much admired by the great maſters, as well his contemporaries, as thoſe who ſucceeded him, that Titian himſelf uſed to ſay, he was the ornament of his profeſſion. And Guido Reni being aſked which of the maſters his predeceſſors he would chooſe to be, were it in his power, after Raphael and Corregio,

gio, named Paul Veroneſe; whom he always called his Paolino. He died of a fever at Venice in 1588, and had a tomb and a ſtatue of braſs erected to his memory in the church of St Sebaſtian. He left great wealth to his two ſons Gabriel and Charles, who lived happily together, and joined in finiſhing ſeveral of their father's imperfect pieces with good ſucceſs.

CAGLIARI, an ancient, large, and rich town, capital of the iſland of Sardinia in the Mediterranean. It is ſeated on the declivity of an hill, is an univerſity, an archbiſhopric, and the reſidence of the viceroy. It has an excellent harbour, and a good trade; but is a place of no great ſtrength. It was taken, with the whole iſland, by the Engliſh in 1708, who transferred it to the emperor Charles the VI.; but it was retaken by the Spaniards in 1717, and about two years afterwards ceded to the duke of Savoy in lieu of Sicily, and hence he has the title of *king of Sardinia*. E. Long. 9. 14. N. Lat. 39. 12.

CAGUI, in zoology, a ſononyme of two ſpecies of monkeys, *viz.* the jacchus and œdipus. See SIMIA.

CAHORS, a conſiderable town of France, in Querci in Guienne, with a biſhop's ſee and an univerſity. It is ſeated on a peninſula made by the river Lot, and built partly on a craggy rock. The principal ſtreet is very narrow; and terminates in the market-place, in which is the town-houſe. The cathedral is a Gothic ſtructure, and has a large ſquare ſteeple. The fortifications are regular, and the town is ſurrounded with thick walls. E. Long. 1. 6. N. Lat. 44. 26.

CAHYS, a dry meaſure for corn, uſed in ſome parts of Spain, particularly at Seville and at Cadiz. It is near a buſhel of our meaſure.

CAJANABURG, the capital of the province of Cajania or Eaſt Bothnia in Sweden, ſituated on the north-eaſt part of the lake Cajania, in E. Long. 27. 0. N. Lat. 63. 50.

CAIPHAS, high-prieſt of the Jews after Simon, condemned Chriſt to death; and was put out of his place by the emperor Vitellius, for which diſgrace he made away with himſelf.

CAJAZZO, a town of the province of Lavoro in the kingdom of Naples, ſituated in E. Long. 15. 0. N. Lat. 41. 15.

CAICOS, the name of ſome American iſlands to the north of St Domingo, lying from W. Long. 112. 10. to 113. 16. N. Lat. 21. 40.

CAJEPUT, an oil brought from the Eaſt Indies reſembling that of Cardamoms.

CAIETA, (anc. geog.) a port and town of Latium, ſo called from Æneas's nurſe; now *Gaeta*, which ſee.

CAJETAN, (Cardinal) was born at Cajeta in the kingdom of Naples in the year 1469. His proper name was *Thomas de Vio*; but he adopted that of *Cajetan* from the place of his nativity. He defended the authority of the Pope, which ſuffered greatly at the council of Nice, in a work entitled *Of the power of the Pope*; and for this work he obtained the biſhopric of Cajeta. He was afterwards raiſed to the archiepiſcopal ſee of Palermo, and in 1517 was made a cardinal by Pope Leo. X. The year after, he was ſent as legate into Germany, to quiet the commotions raiſed againſt indulgences by Martin Luther; but Luther, under protection of Frederic elector of Saxony, ſet him at defiance; for though he obeyed the cardinal's ſummons in repairing to Augſburg, yet he rendered all his proceedings ineffectual. Cajetan was employed in ſeveral other negociations and tranſactions, being as ready at buſineſs as at letters. He died in 1534. He wrote Commentaries upon Ariſtotle's philoſophy, and upon Thomas Aquinas's theology; and made a literal tranſlation of the Old and New Teſtaments.

CAIFONG, a large, populous, and rich town of Aſia, in China, ſeated in the middle of a large and well cultivated plain. It ſtands in a bottom; and when beſieged by the rebels in 1642, they ordered the dykes of the river Hohangho to be cut, which drowned the city, and deſtroyed 300,000 of its inhabitants. E. Long. 113. 27. N. Lat. 35. 0.

CAILLE, (Nicholas Louis de la) an eminent mathematician and aſtronomer, was born at a ſmall town in the dioceſe of Rheims in 1713. His father had ſerved in the army, which he quitted, and in his retirement ſtudied mathematics; and amuſed himſelf with mechanic exerciſes, wherein he proved the happy author of ſeveral inventions of conſiderable uſe to the public. Nicholas, almoſt in his infancy, took a fancy to mechanics, which proved of ſignal ſervice to him in his maturer years. He was ſent young to ſchool at Mantes-ſur-Seine, where he diſcovered early tokens of genius. In 1729, he went to Paris; where he ſtudied the claſſics, philoſophy, and mathematics. Afterwards he went to ſtudy divinity at the college de Navarre, propoſing to embrace an eccleſiaſtical life. At the end of three years he was ordained a deacon, and officiated as ſuch in the church of the college de Mazarin ſeveral years; but he never entered into prieſts orders, apprehending that his aſtronomical ſtudies, to which he became moſt aſſiduouſly devoted, might too much interfere with his religious duties. In 1739, he was conjoined with M. de Thury, ſon to M. Caſſini, in verifying the meridian of the royal obſervatory through the whole extent of the kingdom of France. In the month of November the ſame year, whilſt he was engaged day and night in the operations which this grand undertaking required, and at a great diſtance from Paris, he was, without any ſolicitation, elected into the vacant mathematical chair which the celebrated M. Varignon had ſo worthily filled. Here he began to teach about the end of 1740; and an obſervatory was ordered to be erected for his uſe in the college, and furniſhed with a ſuitable apparatus of the beſt inſtruments. In May 1741, M. de la Caille was admitted into the royal academy of ſciences as an adjoint member for aſtronomy. Beſides the many excellent papers of his diſperſed up and down in their memoirs, he publiſhed Elements of geometry, mechanics, optics, and aſtronomy. Moreover, he carefully computed all the eclipſes of the ſun and moon that had happened ſince the Chriſtian æra, which were printed in a book publiſhed by two Benedictines, entitled *l'Art de verefier les dates*, &c. Paris, 1750, in 4to. Beſides theſe, he compiled a volume of aſtronomical ephemerides for the years 1745 to 1755; another for the years 1755 to 1765; a third for the years 1765 to 1775; an excellent work entitled *Aſtronomiæ fundamenta noviſſimi ſolis et ſtellarum obſervationibus ſtabilita*; and the moſt correct ſolar tables that ever appeared. Having gone through a ſeven years ſeries of aſtronomical obſervations in his own obſervatory, he formed a project of going to obſerve the ſouthern ſtars at the

Cape of Good Hope. This was highly approved by the academy, and by the prime miniſter Comte de Argenſon, and very readily agreed to by the ſtates of Holland. Upon this, he drew up a plan of the method he propoſed to purſue in his ſouthern obſervations; ſetting forth, that beſides ſettling the places of the fixed ſtars, he propoſed to determine the parallax of the moon, Mars, and Venus. But whereas this required correſpondent obſervations to be made in the northern parts of the world, he ſent to thoſe of his correſpondents who were expert in practical aſtronomy previous notice, in print, what obſervations he deſigned to make at ſuch and ſuch times for the ſaid purpoſe. At length, on the 21ſt of November 1750, he ſailed for the Cape, and arrived there on the 19th of April 1751. He forthwith got his inſtruments on ſhore; and, with the aſſiſtance of ſome Dutch artificers, ſet about building an aſtronomical obſervatory, in which his apparatus of inſtruments was properly diſpoſed of as ſoon as it was in a fit condition to receive them.

The ſky at the Cape is generally pure and ſerene, unleſs when a ſouth-eaſt wind blows. But this is often the caſe; and when it is, it is attended with ſome ſtrange and terrible effects. The ſtars look bigger, and ſeem to caper; the moon has an undulating tremor; and the planets have a ſort of beard like comets. Two hundred and twenty-eight nights did our aſtronomer ſurvey the face of the ſouthern heavens; during which ſpace, which is almoſt incredible, he obſerved more than 10,000 ſtars; and whereas the ancients filled the heavens with monſters and old-wives tales, the abbe de la Caille choſe rather to adorn them with the inſtruments and machines which modern philoſophy has made uſe of for the conqueſt of nature*. With no leſs ſucceſs did he attend to the parallax of the moon, Mars, Venus, and the ſun. Having thus executed the purpoſe of his voyage, and no preſent opportunity offering for his return, he thought of employing the vacant time in another arduous attempt; no leſs than that of taking the meaſure of the earth, as he had already done that of the heavens. This indeed had, through the munificence of the French king, been done before by different ſets of learned men both in Europe and America: ſome determining the quantity of a degree under the equator, and others under the arctic circle: but it had not as yet been decided whether in the ſouthern parallels of latitude the ſame dimenſions obtained as in the northern. His labours were rewarded with the ſatisfaction he wiſhed for; having determined a diſtance of 410,814 feet from a place called *Klip-Fontyn* to the Cape, by means of a baſe of 38,802 feet, three times actually meaſured: whence he diſcovered a new ſecret of nature, namely, that the radii of the parallels in ſouth latitude are not the ſame as thoſe of the correſponding parallels in north latitude. About the 23d degree of ſouth latitude he found a degree on the meridian to contain 342,222 Paris feet. He returned to Paris the 27th of September 1754; having in his almoſt four years abſence expended no more than 9144 livres on himſelf and his companion; and at his coming into port, he refuſed a bribe of 100,000 livres, offered by one who thirſted leſs after glory than gain, to be ſharer in his immunity from cuſtomhouſe ſearches.

After receiving the congratulatory viſits of his more intimate friends and the aſtronomers, he firſt of all thought fit to draw up a reply to ſome ſtrictures which profeſſor Euler had publiſhed relative to the meridian, and then he ſettled the reſults of the compariſon of his own with the obſervations of other aſtronomers for the parallaxes. That of the ſun he fixed at 9½″; of the moon, at 56′ 56″; of Mars in his oppoſition, 36″; of Venus, 38″. He alſo ſettled the laws whereby aſtronomical refractions are varied by the different denſity or rarity of the air, by heat or cold, and dryneſs or moiſture. And, laſtly, he ſhowed an eaſy, and by common navigators practicable, method of finding the longitude at ſea by means of the moon, which he illuſtrated by examples ſelected from his own obſervations during his voyages. His fame being now eſtabliſhed upon ſo firm a baſis, the moſt celebrated academies of Europe claimed him as their own: and he was unanimouſly elected a member of the royal ſociety at London; of the inſtitute of Bologna; of the imperial academy at Peterſburg; and of the royal academies of Berlin, Stockholm, and Gottingen. In the year 1760, Mr de la Caille was attacked with a ſevere fit of the gout; which, however, did not interrupt the courſe of his ſtudies; for he then planned out a new and immenſe work, no leſs than a hiſtory of aſtronomy through all ages, with a compariſon of the ancient and modern obſervations, and the conſtruction and uſe of the inſtruments employed in making them. In order to purſue the taſk he had impoſed upon himſelf in a ſuitable retirement, he obtained a grant of apartments in the royal palace of Vincennes; and whilſt his aſtronomical apparatus was erecting there, he began printing his Catalogue of the ſouthern ſtars, and the third volume of his Ephemerides. The ſtate of his health was, towards the end of the year 1763, greatly reduced. His blood grew inflamed; he had pains of the head, obſtructions of the kidneys, loſs of appetite, with an oppletion of the whole habit. His mind remained unaffected, and he reſolutely perſiſted in his ſtudies as uſual. In the month of March, medicines were adminiſtered to him, which rather aggravated than alleviated his ſymptoms; and he was now ſenſible, that the ſame diſtemper which in Africa, ten years before, yielded to a few ſimple remedies, did in his native country bid defiance to the beſt phyſicians. This induced him to ſettle his affairs; his manuſcripts he committed to the care and diſcretion of his eſteemed friend M. Maraldi. It was at laſt determined that a vein ſhould be opened; but this brought on an obſtinate lethargy, of which he died, aged 49.

CAIMACAN, or CAIMACAM, in the Turkiſh affairs, a dignity in the Ottoman empire, anſwering to lieutenant, or rather deputy, amongſt us.

There are uſually two Caimacans; one reſiding at Conſtantinople, as governor thereof; the other attending the grand vizir in quality of his lieutenant, ſecretary of ſtate, and firſt miniſter of his council, and gives audience to ambaſſadors. Sometimes there is a third caimacan, who attends the ſultan; whom he acquaints with any public diſturbances, and receives his orders concerning them.

CAIMAN ISLANDS, certain American iſlands lying ſouth of Cuba, and north-weſt of Jamaica, between 81° and 86° of weſt longitude, and in 21 of north latitude. They are moſt remarkable on account of the

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* See the Planiſphere in his *Cælum auſtrale ſtelliferum.*

fiſhery of tortoiſe, which the people of Jamaica catch here, and carry home alive, keeping them in pens for food, and killing them as they want them.

CAIN, eldeſt ſon of Adam and Eve, killed his brother Abel; for which he was condemned by God to baniſhment and a vagabond ſtate of life. Cain retired to the land of Nod, on the eaſt of Eden; and built a city, to which he gave the name of his ſon Enoch.

CAINITES, a ſect of heretics in the 2d century, ſo called on account of their great reſpect for Cain. They pretended that the virtue which produced Abel was of an order inferior to that which had produced Cain, and that this was the reaſon why Cain had the victory over Abel and killed him; for they admitted a great number of genii, which they called *virtues*, of different ranks and orders. They made profeſſion of honouring thoſe who carry in Scripture the moſt viſible marks of reprobation; as the inhabitants of Sodom, Eſau, Korah, Dathan, and Abiram. They had, in particular a very great veneration for the traitor Judas, under pretence that the death of Jeſus Chriſt had ſaved mankind. They had a forged goſpel of Judas, to which they paid great reſpect.

CAIRNS, or CARNES, the vulgar name of thoſe heaps of ſtones which are to be ſeen in many places of Britain, particularly Scotland and Wales.—They are compoſed of ſtones of all dimenſions thrown together in a conical form, a flat ſtone crowning the apex; (ſee Plate CXXVII.)

Various cauſes have been aſſigned by the learned for theſe heaps of ſtones. They have ſuppoſed them to have been, in times of inauguration, the places where the chieftain-elect ſtood to ſhow himſelf to beſt advantage to the people; or the place from whence judgment was pronounced; or to have been erected on the road-ſide in honour of Mercury; or to have been formed in memory of ſome ſolemn compact, particularly where accompanied by ſtanding pillars of ſtones; or for the celebration of certain religious ceremonies. Such might have been the reaſons, in ſome inſtances, where the evidences of ſtone-cheſts and urns are wanting: but theſe are ſo generally found, that they ſeem to determine the moſt uſual purpoſe of the piles in queſtion to have been for ſepulchral monuments. Even this deſtination might render them ſuitable to other purpoſes; particularly religious, to which by their nature they might be ſuppoſed to give additional ſolemnity.—According to Toland, fires were kindled on the tops or flat ſtones, at certain times of the year, particularly on the eves of the 1ſt of May and the 1ſt of November, for the purpoſe of ſacrificing; at which time all the people having extinguiſhed their domeſtic hearths rekindled them from the ſacred fires of the cairns. In general, therefore, theſe accumulations appear to have been deſigned for the ſepulchral protection of heroes and great men. The ſtone-cheſts, the repoſitory of the urns and aſhes, are lodged in the earth beneath: ſometimes only one, ſometimes more, are found thus depoſited; and Mr Pennant mentions an inſtance of 17 being diſcovered under the ſame pile.

Cairns are of different ſizes, ſome of them very large. Mr Pennant deſcribes one in the iſland of Arran, 114 feet over and of a vaſt height. They may juſtly be ſuppoſed to have been proportioned in ſize to the rank of the perſon, or to his popularity: the people of a whole diſtrict aſſembled to ſhow their reſpect to the deceaſed; and, by an active honouring of his memory, ſoon accumulated heaps equal to thoſe that aſtoniſh us at this time. But theſe honours were not merely thoſe of the day; as long as the memory of the deceaſed endured, not a paſſenger went by without adding a ſtone to the heap: they ſuppoſed it would be an honour to the dead, and acceptable to his manes.

Quanquam feſtinas, non eſt mora longa: licebit
Injecto ter pulvere, curras.

To this moment there is a proverbial expreſſion among the highlanders alluſive to the old practice: a ſuppliant will tell his patron, *Curri mi cloch er do charne*, "I will add a ſtone to your cairn;" meaning, When you are no more, I will do all poſſible honour to your memory.

Cairns are to be found in all parts of the iſlands, in Cornwal, Wales, and all parts of North Britain; they were in uſe among the northern nations; Dahlberg, in his 323d plate, has given the figure of one. In Wales they are called *carneddau*; but the proverb taken from them there, is not of the complimental kind; *Karn ar dy ben*, or, "A cairn on your head," is a token of imprecation.

CAIRO, or GRAND CAIRO, the capital of Egypt, ſituated in a plain at the foot of a mountain, in E. Long. 32. 0. N. Lat. 30. 0. It was founded by Jawhar, a Magrebian general, in the year of the Hegira 358. He had laid the foundations of it under the horoſcope of Mars; and for that reaſon gave his new city the name of *Al Kahirah*, or the *Victorious*, an epithet applied by the Arab aſtronomers to that planet. In 362 it became the reſidence of the kaliffs of Egypt, and of conſequence the capital of that country, and has ever ſince continued to be ſo. It is divided into the New and Old cities. Old Cairo is on the eaſtern ſide of the river Nile, and is now almoſt uninhabited. The New, which is properly Cairo, is ſeated in a ſandy plain about two miles and a half from the old city. It ſtands on the weſtern ſide of the Nile, from which it is not three quarters of a mile diſtant. It is extended along the mountain on which the caſtle is built, for the ſake of which it was removed hither, in order, as ſome pretend, to be under its protection. However, the change is much for the worſe, as well with regard to air as water, and the pleaſantneſs of the proſpect. Bulack may be called the port of Cairo; for it ſtands on the bank of the Nile, about a mile and a half from it, and all the corn and other commodities are landed there before they are brought to the city. Some travellers have made Cairo of a moſt enormous magnitude, by taking in the old city Bulack, and the new; the real circumference of it, however, is not above ten miles, but it is extremely populous. The firſt thing that ſtrikes a traveller is the narrowneſs of the ſtreets, and the appearance of the houſes. Theſe are ſo daubed with mud on the outſide, that you would think they were built with nothing elſe. Beſides, as the ſtreets are unpaved, and always full of people, the walking in them is very inconvenient, eſpecially to ſtrangers. To remedy this, there are a great number of aſſes, which always ſtand ready to be hired for a trifle, that is, a penny a mile. The owners drive them along, and give notice to the crowd to make way. And here it may be obſerved, that the Chriſtians in this, as well as other parts of the Turkiſh dominions, are not permitted to ride upon horſes. The number of the inhabitants can only be gueſſed at; but we may conclude it to be very great, becauſe in ſome years the plague will carry off 200,000, without their being much miſſed. The houſes are from one to two or three ſtories high, and flat at the top; where they take the air, and often ſleep all night. The better ſort of theſe have a court on the inſide like a college. The common run of houſes have very little room, and even among great people it is uſual for 20 or 30 to lie in the ſmall hall. Some houſes will hold 300 perſons of both ſexes, among whom are 20 or 30 ſlaves, and thoſe of ordinary rank have generally three or four.

There is a canal called *Halis*, which runs along the city from one end to the other, with houſes on each ſide, which make a large ſtraight ſtreet. Beſides this, there are ſeveral lakes, which are called *birks* in the language of the country. The principal of theſe, which is near the caſtle, is 500 paces in diameter. The moſt elegant houſes in the city are built on its banks; but what is extraordinary, eight months in the year it contains water, and the other four it appears with a charming verdure. When there is water ſufficient, it is always full of gilded boats, barges, and barks, in which people of condition take their pleaſure towards night, at which time there are curious fire-works, and variety of muſic.

New Cairo is ſurrounded with walls built with ſtone, on which are handſome battlements, and at the diſtance of every hundred paces there are very fine towers, which have room for a great number of people. The walls were never very high, and are in many places gone to ruin. The baſha lives in the caſtle, which was built by Saladine ſeven hundred years ago. It ſtands in the middle of the famous mountain Moketan, which terminates in this place, after it had accompanied the Nile from Ethiopia hither. This caſtle is the only place of defence in Egypt; and yet the Turks take no notice of its falling, inſomuch that in proceſs of time it will become a heap of rubbiſh. The principal part in it is a magnificent hall, environed with 12 columns of granite, of a prodigious height and thickneſs, which ſuſtain an open dome, under which Saladine diſtributed juſtice to his ſubjects. Round this dome there is an inſcription in relievo, which determines the date and by whom it was built. From this place the whole city of Cairo may be ſeen, and above 30 miles along the Nile, with the fruitful plains that lie near it, as well as the moſques, pyramids, villages, and gardens, with which theſe fields are covered. Theſe granite pillars were the work of antiquity, for they were got out of the ruins of Alexandria. There are likewiſe in the moſques and in the principal houſes no leſs than 40,000 more, beſides great magazines, where all kinds are to be had at very low rates. A janiſſary happened to find five in his garden, as large as thoſe in the caſtle; but could not find any machine of ſtrength ſufficient to move them, and therefore had them ſawed in pieces to make mill-ſtones. It is believed that there have been 30 or 40,000 of theſe pillars brought from Alexandria, where there are yet many more to be had. The gates of Cairo are three, which are very fine and magnificent.

There are about 300 public moſques in this city, ſome of which have ſix minarets. The moſque of Aſhar hath ſeveral buildings adjoining, which were once a famous univerſity, and 14,000 ſcholars and ſtudents were maintained on the foundation; but has now not above 1400, and thoſe are only taught to read and write. All the moſques are built upon the ſame plan, and differ only in magnitude. The entrance is thro' the principal gate into a large ſquare, open on the top, but well paved. Round this are covered galleries, ſupported by pillars: under which they ſay their prayers, in the ſhade. On one ſide of the ſquare there are particular places with baſons of water, for the conveniency of performing the ablutions injoined by the Koran. The moſt remarkable part of the moſque, beſides the minaret, is the dome. This is often bold, well proportioned, and of an aſtoniſhing magnitude. The inſide ſtones are carved like lace, flowers, and melons. They are built ſo firm, and with ſuch art, that they will laſt 600 or 700 years. About the outward circumference there are large Arabic inſcriptions, in relievo, which may be read by thoſe who ſtand below, though they are ſometimes of a wonderful height.

The khanes or caravanſeras are numerous and large, with a court in the middle, like their houſes. Some are ſeveral ſtories high, and are always full of people and merchandiſe. The Nubians, the Abyſſinians, and other African nations, which come to Cairo, have one to themſelves, where they always meet with lodging. Here they are ſecure from inſults, and their effects are all ſafe. Beſides theſe, there is a bazar, or market, where all ſorts of goods are to be ſold. This is in a long broad ſtreet; and yet the crowd is ſo great, you can hardly paſs along. At the end of this ſtreet is another ſhort one, but pretty broad, with ſhops full of the beſt ſort of goods, and precious merchandiſe. At the end of this ſhort ſtreet there is a great khane, where all ſorts of white ſlaves are to be ſold. Farther than this is another khane, where a great number of blacks, of both ſexes, are expoſed to ſale. Not far from the beſt market-place is an hoſpital, and a moſque for mad-people. They alſo receive and maintain ſick people into this hoſpital, but they are poorly looked after.

Old Cairo has ſcarce any thing remarkable but the granaries of Joſeph; which are nothing but a high wall, lately built, which includes a ſquare ſpot of ground, where they depoſite wheat, barley, and other grain, which is a tribute to the baſha, paid by the owners of land. This has no other covering but the heavens, and therefore the birds are always ſure to have their ſhare. There is likewiſe a tolerable handſome church, which is made uſe of by the Copts, who are Chriſtians and the original inhabitants of Egypt. Joſeph's well is in the caſtle, and was made by king Mohammed about 700 years ago. It is called *Joſeph's well*, becauſe they attribute every thing extraordinary to that remarkable perſon. It is cut in a rock, and is 280 feet in depth. The water is drawn up to the top by means of oxen, placed on platforms, at proper diſtances, which turn about the machines that raiſe it. The deſcent is ſo ſloping, that, though there are no ſteps, the oxen can deſcend and aſcend with eaſe.

The river Nile, to which not only Cairo, but all Egypt is ſo much indebted, is now known to have its riſe in Abyſſinia. The increaſe of the Nile generally begins in May, and in June they commonly proclaim about the city how much it is riſen. Over againſt old Cairo the Baſha has a houſe, wherein the water enters to a column, which has lines at the diſtance of every inch, and marks at every two feet as far as 30. When the water riſes to 22 feet, it is thought to be of a ſufficient height; when it riſes much higher, it does a great deal of miſchief. There is much pomp and ceremony uſed in letting the water into the canal, or hali, abovementioned. The baſha gives the firſt ſtroke towards the removal of the dike or dam. When the water has filled the canal and lakes in the city, and the numerous ciſterns that are in the moſques and private houſes, it is let into a vaſt plain, to the north-eaſt; the extent of which is 50 miles. When the country is covered with water, it is no unpleaſant ſight to view the towns appearing like little iſlands, and the people paſſing and repaſſing in boats.

The inhabitants of Cairo are a mixture of Moors, Turks, Jews, Greeks, and Cophts, or Coptis. The only difference between the habit of the Moors and Coptis is their turbans; thoſe of the Moors being white, and of the Coptis white ſtriped with blue. The common people generally wear a long black looſe frock, ſewed together all down before. The Jews wear a frock of the ſame faſhion, made of cloth; and their caps are like a high crowned hat, without brims, covered with the ſame cloth, but not ſo taper. The Jewiſh women's are not very unlike the men's, but more light and long. The Greeks are habited like the Turks, only their Turbans differ.

Proviſions of all kinds are exceeding plenty; for 20 eggs may be bought for a parrah or penny, and bread is ſix times as cheap as with us. They have almoſt all ſorts of fleſh and fiſh; and in particular have tame buffaloes, which are very uſeful. They bring goats into the ſtreets in great numbers, to ſell their milk. Their gardens are well ſtocked with fruit-trees of various kinds, as well as roots, herbs, melons, and cucumbers. The moſt common fleſh meat is mutton. The goats are very beautiful, and have ears two feet in length; but their fleſh is in no great eſteem.

CAIROAN, or CAIRWAN, a city of Africa, in the kingdom of Tunis, ſeated in a ſandy barren ſoil, about five miles from the gulph of Capres. It has neither ſpring, well, nor river; for which reaſon they are obliged to preſerve rain-water in tanks and ciſterns. It was built by the Aglabites; and is the ancient Cyrene*, but hath now loſt its ſplendor. There is ſtill, however, a very ſuperb moſque, and the tombs of the kings of Tunis are yet to be ſeen. E. Long. 9. 12. N. Lat. 35. 40.

CAISSON, in the military art, a wooden cheſt, into which ſeveral bombs are put, and ſometimes filled only with gunpowder: this is buried under ſome work whereof the enemy intend to poſſeſs themſelves, and, when they are maſters of it, is fired, in order to blow them up.

CAISSON is alſo uſed for a wooden frame or cheſt uſed in laying the foundations of the piers of a bridge.

CAITHNESS, otherwiſe called the *ſhire of Wick*, is the moſt northern county of all Scotland; bounded on the eaſt of the ocean, and by Strathnaver and Sutherland on the ſouth and ſouth-weſt: from theſe it is divided by the mountains Orde, and a continued ridge of hills as far as Knockfin, then by the whole courſe of the river Hallowdale. On the north it is waſhed by the Pentland or Putland frith, which flows between this county and the Orkneys. It extends 35 miles from north to ſouth, and about 20 from eaſt to weſt. The coaſt is rocky, and remarkable for a number of bays and promontories. Of theſe, the principal are Sandſide-head to the weſt, pointing to the opening of Pentland frith; Orcas, now Holborn-head, and Dunnet-head, both pointing northward to the frith. Dunnet-head, is a peninſula about a mile broad, and ſeven in compaſs; affording ſeveral lakes, good paſture, excellent mill-ſtones, and a lead-mine. Scribiſter bay, on the north-weſt, is a good harbour, where ſhips may ride ſecurely. Rice-bay, on the eaſt ſide, extends three miles in breadth; but is of dangerous acceſs, on account of ſome ſunk rocks at the entrance. At the bottom of this bay appear the ruins of two ſtrong caſtles, the ſeat of the earl of Caithneſs, called *Caſtle Sinclair*, and Gernego, joined to each other by a draw-bridge. Duncan's bay, otherwiſe called *Dunſby-head*, is the north-eaſt point of Caithneſs, and the extremeſt promontory in Britain. At this place, the breadth of the frith does not exceed 12 miles, and in the neighbourhood is the ordinary ferry to the Orkneys. Here is likewiſe Clytheneſs pointing eaſt, and Noſhead pointing north-eaſt. The ſea in this place is very impetuous, being in continual agitation from violent counter-tides, currents, and vortices. The only iſland belonging to this county is that of Stroma, in the Pentland frith, at the diſtance of two miles from the main land, extending about a mile in length, and producing good corn. The navigation is here rendered very difficult by conflicting tides and currents, which at both ends of the iſland produce a great agitation in the ſea. At the ſouth end, the waves dance ſo impetuouſly, that the ſailors term them the *merry men of May*, alluding to the houſe of one Mr May, on the oppoſite ſhore of Caithneſs, which ſerved them as a land-mark, in the dangerous paſſage between the iſland and the continent. The property of this iſland was once diſputed between the earls of Orkney and Caithneſs; but adjudged to the latter, in conſequence of an experiment, by which it appeared, that venomous creatures will live in Stroma, whereas they die immediately if tranſported to the Orkneys. The county of Caithneſs, though chiefly mountainous, flattens towards the ſea-coaſt, where the ground is arable, and produces good harveſts of oats and barley, ſufficient for the natives, and yielding a ſurplus for exportation. Caithneſs is well watered with ſmall rivers, brooks, lakes, and fountains, and affords a few woods of birch, but is in general bare of trees; and even thoſe the inhabitants plant are ſtunted in their growth. Lead is found at Dunnet, copper at Old Urk, and iron ore at ſeveral places; but theſe advantages are not improved. The air of Caithneſs is temperate, tho' in the latitude of 58, where the longeſt day in ſummer is computed at 18 hours; and when the ſun ſets, he makes ſo ſmall an arch of a circle below the horizon, that the people enjoy a twilight until he riſes again. The fuel uſed by the inhabitants of Caithneſs conſiſts of peat and turf, which the ground yields in great plenty. The

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* See *Barbary*.

foreſts of Moravius and Berridale afford abundance of red-deer and roe-bucks: the country is well ſtored with hares, rabbits, growſe, heathcocks, plover, and all ſorts of game, comprehending a bird called *ſnow-fleet*, about the ſize of a ſparrow, exceedingly fat and delicious, that comes hither in large flights about the middle of February, and takes its departure in April. The hills are covered with ſheep and black cattle; ſo numerous, that a fat cow has been ſold at market for 4s. ſterling. The rocks along the coaſts are frequented by eagles, hawks, and all manner of ſea-fowl, whoſe eggs and young are taken in vaſt quantities by the natives. The rivers and lakes abound with trout, ſalmon, and eels; and the ſea affords a very advantageous fiſhery. Divers obeliſks and ancient monuments appear in this diſtrict, and ſeveral Romiſh chapels are ſtill ſtanding. Caithneſs is well peopled with a race of hardy inhabitants, who employ themſelves chiefly in fiſhing, and breeding ſheep and black cattle: they are even remarkably induſtrious; for between Wick and Dunbeath, one continued track of rugged rocks, extending 12 miles, they have forced ſeveral little harbours for their fiſhing boats, and cut artificial ſteps from the beach to the top of the rocks, where they have erected houſes, in which they cure and dry the fiſh for market.

According to Mr Pennant, this county is ſuppoſed to ſend out in ſome years about 20,000 head of black cattle, but in bad ſeaſons the farmer kills and ſalts great numbers for ſale. Great numbers of ſwine are alſo reared here. Theſe are ſhort, high-backed, long briſtled, ſharp, ſlender, and long-noſed; have long erect ears, and moſt ſavage looks. Here are neither barns nor granaries: the corn is threſhed out, and preſerved in the chaff in byks; which are ſtacks, in the ſhape of bee-hives, thatched quite round, where it will keep good for two years. Vaſt numbers of ſalmon are taken at Caſtle-hill, Dunnet, Wick, and Thurſo. A miraculous draught at this laſt place is ſtill talked of, not leſs than 2500 being taken at one tide within the memory of man; and Mr Smollet informs us, that, in the neighbourhood, above 300 good ſalmon have been taken at one draught of the net. In the month of November, great numbers of ſeals are taken in the caverns that open into the ſea, and run ſome hundreds of yards under ground. The entrance of theſe caverns is narrow, but the inſide lofty and ſpacious. The ſeal-hunters enter theſe in ſmall boats with torches, which they light as ſoon as they land, and then with louds ſhouts alarm the animals, which they kill with clubs as they attempt to paſs. This is a hazardous employment; for ſhould the wind blow hard from ſea, theſe adventurers are inevitably loſt. Sometimes a large ſpecies of ſeals, 12 feet long, have been killed on this coaſt; and it is ſaid the ſame kind are found on the rock Hiſkir, one of the weſtern iſlands. During the ſpring, great quantities of lump-fiſh reſort to this coaſt, and are the prey of the ſeals, as appears from the number of ſkins of thoſe fiſhes which at that ſeaſon float aſhore. At certain times alſo the ſeals ſeem to be viſited by a great mortality; for, at thoſe times, multitudes of them are ſeen dead in the water. Much limeſtone is found in this country, which when burnt is made into a compoſt with turf and ſea-plants. The common people are kept in great ſervitude, and moſt of their time is given to the lairds, an invincible impediment to the proſperity of the country. The women are alſo condemned to a ſhameful drudgery; it not being uncommon to ſee them trudging in droves of 60 or 70 to the fields with baſkets of dung on their backs, which are filled at pleaſure from the dunghills by their lords and maſters with their pitchforks.

The laſt private war in Scotland was occaſioned by a diſpute relating to this county. An earl of Breadalbane married an heireſs of Caithneſs: the inhabitants would not admit her title, but ſet up another perſon in oppoſition. The earl, according to the cuſtom of thoſe times, deſigned to aſſert his right by force of arms: he raiſed an army of 1500 men; but thinking the number too great, he diſmiſſed firſt one 500, and then another. With the remainder he marched to the borders of Caithneſs. Here he thought proper to add ſtratagem to force. He knew that the enemy's army waited for him on the other ſide of the promontory of Ord. He knew alſo, that whiſky was then the nectar of Caithneſs; and therefore ordered a ſhip laden with that precious liquor to paſs round, and wilfully ſtrand itſelf on the ſhore. The directions were punctually obeyed; and the crew in a ſeeming fright eſcaped in the boats to the invading army. The Caithneſs men made a prize of the ſhip; but making too free with the freight, became an eaſy prey to the earl, who attacked them during their intoxication, and gained the county, which he diſpoſed of very ſoon after his conqueſt.

CAIUS, Kaye, or *Keye*, (Dr John), the founder of Caius college in Cambridge, was born at Norwich in 1510. He was admitted very young a ſtudent in Gonville-hall in the abovementioned univerſity; and at the age of 21 tranſlated from Greek into Latin ſome pieces of divinity, and into Engliſh Eraſmus's paraphraſe on Jude, &c. From theſe his juvenile labours, it ſeems probable that he firſt intended to proſecute the ſtudy of divinity. Be that as it may, he travelled to Italy, and at Padua ſtudied phyſic under the celebrated Montanus. In that univerſity he continued ſome time, where we are told he read Greek lectures with great applauſe. In 1543, he travelled through part of Italy, Germany, and France; and returning to England commenced doctor of phyſic at Cambridge. He practiſed firſt at Shrewſbury, and afterwards at Norwich: but removing to London, in 1547 he was admitted fellow of the college of phyſicians, to which he was ſeveral years preſident. In 1557, being then phyſician to queen Mary, and in great favour, he obtained a licence to advance Gonville-hall, where he had been educated, into a college; which he endowed with ſeveral conſiderable eſtates, adding an entire new ſquare at the expence of 1834l. Of this college he accepted the maſterſhip, which he kept till within a ſhort time of his death. He was phyſician to Edward VI. queen Mary, and queen Elizabeth. Towards the latter end of his life he retired to his own college at Cambridge; where, having reſigned the maſterſhip to Dr Legge of Norwich, he ſpent the remainder of his life as a fellow-commoner. He died in July 1573, aged 63; and was buried in the chapel of his own college. Dr Caius was a learned, active, benevolent man. In 1557, he erected a monument in St Paul's to the memory of the famous Linacre. In 1563, he obtained a grant for the college of phyſicians to take the bodies of two malefactors

factors annually for diſſection; and he was the inventor of the *inſignia* which diſtinguiſh the preſident from the reſt of the fellows. He wrote, 1. Annals of the college from 1555 to 1572. 2. Tranſlation of ſeveral of Galen's works. Printed at different times abroad. 3. *Hippocrates de Medicamentis,* firſt diſcovered and publiſhed by our author; alſo *De ratione victus,* Lov. 1556, 8vo. 4. *De medendi Methodo.* Baſil, 1544, Lond. 1555, 8vo. 5. Account of the ſweating ſickneſs in England. Lond. 1556. 1721. It is entitled *De ephemera Britannica.* 6. Hiſtory of the univerſity of Cambridge. Lond. 1568, 8vo. 1574, 4to. in Latin. 7. *De thermis Britannicis,* Doubtful whether ever printed. 8. Of ſome rare plants and animals. Lond. 1570. 9. *De cannibus Britannicis,* 1570. 1729. 10. *De pronunciatione Græcæ et Latinæ Linguæ.* Lond. 1554. 11. *De libris propriis.* Lond. 1570. Beſides many other works which never were printed.

CAKE, a finer ſort of bread, denominated from its flat round figure.

We meet with different compoſitions under the name of *cakes*; as *ſeed-cakes,* made of flour, butter, cream, ſugar, coriander, and caraway ſeeds, mace, and other ſpices and perfumes baked in the oven; *plum-cake,* made much after the ſame manner, only with fewer ſeeds, and the addition of currants; *pan-cakes,* made of a mixture of flower, eggs, &c. fried; *cheeſe-cakes,* made of cream, eggs, and flour, with or without cheeſe-curd, butter, almonds, &c. *oat-cakes,* made of fine oaten flour, mixed with yeſt and ſometimes without, rolled thin, and laid on an iron or ſtone to bake over a ſlow fire; *ſugar-cakes,* made of fine ſugar beaten and ſearced with the fineſt flour, adding butter, roſe-water, and ſpices; *roſe-cakes, placentæ roſaceæ,* are leaves of roſes dried and preſſed into a maſs, ſold in the ſhops for epithems.

The Hebrews had ſeveral ſorts of cakes, which they offered in the temple. They were made of the meal either of wheat or barley; they were kneaded ſometimes with oil and ſometimes with honey. Sometimes they only rubbed them over with oil when they were baked, or fried them with oil in a frying pan upon the fire. In the ceremony of Aaron's conſecration, they ſacrificed a calf and two rams, and offered unleavened bread, and cakes unleavened, tempered with oil, and wafers unleavened anointed with oil; the whole made of fine wheaten flour. Ex. xxix. 1, 2.

CAKET, a town of Aſia, in Perſia, in the province of Gurgiſtan, near Mount Caucaſus. Its trade conſiſts chiefly of ſilks. E. Long. 46. 15. N. Lat. 43. 32.

CALABASH, in commerce, a light kind of veſſel formed of the ſhell of a gourd, emptied and dried, ſerving to put divers kinds of goods in, as pitch, roſin, and the like. The word is Spaniſh, *Calabacca,* which ſignifies the ſame. The Indians alſo, both of the North and South Sea, put the pearls they have fiſhed in calabaſhes, and the negroes on the coaſt of Africa do the ſame by their gold-duſt. The ſmaller calabaſhes are alſo frequently uſed by theſe people as a meaſure, by which they ſell theſe precious commodities to the Europeans. The ſame veſſels likewiſe ſerve for putting in liquors; and do the office of cups, as well as bottles, for ſoldiers, pilgrims, &c.

Calabash-Tree, in botany. See Crescentia.

African Calabash-Tree. See Adansonia.

CALABRIA, a country of Italy, in the kingdom of Naples, divided into Calabria Ultra, and Calabria Citra, commonly called *Ulterior* and *Citerior,* or Farther and Hither Calabria. Calabria Citerior is one of the 12 provinces of the kingdom of Naples; and bounded on the ſouth by Calabria Ultra, on the north by Baſilicata, and on the weſt and eaſt by the ſea: Coſenſa is the capital. Calabria Ultra is waſhed by the Mediterranean ſea on the eaſt, ſouth, and weſt, and bounded by Calabria Citra on the north. Reggio is the capital town.

This country has been almoſt entirely deſolated by the earthquakes of 1783. The reiterated ſhocks extended from Cape Spartivento to Amantea above the gulf of St Euſemia, and alſo affected that part of Sicily which lies oppoſite to the ſouthern extremity of Italy. Thoſe of the 5th and 7th of February, and of the 28th of March, were the moſt violent, and completed the deſtruction of every building throughout the abovementioned ſpace. Not one ſtone was left upon another ſouth of the narrow iſthmus of Squillace; and what is more diſaſtrous, a very large proportion of the inhabitants was killed by the falling of their houſes, near 40,000 lives being loſt. Some perſons were dug out alive after remaining a ſurpriſing length of time buried among the rubbiſh. Meſſina became a maſs of ruins; its beautiful Palazzata was thrown in upon the town, and its quay cracked into ditches full of water. Reggio almoſt deſtroyed; Tropea greatly damaged; every other place in the province levelled to the ground.

Before and during the concuſſion the clouds gathered, and then hung immoveable and heavy over the earth. At Palmi, the atmoſphere wore ſo fiery an aſpect, that many people thought part of the town was burning. It was afterwards remembered that an unuſual heat had affected the ſkin of ſeveral perſons juſt before the ſhock; the rivers aſſumed a muddy aſh-coloured tinge, and a ſulphureous ſmell was almoſt general. A frigate paſſing between Calabria and Lipari felt ſo ſevere a ſhock, that the ſteerſman was thrown from the helm, and the cannons were raiſed upon their carriages, while all around the ſea exhaled a ſtrong ſmell of brimſtone.

Stupendous alterations were occaſioned in the face of the country; rivers ckoaked up by the falling in of the hills, were converted into lakes, which if not ſpeedily drained, by ſome future convulſion, or opened by human labour, will fill the air with peſtilential vapours, and deſtroy the remnants of population. Whole acres of ground, with houſes and trees upon them, were broken off from the plains, and waſhed many furlongs down the deep hollows which the courſe of the rivers had worn; there, to the aſtoniſhment and terror of beholders, they found a new foundation to fix upon, either in an upright or an inclining poſition. In ſhort, every ſpecies of phenomenon, incident to theſe deſtructive commotions of the earth, was to be ſeen in its utmoſt extent and variety in this ruinated country. Their Sicilian majeſties, with the utmoſt expedition, diſpatched veſſels loaded with every thing that could be thought of on the occaſion for the relief and accommodation of the diſtreſſed Calabrians; a general officer went from Naples with engineers and troops to direct the operations of the perſons employed in clearing away and rebuilding the houſes, and to defend the property of the ſufferers. The king ordered this officer to take all the money the royal treaſures could ſupply or borrow: for, rather than it ſhould be wanting on this preſſing call, he was determined to part with his plate, nay, the very furniture of his palace. A meſſenger ſent off from a town near Reggio on the 8th of February, travelled four days without ſhelter, and without being able to procure a morſel of bread; he ſupported nature with a piece of cheeſe which he had brought in his pocket, and the vegetables he was lucky enough to find near the road. To add to all their other ſufferings, the Calabrians found themſelves and the miſerable wreck of their fortunes expoſed to the depredations of robbers and pirates. Villains landed from boats and plundered ſeveral places, and thieves went even from Naples in ſearch of booty: In order to ſtrike a greater terror, they dreſſed themſelves like Algerines; but were diſcovered and driven off. To this accumulated diſtreſs ſucceeded a moſt inclement ſeaſon, which obſtructed every effort made to alleviate it; and almoſt daily earthquakes kept the inhabitants in continual dread, not of being deſtroyed by the fall of houſes, for none were left, but of being ſwallowed up by the ſplitting of the earth, or buried in the waves by ſome ſudden inundation.

For further particulars concerning this dreadful cataſtrophe, and the phenomena attending it, ſee EARTHQUAKE.

CALADE, in the manege, the deſcent or ſloping declivity of a riſing manege-ground, being a ſmall eminence, upon which we ride down a horſe ſeveral times, putting him to a ſhort gallop, with his fore-hams in the air, to learn him to ply or bend his haunches, and form his ſtop upon the aids of the calves of the legs, the ſtay of the bridle, and the caveſon ſeaſonably given.

CALAGORINA, or CALAGURIS, diſtinguiſhed by the ſurname *Naſica* (anc. geog.), a city of the Vaſcones in the Hither Spain; now *Calahorra.*

CALAHORRA, an epiſcopal town of Spain, in Old Caſtile, ſeated in a fertile ſoil, on the ſide of a hill which extends to the banks of the river Ebro, W. Long. 2. 7. N. Lat. 42. 12.

CALAIS, a ſtrong town of France, in Lower Picardy, with a citadel and a fortified harbour. It is built in the form of a triangle, one ſide of which is towards the ſea. The citadel is as large as the town, and has but one entrance. It is a trading place, with handſome ſtreets, and ſeveral churches and monaſteries; the number of inhabitants is reckoned to be 4000.

Calais was taken by Edward III. in 1347. Hither he marched his victorious army from Creſcy, and inveſted the town on the 8th of September. But finding that it could not be taken by force without the deſtruction of great multitudes of his men, he turned the ſiege into a blockade, and having made ſtrong entrenchments to ſecure his army from the enemy, huts to protect them from the inclemency of the weather, and ſtationed a fleet before the harbour to prevent the introduction of proviſions, he reſolved to wait with patience till the place fell into his hands by famine. The beſieged, diſcovering his intention, turned ſeventeen hundred women, children, and old people out of the town, to ſave their proviſions; and Edward had the goodneſs, after entertaining them with a dinner, and giving them twopence a-piece, to ſuffer them to paſs. The garriſon and inhabitants of Calais having at length conſumed all their proviſions, and even eaten all their horſes, dogs, cats, and vermin, in the place, the governor John de Vienne appeared upon the walls, and offered to capitulate. Edward, greatly incenſed at their obſtinate reſiſtance, which had detained him eleven months under their walls, at an immenſe expence both of men and money, ſent Sir Walter Manny, an illuſtrious knight, to acquaint the governor, that he would grant them no terms; but that they muſt ſurrender at diſcretion. At length, however, at the ſpirited remonſtrances of the governor, and the perſuaſions of Sir Walter Manny, Edward conſented to grant their lives to all the garriſon and inhabitants, except ſix of the principal burgeſſes, who ſhould deliver to him the keys of the city, with ropes about their necks. When theſe terms were made known to the people of Calais, they were plunged into the deepeſt diſtreſs; and after all the miſeries they had ſuffered, they could not think without horror of giving up ſix of their fellow-citizens to certain death. In this extremity, when the whole people were drowned in tears, and uncertain what to do, Euſtace de Pierre, one of the richeſt merchants in the place, ſtepped forth, and voluntarily offered himſelf to be one of theſe ſix devoted victims. His noble example was ſoon imitated by other five of the moſt wealthy citizens. Theſe true patriots, barefooted, and bareheaded, with ropes about their necks, were attended to the gates by the whole inhabitants, with tears, bleſſings, and prayers, for their ſafety. When they were brought into Edward's preſence, they laid the keys of the city at his feet, and falling on their knees implored his mercy in ſuch moving ſtrains, that all the noble ſpectators melted into tears. The king's reſentment was ſo ſtrong for the many toils and loſſes he had ſuffered in this tedious ſiege, that he was in ſome danger of forgetting his uſual humanity; when the queen, falling upon her knees before him, earneſtly begged and obtained their lives. This great and good princeſs conducted theſe virtuous citizens, whoſe lives ſhe had ſaved, to her own apartment, entertained them honourably, and diſmiſſed them with preſents. Edward took poſſeſſion of Calais Auguſt 4th; and in order to ſecure a conqueſt of ſo great importance, and which had coſt him ſo dear, he found it neceſſary to turn out all the ancient inhabitants, who had diſcovered ſo ſtrong an attachment to their native prince, and to people it with Engliſh.

Calais remained in ſubjection to England till the reign of queen Mary, when it was retaken by the duke of Guiſe. This general began the enterpriſe by ordering the privateers of Normandy and Bretagne to cruize in the channel, more eſpecially in the very ſtraits of Calais; he then detached the duke of Nevers, with a conſiderable army, towards the country of Luxemburgh; a motion which drew the attention of the Spaniards that way: when all things were ready, he procured an application from the people Boulogne, for a body of troops to ſecure them againſt the incurſions of the Spaniards; he ſent a ſtrong detachment at their requeſt, which was followed by another, under colour of ſupporting them, then repaired thither in perſon, ſecure that his officers would follow his inſtructions; and thus, on the firſt day of the new year, 1557, Calais was inveſted. He immediately attacked fort St Agatha, which the garriſon quitted, and retired into the fort of Nieulai, which, together with the Riſbank, the beſiegers attacked at the ſame time, granted good terms to the officer who commanded in the former, but obliged the garriſon of the latter to ſurrender priſoners of war. By theſe means he opened a communication with the ſea; and having received from on board the ſhips an immenſe quantity of hurdles, his infantry, by the help of them, paſſed the moraſſes that lie round the town. He then made a falſe attack at the water-gate, which drew the attention of the garriſon, who fatigued themſelves exceedingly in making entrenchments behind the breach; but when they had finiſhed their work, he began to fire upon the caſtle, where the walls were very old, and had been neglected on account of the breadth of the ditch, which was alſo very deep when the tide was in; but a great breach being made, the duke cauſed it to be attacked in the night, and during the ebb the ſoldiers paſſing almoſt up to the ſhoulders. The place was eaſily carried, though the governor made three vigorous attacks before the break of day, in order to diſlodge them; but the French, though they loſt a conſiderable number of men, kept their poſts. The governor then ſaw that it was impracticable to defend the place any longer, and therefore made the beſt terms for himſelf that he could obtain, which, however, were not very good: and thus in eight days the duke of Guiſe recovered a fortreſs which coſt the victorious Edward III. a whole year's ſiege, and which had been now 210 years in the poſſeſſion of the Engliſh, without ſo much as a ſingle attempt to retake it. There are very different accounts given of this matter: Some Engliſh hiſtorians ſay, that king Philip penetrated the deſign of the French upon this fortreſs, gave notice of it in England, and offered to take the defence of it upon himſelf; but that this, out of jealouſy, was refused, it being believed to be only an artifice to get a place of ſuch conſequence into his own hands. The truth of the matter ſeems to be this: The ſtrength of Calais conſiſted in its ſituation and outworks, which required a very numerous garriſon; but this being attended with a very large expence, the beſt part of the troops had been ſent to join Philip's army, ſo that the governor had not above 500 men, and there were not more than 250 of the townſmen able to bear arms. As to ammunition, artillery, and proviſions, the French found there abundance, but with ſo ſlender a garriſon, that it was impoſſible to make a better defence; and therefore, when the lord Wentworth, who was governor, and whom the French call lord Dumfort, was tried by his peers for the loſs of this place, he was acquitted. The duke obliged all the Engliſh inhabitants to quit Calais; and beſtowed the government of it upon des Termes, who was ſoon after made a marſhal of France.

The fortifications of Calais are good; but its greateſt ſtrength is its ſituation among the marſhes, which may be overflowed at the approach of an enemy. The harbour is not ſo good as formerly, nor will it admit veſſels of any great burden. In times of peace, there are packet-boats going backward and forward twice a week from Dover to Calais, which is 21 miles diſtant. E. Long. 2. 6. N. Lat. 50. 58.

Calais and Zetes, in fabulous hiſtory, ſons of Boreas and Orythia, to whom the poets attributed wings: they went on the voyage of Colchis with the Argonauts, delivered Phineus from the harpies, and were ſlain by Hercules.

CALAMANCO, a ſort of woollen ſtuff manufactured in England and Brabant. It has a fine gloſs; and is checkered in the warp, whence the checks appear only on the right ſide. Some calamancos are quite plain, others have broad ſtripes adorned with flowers, ſome with plain broad ſtripes, ſome with narrow ſtripes, and others watered.

CALAMARIÆ, in botany, an order of plants in the *Fragmenta methodi naturalis* of Linnæus; in which he has the following genera, viz. bobartia, ſcirpus, cyperus, eriophorum, carex, ſchænus, flagellaria, juncus. See BOTANY.

CALAMATA, a conſiderable town of Turkey in Europe, in the Morea, and province of Belvedera. It was taken by the Venetians in 1685; but the Turks retook it afterwards with all the Morea. It ſtands on the river Spinarza, eight miles from the ſea. E. Long. 22. 15. N. Lat. 37. 8.

CALAMINE CALAMY, *Lapis Calaminaris*, or *Cadmia Foſſilis*, a ſort of ſtone or mineral, containing zinc, iron, and ſometimes other ſubſtances. It is conſiderably heavy, and the more ſo the better; moderately hard and brittle, or of a conſiſtence betwixt ſtone and earth: the colour is ſometimes whitiſh or grey; ſometimes yellowiſh, or of a deep yellow; ſometimes red; ſometimes brown or blackiſh. It is plentiful in ſeveral places of Europe, as Hungary, Tranſylvania, Poland, Spain, Sweden, Bohemia, Saxony, Goſlar, France, and England, particularly in Derbyſhire, Glouceſterſhire, Nottinghamſhire, and Somerſetſhire, as alſo in Wales. The calamine of England, however, is by the beſt judges allowed to be ſuperior in quality to that of moſt other countries. It ſeldom lies very deep, being chiefly found in clayey grounds near the ſurface. In ſome places it is mixed with lead-ores. It is the only true ore of zinc, and is uſed as an ingredient in making of braſs.—Newmann relates various experiments with this mineral, the only reſult of which was to ſhow that it contained iron as well as zinc. The moſt remarkable are the following. A ſaturated ſolution of calamine in the marine acid, concentrated by evaporating part of the liquor, exhibits in the cold an appearance of fine cryſtals, which on the application of warmth diſſolve and diſappear. A little of this concentrated ſolution tinges a large quantity of water of a bright yellow colour; and at the ſame time depoſits by degrees a fine, ſpongy, browniſh precipitate. Glue diſſolved in this ſolution, and afterwards inſpiſſated, forms an extremely ſlippery tenacious maſs, which does not become dry, and, were it not too expenſive, might be of uſe for entangling flies, caterpillars, &c. Sulphur boiled in the ſolution ſeems to acquire ſome degree of tranſparency.—This mineral is an article in the materia medica; but, before it comes to the ſhops is uſually roaſted or calcined, in order to ſeparate ſome arſenical or ſulphureous matter which in its crude ſtate it is ſuppoſed to contain, and to render it more eaſily reducible into a fine powder. In this ſtate it is employed in collyria againſt defluxions of thin acrid humours upon the eyes, for drying up moiſt running ulcers, and healing excoriations. It is the baſis of an officinal epulotic CERATE.

Though the lapis calaminaris is the only native ore of zinc, there is another ſubſtance from which that ſemi-metal is alſo obtained. This is called *cadmia fornacum*, or *cadmia of the furnaces*, to diſtinguiſh it from the other. This is a matter ſublimed when ores containing zinc, like thoſe of Rammelſberg, are ſmelted. This cadmia conſiſts of the flowers of the ſemi-metal ſublimed during the fuſion, and adhering to the inner ſurfaces of the walls of furnaces, where they ſuffer a ſemi-fuſion, and therefore acquire ſome ſolidity. So great a quantity of theſe are collected, that they form very thick incruſtations, which muſt be frequently taken off. The name of *cadmia of the furnaces* has alſo been given to all the ſoots and metallic ſublimates formed by ſmelting in the great, although there is certainly a difference in theſe matters.

CALAMINT, in botany. See MELISSA, and MENTHA.

CALAMUS, in botany: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 5th order, *Tripetaloideæ*. The calyx is hexaphyllous, there is no corolla, the fruit is a dry monoſpermous berry, imbricated backwards. There is but one ſpecies, the rotang. The ſtem is without branches, has a crown at top, and is every where beſet with ſtraight ſpines. This is the true Indian cane, which is not viſible on the outſide; but the bark being taken off diſcovers the ſmooth ſtick, which has no marks of ſpine on the bark, and is exactly like thoſe which the Dutch ſell to us; keeping this matter very ſecret, leſt travellers going by ſhould take as many canes out of the woods as they pleaſe. Sumatra is ſaid to be the place where moſt of theſe ſticks grow. Such are to be choſen as are of proper growth between two joints, ſuitable to the faſhionable length of canes as they are then worn: but ſuch are ſcarce.—The calamus rotang is one of ſeveral plants from which the drug called Dragon's-blood is obtained.

CALAMUS, in the ancient poets, denotes a ſimple kind of pipe or fiſtula, the muſical inſtrument of the ſhepherds and herdſmen; uſually made either of an oaten ſtalk or a reed.

CALAMUS *Aromaticus*, or *Sweet-ſcented Flag*, in the materia medica, a ſpecies of flag called *acorus* by Linnæus. See ACORUS.

CALAMUS *Scriptorius*, in antiquity, a reed or ruſh to write with. The ancients made uſe of ſtyles to write on tables covered with wax; and of reed, or ruſh, to write on parchment, or Egyptian paper.

CALAMY (Edmund), an eminent Preſbyterian divine, born at London in the year 1600, and educated at Pembroke-hall, Cambridge, where his attachment to the Arminian party excluded him from a fellowſhip. Dr Felton biſhop of Ely, however, made him his chaplain; and, in 1639, he was choſen miniſter of St Mary Aldermary, in the city of London. Upon the opening of the long parliament, he diſtinguiſhed himſelf in defence of the Preſbyterian cauſe; and had a principal hand in writing the famous *Smectymnus*, which, himſelf ſays, gave the firſt deadly blow to epiſcopacy. The authors of this tract were five, the initials of whoſe names formed the name under which it was publiſhed; viz. Stephen Marſhal, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Sparſtow. He was after that an active member in the aſſembly of divines, was a ſtrenuous oppoſer of ſectaries, and uſed his utmoſt endeavours to prevent thoſe violences committed after the king was brought from the iſle of Wight. In Cromwell's time he lived privately, but was aſſiduous in promoting the king's return; for which he was afterwards offered a biſhopric, but refuſed it. He was ejected for nonconformity in 1662; and died of grief at the ſight of the great fire of London.

CALAMY (Edmund), grandſon to the preceding (by his eldeſt ſon Mr Edward Calamy, who was ejected out of the living of Moxton in Eſſex on St Bartholomew's day 1662), was born in London, April 5th 1671. After having learned the languages, and gone through a courſe of natural philoſophy and logic at a private academy in England, he ſtudied philoſophy and civil law at the univerſity of Utrecht, and attended the lectures of the learned Grævius. Whilſt he reſided here, an offer of a profeſſor's chair in the univerſity of Edinburgh was made him by Mr Carſtairs, principal of that univerſity, ſent over on purpoſe to find a perſon properly qualified for ſuch an office. This he declined; and returned to England in 1691, bringing with him letters from Grævius to Dr Pocock canon of Chriſtchurch and regius profeſſor of Hebrew, and to Dr Bernard Savilian profeſſor of aſtronomy, who obtained leave for him to proſecute his ſtudies in the Bodleian library. Having reſolved to make divinity his principal ſtudy, he entered into an examination of the controverſy between the conformiſts and non-conformiſts; which determined him to join the latter: and coming to London in 1692, he was unanimouſly choſen aſſiſtant to Mr Matthew Sylveſter at Blackfriars; and in 1694, he was ordained at Mr Anneſly's meeting-houſe in Little St-Helena, and ſoon after was invited to become aſſiſtant to Mr Daniel Williams in Hand-Alley. In 1702, he was choſen to be one of the lecturers in Salter's-hall; and, in 1703, ſucceeded Mr Vincent Alſop as paſtor of a great congregation in Weſtminſter. He drew up the table of contents to Mr Baxter's hiſtory of his life and times, which was ſent to the preſs in 1696; made ſome remarks on the work itſelf, and added to it an index; and, reflecting on the uſefulneſs of the book, he ſaw the expediency of continuing it, for Mr Baxter's hiſtory came no lower than the year 1684. Accordingly he compoſed an abridgement of it, with an account of many other miniſters who were ejected after the reſtoration of Charles II.; their apology, containing the grounds of their nonconformity and practice as to ſtated and occaſional communion with the church of England; and a continuation of their hiſtory till the year 1691. This work was publiſhed in 1702. He afterwards publiſhed a moderate defence of nonconformity, in three tracts, in anſwer to ſome tracts of Dr Hoadley. In 1709, Mr Calamy made a tour to Scotland; and had the degree of doctor of divinity conferred on him by the univerſities of Edinburgh, Aberdeen, and Glaſgow. In 1713, he publiſhed a ſecond edition of his Abridgement of Mr Baxter's hiſtory of his life and times; in which, among other additions, there is a continuation of the hiſtory through king William's reign, and queen Anne's, down to the paſſing of the occaſional bill; and in the cloſe is ſubjoined the reformed liturgy, which was drawn

drawn up and preſented to the biſhops in 1661, “ that the world may judge (he ſays in his preface) how fairly the ejected miniſters have been often repreſented as irreconcileable enemies to all liturgies.” In 1718, he wrote a vindication of his grandfather, and ſeveral other perſons, againſt certain reflections caſt upon them by Mr Archdeacon Echard in his Hiſtory of England; and in 1728 appeared his Continuation of the account of the miniſters, lecturers, maſters, and fellows of colleges, and ſchoolmaſters, who were ejected, after the reſtoration in 1660, by or before the act of uniformity. He died June 3d 1732, greatly regretted, not only by the diſſenters, but alſo by the moderate members of the eſtabliſhed church, both clergy and laity, with many of whom he lived in great intimacy. Beſides the pieces already mentioned, he publiſhed a great many ſermons on ſeveral ſubjects and occaſions. He was twice married, and had 13 children.

CALANDRE, a name given by the French writers to an inſect that does vaſt miſchief in granaries. It is properly of the ſcarab or beetle-claſs; it has two antennæ or horns formed of a great number of round joints, and covered with a ſoft and ſhort down; from the anterior part of the head there is thruſt out a trunk, which is ſo formed at the end, that the creature eaſily makes way with it through the coat or ſkin that covers the grain, and gets at the meal or farina on which it feeds; the inſide of the grains is alſo the place where the female depoſits her eggs, that the young progeny may be born with proviſion about them. When the female has pierced a grain of corn for this purpoſe, ſhe depoſits in it one egg, or at the utmoſt two, but ſhe moſt frequently lays them ſingle: theſe eggs hatch into ſmall worms, which are uſually found with their bodies rolled up in a ſpiral form, and after eating till they arrive at their full growth, they are changed into chryſales, and from theſe in about a fortnight comes out the perfect calandre. The female lays a conſiderable number of eggs; and the increaſe of theſe creatures would be very great: but nature has ſo ordered it, that while in the egg ſtate, and even while in that of the worm, they are ſubject to be eaten by mites; theſe little vermin are always very plentiful in granaries, and they deſtroy the far greater number of theſe larger animals.

CALAS, (John) the name of a moſt unfortunate Proteſtant merchant at Thoulouſe, inhumanly butchered under forms of law cruelly proſtituted to ſhelter the ſanguinary dictates of ignorant Popiſh zeal. He had lived 40 years at Thoulouſe. His wife was an Engliſh woman of French extraction: and they had five ſons; one of whom, Lewis, had turned Catholic through the perſuaſion of a Catholic maid who had lived 30 years in the family. In October 1761, the family conſiſted of Calas, his wife, Mark Anthony their ſon, Peter their ſecond ſon, and this maid. Anthony was educated for the bar; but being of a melancholy turn of mind, was continually dwelling on paſſages from authors on the ſubject of ſuicide, and one night in that month hanged himſelf on a bar laid acroſs two folding doors in their ſhop. The crowd collected by the confuſion of the family on ſo ſhocking a diſcovery, took it into their heads that he had been ſtrangled by the family to prevent his changing his religion, and that this was a common practice among proteſtants. The officers of juſtice adopted the popular tale, and were ſupplied by the mob with what they accepted as evidences of the fact. The fraternity of white penitents got the body, buried it with great ceremony, and performed a ſolemn ſervice for him as a martyr; the Franciſcans did the ſame: and after theſe formalities no one doubted the guilt of the devoted heretical family. They were all condemned to the torture, to bring them to confeſſion: they appealed to the parliament; who, as weak and as wicked as the ſubordinate magiſtrates, ſentenced the father to the torture ordinary and extraordinary, to be broken alive upon the wheel, and then to be burned to aſhes. A diabolical decree! which, to the ſhame of humanity, was actually carried into execution. Peter Calas, the other ſon, was baniſhed for life; and the reſt were acquitted. The diſtracted widow found ſome friends, and among the reſt M. Voltaire, who laid her caſe before the council of ſtate at Verſailles, and the parliament of Thoulouſe were ordered to tranſmit the proceedings. Theſe the king and council unanimouſly agreed to annul; the capitoul, or chief magiſtrate of Thoulouſe, was degraded and fined; old Calas was declared to have been innocent; and every imputation of guilt was removed from the family, who alſo received from the king and clergy conſiderable gratuities.

CALASH, or CALESH, a ſmall light kind of chariot or chair, with very low wheels, uſed chiefly for taking the air in parks and gardens. The calaſh is for the moſt part richly decorated, and open on all ſides for the conveniency of the air and proſpect, or at moſt incloſed with light mantlets of wax-cloth to be opened and ſhut at pleaſure. In the Philoſophical Tranſactions we have a deſcription of a new ſort of calaſh going on two wheels, not hung on traces, yet eaſier than the common coaches, over which it has this further advantage, that whereas a common coach will overturn if one wheel go on a ſurface a foot and an half higher than the other, this will admit of a difference of 3½ feet without danger of overturning. Add, that it would turn over and over; that is, after the ſpokes being ſo turned as that they are parallel to the horizon, and one wheel flat over the head of him that rides in it, and the other flat under him, it will turn once more, by which the wheels are placed *in ſtatu quo*, without any diſorder to the horſe or rider.

CALASIO (Marius), a Franciſcan, and profeſſor of the Hebrew language at Rome, of whom there is very little to be ſaid, but that he publiſhed there, in the year 1621, a Concordance of the Bible, which conſiſted of four great volumes in folio. This work has been highly approved and commended both by Proteſtants and Papiſts, and is indeed a moſt admirable work. For beſides the Hebrew words in the Bible, which are in the body of the book with the Latin verſion over againſt them; there are, in the margin, the differences between the ſeptuagint verſion and the vulgate; ſo that at one view may be ſeen wherein the three Bibles agree, and wherein they differ. Moreover, at the beginning of every article there is a kind of dictionary, which gives the ſignification of each Hebrew word; affords an opportunity of comparing it with other oriental languages, viz. with the Syriac, Arabic, and Chaldee; and is extremely uſeful for determining more exactly the true meaning of the Hebrew words.

CALASIRIS, in antiquity, a linen tunic fringed at the bottom, and worn by the Egyptians under a white woollen garment; but this laſt they were obliged to pull off when they entered the temples, being only allowed to appear there in linen garments.

CALATAJUD, a large and handſome town of Spain, in the kingdom of Arragon; ſituated at the confluence of the rivers Xalon and Xiloca, at the end of a very fertile valley, with a good caſtle on a rock. W. Long. 2. 9. N. Lat. 41. 22.

CALATHUS, in antiquity, a kind of hand-baſket made of light wood or ruſhes; uſed by the women ſometimes to gather flowers, but chiefly after the example of Minerva, to put their work in. The figure of the calathus, as repreſented on ancient-monuments, is narrow at the bottom, and widening upwards like that of a top. Pliny compares it to that of a lily. The calathus or work-baſket of Minerva is no leſs celebrated among the poets than her diſtaff.

Calathus was alſo the name of a cup for wine uſed in ſacrifices.

CALATOR, in antiquity, a cryer or officer appointed to publiſh ſomething aloud, or call the people together. The word is formed from καλεω, *voco, I call*. Such miniſters the pontifices had, whom they uſed to ſend before them when they went to ſacrifice on *feriæ* or holidays, to advertiſe the people to leave off work. The magiſtrates alſo uſed *calatores*; to call the people to the comitia, both *curiata* and *centuriata*. The officers in the army alſo had *calatores*; as had likewiſe many private families, to invite their gueſts to entertainments.

CALATRAVA, a city of New Caſtile, in Spain, ſituated on the river Guadiana, 45 miles ſouth of Toledo. W. Long. 4. 20. N. Lat. 39. 0.

Knights of Calatrava, a military order in Spain, inſtituted under Sancho III. king of Caſtile, upon the following occaſion. When that prince took the ſtrong fort of Calatrava from the moors of Andaluſia, he gave it to the templars, who, wanting courage to defend it, returned it him again. Then Don Reymond, of the order of the Ciſtercians, accompanied with ſeveral perſons of quality, made an offer to defend the place, which the king thereupon delivered up to them, and inſtituted that order. It increaſed ſo much under the reign of Alphonſus, that the knights deſired they might have a grand maſter, which was granted. Ferdinand and Iſabella afterwards, with the conſent of pope Innocent VIII. re-united the grand maſterſhip of Calatrava to the Spaniſh crown; ſo that the kings of Spain are now become perpetual adminiſtrators thereof

The knights of Calatrava bear a croſs gules, flowerdeliſed with green, &c. Their rule and habit was originally that of the Ciſtercians.

CALAURIA, (anc. geog) an iſland of Greece in the Saronic bay, over againſt the port of Troezen, at the diſtance of 40 ſtadia. Hither Demoſthenes went twice into baniſhment; and here he died. Neptune was ſaid to have accepted this iſland from Apollo, in exchange for Delos. The city ſtood on a high ridge nearly in the middle of the iſland, commanding an extenſive view of the gulph and its coaſts. There was his holy temple. The prieſteſs was a virgin, who was diſmiſſed when marriageable. Seven of the cities near the iſland held a congreſs at it, and ſacrificed jointly to the deity. Athens, Ægina, and Epidaurus were of this number, with Nauplia, for which place Argos contributed. The Macedonians, when they had reduced Greece, were afraid to violate the ſanctuary, by forcing from it the fugitives, his ſuppliants. Antipater commanded his general to bring away the orators who had offended him, alive; but Demoſthenes could not be prevailed on to ſurrender. His monument remained in the ſecond century, within the incloſure of the temple. The city of Calauria has been long abandoned. Traces of buildings, and of ancient walls, appear nearly level with the ground; and ſome ſtones, in their places, each with a ſeat and back, forming a little circle, once perhaps a bath. The temple, which was of the Doric order, and not large, as may be inferred from the fragments, is reduced to an inconſiderable heap of ruins. The iſland is now called *Poro*. It ſtretches along before the coaſt of the Morea in a lower ridge, and is ſeparated from it by a canal only four ſtadia or half a mile wide. This, which is called Poro or the Ferry, in ſtill weather may be paſſed on foot, as the water is not deep. It has given its name to the iſland, and alſo to the town, which conſiſts of of about 200 houſes, mean and low, with flat roofs; riſing on the ſlope of a bare diſagreeable rock.

CALCADA, or *St Dimingo Calcalda*, a town of Spain, ſituated in W. Long. 3. 5. N. Lat. 42. 36.

CALCAR, a very ſtrong town of Germany, in the circle of Weſtphalia, and duchy of Cleves. It belongs to the king of Pruſſia, and is ſeated near the Rhine, in E. Long. 5. 41. N. Lat. 51. 45.

Calcar, in glaſs-making, the name of a ſmall oven, or reverberatory furnace, in which the firſt calcination of ſand and ſalt of potaſhes is made for the turning them into what is called *frit*. This furnace is made in the faſhion of an oven ten feet long, ſeven broad in the wideſt part, and two feet deep. On one ſide of it is a trench ſix inches ſquare, the upper part of which is level with the calcar, and ſeparated only from it at the mouth by bricks nine inches wide. Into this trench they put ſea-coal, the flame of which is carried into every part of the furnace, and is reverberated from the roof upon the frit, over the ſurface of which the ſmoke flies very black, and goes out at the mouth of the calcar; the coals burn on iron grates, and the aſhes fall through.

Calcar (John de), a celebrated painter, was the diſciple of Titian, and perfected himſelf by ſtudying Raphael. Among other pieces he drew a nativity, repreſenting the angels around the infant Chriſt; and ſo ordered the diſpoſition of his picture, that the light all proceeds from the child. He died at Naples, in 1546, in the flower of his age. It was he who deſigned the anatomical figures of Veſal, and the portraits of the painters of Veſari.

CALCAREOUS, ſomething that partakes of the nature and qualities of calx, or lime. We ſay, a *calcareous* earth, *calcareous* ſtone. See *Chemistry-Index*.

CALCEARIUM, in antiquity, a donative or largeſs beſtowed on Roman ſoldiers for buying ſhoes. In monaſteries, *calcearium* denoted the daily ſervice of cleaning the ſhoes of the religious.

CALCEOLARIA, in botany, a genus of the monogynia order, belonging to the diandria claſs of plants. The corolla is ringent and inflated; the capſule has two cells, and two valves; the calyx four parted and equal.

CALCHAS, in fabulous hiſtory, a famous diviner, followed the Greek army to Troy. He foretold that the ſiege would laſt ten years; and that the fleet, which was detained in the port of Aulis by contrary winds, would not ſail till Agamemnon's daughter had been ſacrificed to Diana. After the taking of Troy, he retired to Colophon; where, it is ſaid, he died of grief, becauſe he could not divine what another of his profeſſion, called *Mopſus*, had diſcovered.

CALCINATION, in chemiſtry, the reducing of ſubſtances to a calx by fire. See *CHEMISTRY-Index*.

CALCINATO, a town of Italy, in the duchy of Mantua, remarkable for a victory gained over the Imperialiſts by the French in 1706. E. Long. 9. 55. N. Lat. 45. 25.

CALCULARY *of a* PEAR, a congeries of little ſtrong knots diſperſed through the whole parenchyma of the fruit. The calculary is moſt obſerved in rough-taſted or choak-pears. The knots lie more continuous and compact together towards the pear where they ſurround the ACETARY. About the ſtalk they ſtand more diſtant; but towards the cork, or ſtool of the flower, they ſtill grow cloſer, and there at laſt gather into the firmneſs of a plumb-ſtone. The calculary is no vital or eſſential part of the fruit; the ſeveral knots whereof it conſiſts being only ſo many concretions or precipitations out of the ſap, as we ſee in urines, wines, and other liquors.

CALCULATION, the act of computing ſeveral ſums, by adding, ſubtracting, multiplying, or dividing. See ARITHMETIC.

CALCULATION is more particularly uſed to ſignify the computations in aſtronomy and geometry, for making tables of logarithms, ephemerides, finding the time of eclipſes, &c. See ASTRONOMY, GEOMETRY, and LOGARITHMS.

CALCULUS, primarily denotes a little ſtone or pebble, anciently uſed in making computations, taking of ſuffrages, playing at tables, and the like. In after-times, pieces of ivory, and counters ſtruck of ſilver, gold, and other matters, were uſed in lieu thereof, but ſtill retaining the ancient names. Computiſts were by the lawyers called *calculones*, when they were either ſlaves or newly freed men; thoſe of a better condition were named *calculatores* or *numerarii*: ordinarily there was one of theſe in each family of diſtinction. The Roman judges anciently gave their opinions by calculi, which were white for abſolution, and black for condemnation. Hence *calculus albus*, in ancient writers, denotes a favourable vote, either in a perſon to be abſolved and acquitted of a charge, or elected to ſome dignity or poſt; as *calculus niger* did the contrary. This uſage is ſaid to have been borrowed from the Thracians, who marked their happy or proſperous days by *white*, and their unhappy by *black*, pebbles, put each night into an urn.

Beſides the diverſity of colour, there were ſome calculi alſo which had figures or characters engraven on them, as thoſe which were in uſe in taking the ſuffrages both in the ſenate and at aſſemblies of the people. Theſe calculi were made of thin wood, poliſhed and covered over with wax. Their form is ſtill ſeen in ſome medals of the Caſſian family; and the manner of caſting them into the urns, in the medals of the Licinian family. The letters marked upon theſe calculi were U. R. for *uti rogas*, and A. for *antiquo*; the firſt of which expreſſed an approbation of the law, the latter a rejection of it. Afterwards the judges who ſat in capital cauſes uſed calculi marked with the letter A. for *abſolvo*; C. for *condemno*; and N. L. for *non liquet*, ſignifying that a more full information was required.

Calculus is alſo uſed in ancient grammatic writers for a kind of weight equal to two grains of cicer. Some make it equivalent to the ſiliqua, which is equal to three grains of barley. Two calculi made the ceratium.

CALCULUS *Differentialis* is a method of differencing quantities, or of finding an infinitely ſmall quantity, which, being taken infinite times, ſhall be equal to a given quantity; or, it is the arithmetic of the infinitely ſmall differences of variable quantities.

The foundation of this calculus is an infinitely ſmall quantity, or an infiniteſimal, which is a portion of a quantity incomparable to that quantity, or that is leſs than any aſſignable one, and therefore accounted as nothing; the error accruing by omitting it being leſs than any aſſignable one. Hence two quantities, only differing by an infiniteſimal, are reputed equal. Thus, in Aſtronomy, the diameter of the earth is an infiniteſimal, in reſpect of the diſtance of the fixed ſtars; and the ſame holds in abſtract quantities. The term, infiniteſimal, therefore, is merely reſpective, and involves a relation to another quantity; and does not denote any real ens, or being. Now infiniteſimals are called *differentials*, or *differential quantities*, when they are conſidered as the differences of two quantities. Sir Iſaac Newton calls them *moments*; conſidering them as the momentary increments of quantities, v. g. of a line generated by the flux of a point, or of a ſurface by the flux of a line. The differential calculus, therefore, and the doctrine of fluxions, are the ſame thing under different names; the former given by M. Leibnitz, and the latter by Sir Iſaac Newton: each of whom lay claim to the diſcovery. There is, indeed, a difference in the manner of expreſſing the quantities reſulting from the different views wherein the two authors conſider the infiniteſimals; the one as moments, the other as differences: Leibnitz, and moſt foreigners, expreſs the differentials of quantities by the ſame letters as variable ones, only prefixing the letter d: thus the differential of x is called $d\,x$; and that of y, $d\,y$: now $d\,x$ is a poſitive quantity, if x continually increaſe; negative, if it decreaſe. The Engliſh, with Sir Iſaac Newton, inſtead of $d\,x$ write x (with a dot over it;) for dy, y, &c. which foreigners object againſt, on account of that confuſion of points, which they imagine ariſes when differentials are again differenced; beſides, that the printers are more apt to overlook a point than a letter. Stable quantities being always expreſſed by the firſt letters of the alphabet $d\,a=o$, $d\,b=o$, $d\,c=o$; wherefore $d\,(x+y-a)=d\,x+d\,y$, and $d\,(x-y+a)\;d\,x-d\,y$. So that the differencing of quantities is eaſily performed, by the addition or ſubtraction of their compounds.

To difference quantities that multiply each other; the rule is, firſt, multiply the differential of one factor into the other factor, the ſum of the two factors is the differential ſought: thus, the quantities being $x\,y$, the dif-

differential will be $x\,dy+y\,dx$, i. e. $d\,(x\,y) = x\,dy+y\,dx$. Secondly, if there be three quantities mutually multiplying each other, the factum of the two muſt then be multiplied into the differential of the third: thus ſuppoſe $v\,x\,y$, let $v\,x = t$, then $v\,x\,y = t\,y$; conſequently $d\,(v\,x\,y) = t\,dy+y\,dt$: but $dt = v\,dx+x\,dv$. Theſe values, therefore, being ſubſtituted in the antecedent differential, $t\,dy+y\,dt$, the reſult is, $d\,(v\,x\,y) = v\,x\,dy+v\,y\,dx+x\,y\,dv$. Hence it is eaſy to apprehend how to proceed, where the quantities are more than three. If one variable quantity increaſe, while the other y decreaſes, it is evident $y\,dx-x\,dy$ will be the differential of $x\,y$.

To difference quantities that mutually divide each other; the rule is, firſt, multiply the differential of the diviſor into the dividend; and on the contrary, the differential of the dividend into the diviſor; ſubtract the laſt product from the firſt, and divide the remainder by the ſquare of the diviſor; the quotient is the differential of the quantities mutually dividing each other. See FLUXIONS.

CALCULUS Exponentialis, is a method of differencing exponential quantities, or of finding and ſumming up the differentials or moments of exponential quantities; or at leaſt bringing them to geometrical conſtructions.

By exponential quantity, is here underſtood a power, whoſe exponent is variable; v. g. $x^x\ a^x\ x^y$. where the exponent x does not denote the ſame in all the points of a curve, but in ſome ſtands for 2, in others for 3, in others for 5, &c.

To difference an exponential quantity; there is nothing required but to reduce the exponential quantities to logarithmic ones; which done, the differencing is managed as in logarithmic quantities.—Thus, ſuppoſe the differential of the exponential quantity x^y required, let

$$x^y = z$$

Then will $y\,l\,x = l\,z$

$$l\,x\,dy+\frac{y\,dx}{x} = \frac{dz}{z}$$

$$z\,l\,x\,dy+\frac{z\,y\,dx}{x} = dz$$

That is, $x^y\,l\,x\,dy+x^{y-1}\,dx = dz$.

CALCULUS Integralis, or Summatorius, is a method of integrating, or ſumming up moments, or differential quantities; i. e. from a differential quantity given, to find the quantity from whoſe differencing the given differential reſults.

The integral calculus, therefore, is the inverſe of the differential one: whence the Engliſh, who uſually call the differential method *fluxions*, give this *calculus*, which aſcends from the fluxions, to the flowing or variable quantities: or, as foreigners expreſs it, from the differences to the ſums, by the name of the *inverſe method of fluxions*.

Hence, the integration is known to be juſtly performed, if the quantity found, according to the rules of the differential calculus, being differenced, produce that propoſed to be ſummed.

Suppoſe $\int$ the ſign of the ſum, or integral quantity, then $\int y\,dx$ will denote the ſum, or integral of the differential $y\,dx$.

To integrate, or ſum up a differential quantity: It is demonſtrated, firſt, that $\int dx = x$: ſecondly, $\int (dx+dy) = x+y$: thirdly, $\int (x\,dy+y\,dx) = x\,y$: fourthly, $\int (m\,x^{m-1}\,dx = x\,m$: fifthly, $\int (n:m)\,x^{\frac{n-m}{m}}\,dx = x^{\frac{n}{m}}$: ſixthly, $\int (y\,dx-x\,dy) : y^2 = x : y$. Of theſe, the fourth and fifth caſes are the moſt frequent, wherein the differential quantity is integrated, by adding a variable unity to the exponent, and dividing the ſum by the new exponent multiplied into the differential of the root: v. g. the fourth caſe, by $m-(1+1)\,dx$, i. e. by $m\,dx$.

If the differential quantity to be integrated doth not come under any of theſe formulas, it muſt either be reduced to an integral finite, or an infinite ſeries, each of whoſe terms may be ſummed.

It may be here obſerved, that, as in the analyſis of finites, any quantity may be raiſed to any degree of power; but *vice verſa*, the root cannot be extracted out of any number required: ſo in the analyſis of infinites, any variable or flowing quantity may be differenced; but *vice verſa*, any differential cannot be integrated. And as, in the analyſis of finites, we are not yet arrived at a method of extracting the roots of all equations, ſo neither has the integral calculus arrived at its perfection: and as in the former we are obliged to have recourſe to approximation, ſo in the latter we have recourſe to infinite ſeries, where we cannot attain to a perfect integration.

CALCULUS Literalis, or *Literal CALCULUS*, is the ſame with ſpecious arithmetic, or algebra, ſo called from its uſing the letters of the alphabet; in contradiſtinction to numeral arithmetic, which uſes figures. In the literal calculus given quantities are expreſſed by the firſt letters, *a b c d*; and quantities ſought by the laſt *z y x*, &c. Equal quantities are denoted by the ſame letters.

CALCULUS Minervæ, among the ancient lawyers, denoted the deciſion of a cauſe, wherein the judges were equally divided. The expreſſion is taken from the hiſtory of Oreſtes, repreſented by Æſchylus and Euripides; at whoſe trial, before the Areopagites, for the murder of his mother, the votes being equally divided for and againſt him, Minerva interpoſed, and gave the caſting vote or calculus in his behalf.

M. Cramer, profeſſor at Marpurg, has a diſcourſe expreſs, *De Calculo Minervæ*; wherein he maintains, that all the effect an entire equality of voices can have, is to leave the cauſe *in ſtatu quo*.

CALCULUS Tiburtinus, a ſort of figured ſtone, formed in great plenty about the cataracts of the Anio, and other rivers in Italy; of a white colour, and in ſhape oblong, round, or echinated. They are a ſpecies of the *ſtiriæ lapideæ*, and generated like them; and ſo like ſugar-plums in the whole, that is a common jeſt at Rome to deceive the unexperienced by ſerving them up at deſerts.

CALCULUS, in Medicine, the diſeaſe of the ſtone in the bladder, or kidneys. The term is Latin, and ſignifies a *little pebble*. The calculus in the bladder is called *lithiaſis*; and in the kidneys, *nephritis*. See MEDICINE and SURGERY.

Human calculi are commonly formed of different ſtrata

ſtrata or incruſtations; ſometimes ſmooth and heavy like mineral ſtones; but oftener rough, ſpongy, light, and full of inequalities or protuberances; chemically analyſed, or diſtilled in an open fire, they nearly yield the ſame principles as urine itſelf, or at leaſt an empyreumatic volatile urinous matter, together with a great deal of air. They never have, nor can have naturally, any foreign matter for a baſis: but they may by accident; an inſtance of which is related by Dr Percival*. A bougie had unfortunately ſlipped into the bladder, and upon it a ſtone of conſiderable ſize was formed in leſs than a year. This ſtone had ſo much the appearance of chalk, that the Doctor was induced to try whether it could be converted into quicklime. His experiment ſucceeded, both with that and ſome other calculi; from which he conjectures, that hard waters which contain calcareous earth may contribute towards the formation of theſe calculi.

CALCUTTA, the capital of the province of Bengal, and of all the Britiſh poſſeſſions in the Eaſt-Indies, is ſituated on the river Hughely, a branch of the Ganges, about 100 miles from the ſea, in N. Lat. 23. and 88. 28. E. Long. from Greenwich. It is but a modern city, built on the ſite of a village called *Govindpour*. The Engliſh firſt obtained the Mogul's permiſſion to ſettle in this place in the year 1690; and Mr Job Channock, the company's agent, made choice of the ſpot on which the city ſtands, on account of a large ſhady grove which grew there; though in other reſpects it was the worſt he could have pitched upon; for three miles to the north coaſt, there is a ſalt-water lake, which overflows in September, and when the flood retires in December, leaves behind ſuch a quantity of fiſh and other putreſcent matter, as renders the air very unhealthy. The cuſtom of the Gentoos throwing the dead bodies of their poor people into the river is alſo very diſguſtful, and undoubtedly contributes to render the place unhealthy, as well as the cauſe already mentioned.

Calcutta is now become a large and populous city, being ſuppoſed at preſent to contain 500,000 inhabitans. It is elegantly built, at leaſt the part inhabited by the Engliſh; but the reſt, and that the greateſt part, is built after the faſhion of the cities of India in general. The plan of all theſe is nearly the ſame; their ſtreets are exceedingly confined, narrow, and crooked, with a vaſt number of ponds, reſervoirs, and gardens interſperſed. A few of the ſtreets are paved with brick. The houſes are built, ſome with brick, others with mud, and a ſtill greater number with bamboes and mats; all which different kinds of fabrics ſtanding intermixed with one another, form a very uncouth appearance. The brick houſes are ſeldom above two ſtories high, but thoſe of mud and bamboes are only one, and are covered with thatch. The roofs of the brick houſes are flat and terraced. Theſe, however, are much fewer in number than the other two kinds; ſo that fires, which often happen, do not ſometimes meet with a brick houſe to obſtruct their progreſs in a whole ſtreet. Within theſe 20 or 25 years Calcutta has been greatly improved both in appearance and in the ſalubrity of its air: the ſtreets have been properly drained, and the ponds filled; thereby removing a vaſt ſurface of ſtagnant water, the exhalations of which were particularly hurtful. The citadel is named Fort William, and is ſuperior as a fortreſs to any in India; but is now on too extenſive a ſcale to anſwer the purpoſe for which it was intended, viz. the holding a poſt in caſe of extremity. It was begun on this extended plan by lord Clive immediately after the battle of Plaſſey. The expence attending it was ſuppoſed to amount to two millions Sterling.

Calcutta is the emporium of Bengal, and the reſidence of the governor-general of India. Its flouriſhing ſtate may in a great meaſure be ſuppoſed owing to the unlimited toleration of all religions allowed here; the Pagans being ſuffered to carry their idols in proceſſion, the Mahommedans not being diſcountenanced, and the Roman Catholics being allowed a church.—At about a mile diſtant from the town is a plain where the natives annually undergo a very ſtrange kind of penance on the 9th of April; ſome for the ſins they have committed, others for thoſe they may commit, and others in conſequence of a vow made by their parents. This ceremony is performed in the following manner. Thirty bamboes, each about the height of 20 feet, are erected in the plain abovementioned. On the top of theſe they contrive to fix a ſwivel, and another bamboe of thirty feet or more croſſes it, at both ends of which hangs a rope. The people pull down one end of this rope, and the devotee placing himſelf under it, the Brahmin pinches up a large piece of ſkin under both the ſhoulderblades, ſometimes in the breaſts, and thruſts a ſtrong iron hook through each. Theſe hooks have lines of Indian graſs hanging to them, which the prieſt makes faſt to the rope at the end of the croſs bamboe, and at the ſame time puts a ſaſh round the body of the devotee, laying it looſely in the hollow of the hooks, leſt by the ſkin's giving way, he ſhould fall to the ground. When this is done, the people haul down the other end of the bamboe; by which means the devotee is immediately lifted up 30 feet or more from the ground, and they run round as faſt as their legs can carry them. Thus the devotee is thrown out the whole length of the rope, where, as he ſwings, he plays a thouſand antic tricks; being painted and dreſſed in a very particular manner, on purpoſe to make him look more ridiculous. Some of them continue ſwinging half an hour, others leſs. The devotees undergo a preparation of four days for this ceremony. On the firſt and third they abſtain from all kinds of food; but eat fruit on the other two. During this time of preparation they walk about the ſtreets in their fantaſtical dreſſes, dancing to the ſound of drums and horns; and ſome, to expreſs the greater ardour of devotion, run a rod of iron quite through their tongues, and ſometimes through their cheeks alſo.

Before the war of 1755, Calcutta was commonly garriſoned by 300 Europeans, who were frequently employed in conveying the company's veſſels from Patna, loaded with ſalt-petre, piece-goods, opium, and raw ſilk. The trade of Bengal alone ſupplied rich cargoes for 50 or 60 ſhips annually, beſides what was carried on in ſmall veſſels to the adjacent countries. It was this flouriſhing ſtate of Calcutta that probably was one motive for the Nabob Surajah Dowla to attack it in the year 1756. Having had the fort of Coſſimbuzar delivered up to him, he marched againſt Calcutta with all his forces, amounting to 70,000 horſe and foot, with

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* *Eſſays*, Vol. III. p. 165.

with 400 elephants, and inveſted the place on the 15th of June. Previous to any hoſtilities, however he wrote a letter to Mr Drake the governor, offering to withdraw his troops, on condition that he would pay him his duty on the trade for 15 years paſt, defray the expence of his army, and deliver up the black merchants who were in the fort. This being refuſed, he attacked one of the redoubts at the entrance of the town; but was repulſed with great ſlaughter. On the 16th he attacked another advanced poſt, but was likewiſe repulſed with great loſs. Notwithſtanding this diſappointment, however, the attempt was renewed on the 18th, when the troops abandoned theſe poſts, and retreated into the fort; on which the Nabob's troops entered the town, and plundered it for 24 hours. An order was then given to attacking the fort; for which purpoſe a ſmall breaſt-work was thrown up, and two twelve pounders mounted upon it; but without firing oftener than two or three times an hour. The governor then called a council of war, when the captain of the train informed them, that there was not ammunition in the fort to ſerve three days; in conſequence of which the principal ladies were ſent on board the ſhips lying before the fort. They were followed by the governor, who declared himſelf a quaker, and left the place to be defended by Mr Holwell the ſecond in council. Beſides the governor, four of the council, eight gentlemen in the company's ſervice, four officers, and 100 ſoldiers, with 52 free merchants, captains of ſhips, and other gentlemen, eſcaped on board the ſhips, where were alſo 59 ladies, with 33 of their children. The whole number left in the fort were about 250, effective men, with Mr Holwell, four captains, five lieutenants, ſix enſigns, and five ſerjeants; as alſo 14 ſea-captains, and 29 gentlemen of the factory. Mr Holwell then having held a council of war, divided three cheſts of treaſure among the diſcontented ſoldiers; making them large promiſes alſo, if they behaved with courage and fidelity; after which he boldly ſtood on the defence of the place, notwithſtanding the immenſe force which oppoſed him. The attack was very vigorous; the enemy having got poſſeſſion of the houſes, galled the Engliſh from thence, and drove them from the baſtions; but they themſelves were ſeveral times diſlodged by the fire from the fort, which killed upwards of 12,000 men, with the loſs of only five Engliſh ſoldiers the firſt day. The attack, however, was continued till the afternoon of the 20th; when many of the garriſon being killed and wounded, and their ammunition almoſt exhauſted, a flag of truce was hung out. Mr Holwell intended to have availed himſelf of this opportunity to make his eſcape on board the ſhips, but they had fallen ſeveral miles down from the fort, without leaving even a ſingle boat to facilitate the eſcape of thoſe who remained. In the mean time, however, the back-gate was betrayed by the Dutch guard, and the enemy, entering the fort, killed all they firſt met, and took the reſt priſoners.

The fort was taken before ſix in the evening; and, in an hour after, Mr Holwell had three audiences of the Nabob, the laſt being in the durbar or council. In all theſe the governor had the moſt poſitive aſſurances that no harm ſhould happen to any of the priſoners; but he was ſurpriſed and enraged at finding only 5000l. in the fort, inſtead of the immenſe treaſures he expected; and to this, as well as perhaps to the reſentment of the jemmidaars or officers, of whom many were killed in the ſiege, we may impute the cataſtrophe that followed.

As ſoon as it was dark, the Engliſh priſoners, to the number of 146, were directed by the jemmidaars who guarded them, to collect themſelves into one body, and ſit down quietly under the arched veranda, or piazza, to the weſtward of the black-hole priſon. Beſides the guard over them, another was placed at the ſouth-end of this veranda, to prevent the eſcape of any of them. About 500 gunmen, with lighted matches, were drawn up on the parade; and ſoon after the factory was in flames to the right and left of the priſoners, who had various conjectures on this appearance. The fire advanced with rapidity on both ſides; and it was the prevailing opinion of the Engliſh, that they were to be ſuffocated between the two fires. On this they ſoon came to a reſolution of ruſhing on the guard, ſeizing their ſcymitars, and attacking the troops upon the parade, rather than be thus tamely roaſted to death: but Mr Holwell advanced, and found the Moors were only ſearching for a place to confine them in. At that time Mr Holwell might have made his eſcape, by the aſſiſtance of Mr Leech, the company's ſmith, who had eſcaped when the Moors entered the fort, and returned juſt as it was dark, to tell Mr Holwell he had provided a boat, and would enſure his eſcape, if he would follow him through a paſſage few were acqainted with, and by which he then entered. This might eaſily have been accompliſhed, as the guard took little notice of it: but Mr Holwell told Mr Leech, he was reſolved to ſhare the fate of the gentlemen and the garriſon: to which Mr Leech gallantly replied, that "then he was reſolved to ſhare Mr Holwell's fate, and would not leave him."

The guard on the parade advanced, and ordered them all to riſe and go into the barracks. Then, with their muſkets preſented, they ordered them to go into the black-hole priſon; while others with clubs and ſcymitars, preſſed upon them ſo ſtrong, that there was no reſiſting it; but, like one agitated wave impelling another, they were obliged to give way and enter; the reſt following like a torrent. Few among them, the ſoldiers excepted, had the leaſt idea of the dimenſions or nature of a place they had never ſeen; for if they had, they ſhould at all events have ruſhed upon the guard, and been cut to pieces by their own choice as the leſſer evil.

It was about eight o'clock when theſe 146 unhappy perſons, exhauſted by continual action and fatigue, were thus crammed together into a dungeon about eighteen feet ſquare, in a cloſe ſultry night in Bengal; ſhut up to the eaſt and ſouth, the only quarters from whence air could reach them, by dead walls, and by a wall and door to the north; open only to the weſt by two windows, ſtrongly barred with iron, from which they could receive ſcarce any circulation of freſh air.

They had been but few minutes confined before every one fell into a perſpiration ſo profuſe, that no idea can be formed of it. This brought on a raging thirſt, which increaſed in proportion as the body was drained of its moiſture. Various expedients were thought of to give more room and air. Every man was ſtripped, and every hat put in motion: they ſeveral times ſat down on their hams; but at each time ſeveral of the poor creatures fell, and were inſtantly ſuffocated or trod to death.

Before nine o'clock every man's thirſt grew intolerable, and reſpiration difficult. Efforts were again made to force the door; but ſtill in vain. Many inſults were uſed to the guards, to provoke them to fire in upon the priſoners, who grew outrageous, and many delirious. "Water, water," became the general cry. Some water was brought; but theſe ſupplies, like ſprinkling water on fire, only ſerved to raiſe and feed the flames. The confuſion became general, and horrid from the cries and ravings for water, and ſome were trampled to death. This ſcene of miſery proved entertainment to the brutal wretches without, who ſupplied them with water, that they might have the ſatisfaction of ſeeing them fight for it, as they phraſed it; and held up lights to the bars, that they might loſe no part of the inhuman diverſion.

Before eleven o'clock, moſt of the gentlemen were dead, and one third of the whole. Thirſt grew intolerable: but Mr Holwell kept his mouth moiſt by ſucking the perſpiration out of his ſhirt ſleeves, and catching the drops as they fell, like heavy rain, from his head and face. By half an hour after eleven, moſt of the living were in an outrageous delirium. They found that water heightened their uneaſineſſes; and "Air, air," was the general cry. Every inſult that could be deviſed againſt the guard, all the opprobrious names that the viceroy and his officers could be loaded with, were repeated to provoke the guard to fire upon them. Every man had eager hopes of meeting the firſt ſhot. Then a general prayer to heaven, to haſten the approach of the flames to the right and left of them, and put a period to their miſery. Some expired on others; while a ſteam aroſe as well from the living as the dead, which was very offenſive.

About two in the morning, they crowded ſo much to the windows, that many died ſtanding, unable to fall by the throng and equal preſſure round. When the day broke, the ſtench ariſing from the dead bodies was unſufferable. At that juncture, the Soubah, who had received an account of the havoc death had made among them, ſent one of his officers to enquire if the chief ſurvived. Mr Holwell was ſhown to him; and near ſix an an order came for their releaſe.

Thus they had remained in this infernal priſon from eight at night until ſix in the morning, when the poor remains of 146 ſouls, being only 23, came out alive, but moſt of them in a high putrid fever. The dead bodies were dragged out of the hole by the ſoldiers, and thrown promiſcuouſly into the ditch of an unfiniſhed ravelin, which was afterwards filled with earth.

The injuries which Calcutta, ſuffered at this time, however, were ſoon repaired. The place was retaken by Admiral Watſon and Colonel Clive, early in 1757; Surajah Dowla was defeated, depoſed, and put to death; and Meer Jaffier, who ſucceeded him in the Nabobſhip, engaged to pay an immenſe ſum for the indemnification of the inhabitants. Since that time the immenſe acquiſition of territory by the Britiſh in this part of the world, with the conſtant ſtate of ſecurity enjoyed by this city, have given an opportunity of embelliſhing and improving it greatly beyond what it was before.—Among theſe improvements we may reckon that of Sir William Jones; who, on the 15th of January 1784, inſtituted a ſociety for inquiring into the hiſtory civil and natural, the antiquities, arts, ſciences, and literature of Aſia; and thus the literature of Europe, and along with it, it is to be hoped, the arts of humanity, beneficence, and peace, have at length obtained a footing in the rich empire of indoſtan, ſo long a prey to the rapine and violence of tyrants and uſurpers.

CALDARIUM, in the ancient baths, denoted a brazen veſſel or ciſtern, placed in the hypocauſtum, full of hot water, to be drawn thence into the *piſcinia* or bath, to give it the neceſſary degree of heat. In this ſenſe, the *caldarium* ſtood contradiſtinguiſhed from the *tepidarium* and *frigidarium*.

CALDARIUM alſo denoted the ſtove, or ſudatory, being a cloſe vaulted room, wherein by hot dry fumes, without water, people were brought to a profuſe ſweat. In which ſenſe, *caldarium* was the ſame with what was otherwiſe denominated *vaporarium*, *ſudatorium* and *laconium*; in the Greek baths, *hypocauſtum*, υποκαυςον.

CALDERINUS (Domitius), a learned critic, born at Calderia near Verona. He read lectures upon polite literature at Rome with great reputation; and was the firſt who ventured to write upon the moſt difficult of the ancient poets. He died very young in 1477.

CALDERON, De la Barca, (Dom. Pedro), a Spaniſh officer, who, after having ſignalized himſelf in the military profeſſion, quitted it for the eccleſiaſtical, and then commenced dramatic writer. His dramatic works make 9 vols in 4to. and ſome Spaniſh authors have compared him to Shakeſpeare. He flouriſhed about the year 1640.

CALDERWOOD (David), a famous divine of the church of Scotland, and a diſtinguiſhed writer in behalf of the Preſbyterians, was deſcended of a good family in that kingdom; and being early deſigned for the miniſtry, he applied with great diligence to the ſtudy of the Scriptures in their original tongues, the works of the fathers, the councils, and the beſt writers on church-hiſtory. He was ſettled about the year 1604 at Crelling near Jedburgh. King James I. of Great Britain, being deſirous of bringing the church of Scotland nearer to a conformity with that of England, laboured earneſtly to reſtore the epiſcopal authority, and enlarge the powers of the biſhops who were then in Scotland. This deſign was very warmly oppoſed by many of the miniſters, and particularly by Mr David Calderwood; who, when Mr James Law, biſhop of Orkney, came to viſit the preſbyteries of Merſe and Teviotdale, declined his juriſdiction by a paper under his hand dated May 5th 1608. But the king having its ſucceſs much at heart, ſent the earl of Dunbar, then high-treaſurer of Scotland, with Dr Abbot afterwards archbiſhop of Canterbury, and two other divines, into that kingdom, with inſtructions to employ every method to perſuade both the clergy and laity of his majeſty's ſincere deſire to promote the good of the church, and of his zeal for the Proteſtant religion. Mr Calderwood did not aſſiſt at the general aſſembly held at Glaſgow June 8th 1610, in which lord Dun-

Calderwood.

bar preſided as a commiſſioner; and it appears from his writings, that he looked upon every thing tranſacted in it as null and void. In May following, king James went to Scotland; and on the 17th of June held a parliament at Edinburgh: at that time the clergy met in one of the churches, to hear and adviſe with the biſhops; which kind of aſſembly, it ſeems, was contrived in order to reſemble the Engliſh convocation. Mr Calderwood was preſent at it, but declared publicly that he did not take any ſuch meetings to reſemble a convocation; and being oppoſed by Dr Whitford and Dr Hamilton, who were friends to the biſhops, he took his leave of them in theſe words: "It is abſurd to ſee men ſitting in ſilks and ſattins, and to cry poverty in the kirk, when purity is departing." The parliament proceeded in the mean while in the diſpatch of buſineſs; and Mr Calderwood, with ſeveral other miniſters, being informed that a bill was depending to empower the king, with the advice of the archbiſhops, biſhops, and ſuch a number of the miniſtry, as his Majeſty ſhould think proper, to conſider and conclude as to matters decent for the external policy of the church, not repugnant to the word of God; and that ſuch concluſions ſhould have the ſtrength and power of eccleſiaſtical laws: againſt this they proteſted, for four reaſons. 1. Becauſe their church was ſo perfect, that, inſtead of needing reformation, it might be a pattern to others. 2. General aſſemblies, as now eſtabliſhed by law, and which ought always to continue, might by this means be overthrown. 3. Becauſe it might be a means of creating ſchiſm, and diſturb the tranquillity of the church. 4. Becauſe they had received aſſurances, that no attempts ſhould be made to bring them to a conformity with the church of England. They deſired therefore, that, for theſe and other reaſons, all thoughts of paſſing ſuch a law might be laid aſide: but in caſe this be not done, they proteſt for themſelves and their brethren who ſhall adhere to them, that they can yield no obedience to this law, when it ſhall be enacted, becauſe it is deſtructive of the liberty of the church; and therefore ſhall ſubmit to ſuch penalties, and think themſelves obliged to undergo ſuch puniſhments, as may be inflicted on them for diſobeying that law. This proteſt was ſigned by Mr Archibald Simſon on behalf of the members who ſubſcribed another ſeparate roll, which he kept for his juſtification. This proteſt was preſented to the clerk regiſter, who refuſed to read it before the ſtates in parliament. However though not read, it had its effect; for although the bill had the conſent of parliament, yet the king thought fit to cauſe it to be laid aſide, and not long after called a general aſſembly at St Andrew's. Soon after the parliament was diſſolved, Mr Calderwood was ſummoned to appear before the high commiſſion court at St Andrew's, on the 8th July following, to anſwer for his mutinous and ſeditious behaviour. July 10th, the king came to that city in perſon; when Mr Calderwood, being called upon, and refuſing to comply with what the king in perſon required of him, was commited to priſon. Afterwards the privy council, according to the power exerciſed by them at that time, directed him to baniſh himſelf out of the king's dominions before Michaelmas next; and not to return without licence. Having applied to the king for a prorogation of his ſentence without ſucceſs, becauſe he would neither acknowledge his offence, nor promiſe conformity for the future, he retired to Holland, where, in 1623, he publiſhed his celebrated piece entitled *Altare Damaſcenum.* Mr. Calderwood having in the year 1624 been afflicted with a long fit of ſickneſs, and nothing having been heard of him for ſome time, one Mr Patrick Scot, as Calderwood himſelf informs us, took it for granted that he was dead; and thereupon wrote a recantation in his name, as if, before his deceaſe, he had changed his ſentiments. This impoſture being detected, Scot went over to Holland, and ſtaid three weeks at Amſterdam, where he made a diligent ſearch for the author of Altare Damaſcenum, with a deſign to have diſpatched him. But Calderwood had privately retired into his own country, where he lived ſeveral years. Scot gave out that the king had furniſhed him with the matter for the pretended recantation, and that he only put it in order. During his retirement, Mr Calderwood collected all the memorials relating to the eccleſiaſtical affairs of Scotland, from the beginning of the reformation there down to the death of king James; which collection is ſtill preſerved in the univerſity library of Glaſgow; that which was publiſhed under the title of "The true hiſtory of Scotland," is only an extract from it. In the advertiſement prefixed to the laſt edition of his Altare Damaſcenum mention is made of his being miniſter of Pencaitland near Edinburgh in 1638; but we find nothing ſaid there, or any where elſe, of his death.

Caldron ‖ Caleb.

CALDRON, a large kitchen utenſil, commonly made of copper; having a moveable iron handle, whereby to hang it on the chimney-hook. The word is formed from the French *Chaudron,* or rather the Latin *caldarium.*

Boiling in CALDRONS (*caldariis decoquere*), is a capital puniſhment ſpoken of in the middle-age writers, decreed to divers ſorts of criminals, but chiefly to debaſers of the coin. One of the torments inflicted on the ancient Chriſtian martyrs, was boiling in caldrons of water, oil, &c.

CALDWALL (Richard), a learned Engliſh phyſician, born in Staffordſhire about the year 1513. He ſtudied phyſic in Brazen-Noſe college Oxford; and was examined, admitted unto, and made cenſor of the college of phyſicians at London, all in one day. Six weeks after he was choſen one of the elects; and in the year 1570 was made preſident of that college. Mr Wood tells us, that he wrote ſeveral pieces in his profeſſion; but he does not tell us what they were, only that he tranſlated a book on the art of ſurgery, written by one Horatio More, a Florentine phyſician. We learn from Cambden, that Caldwall founded a chirurgical lecture in the college of phyſicians, and endowed it with a handſome ſalary. He died in 1585.

CALEA, in botany: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ.* The receptacle is paleaceous, the pappus hairy, and calyx imbricated.

CALEB, one of the deputies ſent by the Iſraelites to take a view of the land of Canaan. He made a good report of the country, and by this means revived the ſpirits of the dejected people; on which account, he and Joſhua were the only perſons who, after their leaving Egypt, ſettled in the land of Canaan. Caleb had,

had, for his ſhare, the mountains and the city of Hebron, from which he drove three kings. Othniel his nephew having taken the city of Debir, Caleb gave him his daughter Achſah in marriage; and died, aged 114.

CALEDONIA, the ancient name of Scotland. From the teſtimonies of Tacitus, Dio, and Solinus, we find, that the ancient Caledonia comprehended all that country lying to the north of the rivers Forth and Clyde. In proportion as the Silures or Cimbri advanced towards the north, the Caledonians, being circumſcribed within narrower limits, were forced to tranſmigrate into the iſlands which crowd the weſtern coaſts of Scotland. It is in this period probably, we ought to place the firſt great migration of the Britiſh Gaël into Ireland; that kingdom being much nearer to the promontory of Galloway and Cantire, than many of the Scottiſh iſles are to the continent of North Britain.

To the country which the Caledonians poſſeſſed, they gave the name of *Caël-doch;* which is the only appellation the Scots, who ſpeak the Gaelic language, know for their own diviſion of Britain. *Caël-doch* is a compound, made up of *Gaël* or *Caël,* the firſt colony of the ancient Gauls who tranſmigrated into Britain, and *doch,* a diſtrict or diviſion of a country. The Romans, by tranſpoſing the letter *l* in *Cael,* and by ſoftening into a Latin termination the *ch* of *doch,* formed the well known name of Caledonia.

When the tribes of North Britain were attacked by the Romans, they entered into aſſociations, that, by uniting their ſtrength, they might be more able to repel the common enemy. The particular name of that tribe, which either its ſuperior power or military reputation placed at the head of the aſſociation, was the general name given by the Romans to all the confederates. Hence it is that the *Mœatæ,* who with other tribes inhabited the diſtricts of Scotland lying ſouthward of the frith, and the *Caledonians,* who inhabited the weſt and north-weſt parts, have engroſſed all the glory which belonged in common, though in an inferior degree, to all the other nations ſettled of old in North Britain. It was for the ſame reaſon that the name of *Mœatæ* was entirely forgotten by foreign writers after the third century, and that of the *Caledonians* themſelves but ſeldom mentioned after the fourth.

Britons, Caledonians, Mœatæ, Barbarians, are the names conſtantly given to the old inhabitants of North Britain, by Tacitus, Herodian, Dio, Spartian, Vopiſcus and other ancient writers. The ſucceſſors of theſe Britons, Caledonians, Mœats, and Barbarians, are called Picts, Scots, and Attacots, by ſome Roman writers of the fourth century,

The origin of the appellation *Scoti* and *Picti,* introduced by latter Roman authors, has occaſioned much controverſy among the antiquarians of theſe days. The diſpute ſeems now to be fully decided by ſome learned critics of the preſent century, whoſe knowledge of the Gaelic language aſſiſted their inveſtigation. See SCOTLAND, PICTS, and HIGHLANDERS.

CALEDONIA, the name of a ſettlement made by the Scots on the weſt ſide of the gulph of Darien, in 1698; out of which they were ſtarved at the requeſt of the Eaſt-India company: for the Engliſh government prohibited the other colonies ſending them any proviſions; ſo they were obliged to leave it in 1700.

New CALEDONIA, an iſland in the ſouth-ſea, lately diſcovered by captain Cook, and, next to New Holland and New Zealand, is the largeſt iſland that hath yet been diſcovered in that ſea. It extends from 19. 37. to 22. 30. South Lat. and from 163. 37. to 167. 14. E. Long. Its length from north-weſt to ſouth-eaſt is about 80 leagues; but its greateſt breadth does not exceed ten leagues. This iſland is diverſified by hills and valleys of various ſize and extent. From the hills iſſue abundance of rivulets, which contribute to fertilize the plains. Along its north-eaſt ſhore the land is flat; and being well watered, and cultivated by the inhabitants after their manner, appeared to great advantage to captain Cook's people. Was it not, indeed, for thoſe fertile ſpots on the plains, the whole country might be called a *dreary waſte:* the mountains and higher parts of the land are in general incapable of cultivation. They conſiſt chiefly of rocks, many of which are full of mundic; the little ſoil that is upon them is ſcorched and burnt up by the ſun; it is, however, covered with coarſe graſs and other plants, and here and there covered with trees and ſhrubs. The country in general bears a great reſemblance to thoſe parts of New South Wales which lie under the ſame parallel of latitude. Several of its natural productions are the ſame, and the woods are without underwood as well as in that country. The whole coaſt ſeems to be ſurrounded by reefs and ſhoals, which render all acceſs to it extremely dangerous; but at the ſame time guard the coaſts againſt the attacks of the wind and ſea; rendering it eaſily navigable along the coaſt by canoes, and cauſing it abound with fiſh. Every part of the coaſt ſeems to be inhabited; the plantations in the plains are laid out with great judgment, and cultivated with much labour. They begin their cultivation by ſetting fire to the graſs, &c. with which the ground is covered, but have no notion of preſerving its vigour by manure; they, however, recruit it by letting it lie for ſome years untouched. On the beach was found a large irregular maſs of rock, not leſs than a cube of ten feet, conſiſting of a cloſe-grained ſtone ſpeckled full of granates ſomewhat bigger than pins heads, from whence it ſeems probable that ſome valuable minerals may be found on this iſland. It differs from all the other iſlands yet diſcovered in the South Sea, by being entirely deſtitute of volcanic productions. Several plants of a new ſpecies were found here; and a few young breadfruit trees, not then ſufficiently grown to bear fruit, ſeemed to have come up without culture: plantains and ſugar-canes are here in ſmall-quantity, and the cocoa-nut trees are ſmall and thinly planted. A new ſpecies of paſſion-flower was likewiſe met with, which was never known to grow wild any where but in America. Several *Caputi* (MELALEUCA) trees were alſo found in flower. Muſquetos here are very numerous. A great variety of birds were ſeen of different claſſes, which were for the moſt part entirely new; particularly a beautiful ſpecies of parrot before unknown to zoologiſts. A new ſpecies of fiſh, of the genus called by Linnæus *tetraodon,* was caught here; and its liver, which was very large, preſented at ſupper. Several ſpecies of this genus being reckoned poiſonous, and the preſent ſpecies being remarkably ugly, Meſſ. Forſters hinted their ſuſpicions of its quality; but the temptation of a freſh meal, and the aſſurances of captain Cook, that he had formerly eaten this identical ſort of fiſh without harm, got the better of their ſcruples, and they eat of it. Its oilineſs, however, though it had no other bad taſte than what proceeded from this, prevented them from taking more than a morſel or two. In a few hours after they had retired to reſt, they were awakened by very alarming ſymptoms, being all ſeized with an extreme giddineſs; their hands and feet were numbed, ſo that they were ſcarcely able to crawl; and a violent langour and oppreſſion ſeized them. Emetics were adminiſtered with ſome ſucceſs, but ſudorifics gave the greateſt relief. Some dogs who had eaten the remainder of the liver were likewiſe taken ill; and a pig which had eaten the entrails died ſoon after, having ſwelled to an unuſual ſize. The effects of this poiſon on the gentlemen did not go entirly off in leſs than ſix weeks.—Abundance of turtle was ſeen here. The natives had not the leaſt notion of goats, hogs, dogs, or cats, and had not even a name for any of them.

The inhabitants are very ſtout, tall, and in general well proportioned; their features mild; their beards and hair black, and ſtrongly frizzled, ſo as to be ſomewhat woolly in ſome individuals: their colour is ſwarthy, or a dark cheſnut brown. A few were ſeen who meaſured ſix feet four inches. They are remarkably courteous, not at all addicted to pilfering and ſtealing; in which character of honeſty they are ſingular, all the other nations in the South Sea being remarkably thieviſh. Some wear their hair long, and tie it up to the crown of their heads; others ſuffer only a large lock to grow on each ſide, which they tie up in clubs; many others, as well as all the women, wear it cropt ſhort. They make uſe of a kind of comb made of ſticks of hard wood, from ſeven to nine or ten inches long, and about the thickneſs of knitting needles; a number of theſe, ſeldom exceeding 20, but generally fewer, are faſtened together at one end, parallel to and near one-tenth of an inch from each other; the ends, which are a little pointed, will ſpread out or open like the ſticks of a fan. Theſe combs they always wear in their hair, on one ſide of their head. Some had a kind of concave cylindrical ſtiff black cap, which appeared to be a great ornament among them, and was ſuppoſed to be worn only by the chiefs and warriors. A large ſheet of ſtrong paper, whenever they got one in exchange, was commonly applied to this purpoſe. The men go naked; only tying a ſtring round their middle, and another round their neck. A little piece of a brown cloth made of the bark of a fig-tree, ſometimes tucked up to the belt, and ſometimes pendulous, ſcarcely deſerves the name of a covering; nor indeed does it ſeem at all intended for that purpoſe. This piece of cloth is ſometimes of ſuch a length, that the extremity is faſtened to the ſtring round the neck; to this ſtring they likewiſe hang ſmall round beads of a pale green nephritic ſtone. Coarſe garments were ſeen among them made of a ſort of matting; but they ſeemed never to wear them, except when in their canoes and unemployed. The women ſeemed to be in a ſervile ſtate: they were the only perſons of the family who had any employment, and ſeveral of them brought bundles of ſticks and fuel on their back: thoſe who had children carried them on their backs in a kind of ſatchel. The women alſo were ſeen to dig up the earth in order to plant it. They are in general of a dark cheſnut, and ſometimes mohogany brown; their ſtature middle-ſized, ſome being rather tall, and their whole form rather ſtout, and ſomewhat clumſy. Their dreſs is the moſt disfiguring that can be imagined, and gives them a thick ſquat ſhape; it is a ſhort petticoat or fringe, conſiſting of filaments or little cords, about eight inches long, which are faſtened to a very long ſtring which they have tied ſeveral times round their waiſt. The filaments, or little ropes, therefore, lie above each other in ſeveral layers, forming a kind of thick thatch all round the body, but which does not near cover the thigh: theſe filaments were ſometimes dyed black; but frequently thoſe on the outſide only were of that colour, the reſt being of a dirty grey. There was not a ſingle inſtance, during the ſhip's ſtay in this iſland, of the women permitting any indecent familiarity with an European: they took pleaſure in practiſing the arts of a jilting coquette, but never became abſolute wantons. The general ornaments of both ſexes are ear-rings of tortoiſe ſhells, necklaces, or amulets, made both of ſhells and ſtones; and bracelets made of large ſhells, which they wear above the elbows.

The houſes, or huts, in New Caledonia, are circular, ſomething like a bee-hive, and full as cloſe and warm; the entrance is by a ſmall door, or long ſquare hole, juſt big enough to admit a man bent double: the ſide-walls are about four feet and a half high; but the roof is lofty, and peaked to a point at the top, above which is a poſt or ſtick of wood, which is generally ornamented either with carving or ſhells, or both. The framing is of ſmall ſpars, reeds, &c. and both ſides and roof are thick, and cloſe covered with thatch made of coarſe long graſs. In the inſide of the houſe are ſet up poſts, to which croſs ſpars are faſtened, and platforms made for the conveniency of laying any thing on. Some houſes have two floors, one above another; the floor is laid with dried graſs, and here and there mats are ſpread for the principal people to ſit or ſleep on. In theſe houſes there was no paſſage for the ſmoke but through the door; they were intolerably ſmoky, and ſo hot as to be inſupportable to thoſe unaccuſtomed to them: probably the ſmoke is intended to drive out the muſquetos which ſwarm here. They commonly erect two or three of theſe huts near each other under a cluſter of lofty fig-trees, whoſe leaves are impervious to the rays of the ſun.

The canoes uſed here are very heavy clumſy veſſels; they are made of two trees hollowed out, having a raiſed gunnel about two inches high, and cloſed at each end with a bulk head of the ſame height; ſo that the whole is like a long ſquare trough about three feet ſhorter than the body of the canoe. Two canoes thus fitted are faſtened to each other about three feet aſunder, by means of croſs-ſpars, which project about a foot over each ſide. Over theſe is laid a deck or heavy platform made of plank and ſmall round ſpars on which they have a fire-hearth, and generally a fire burning; they are navigated by one or two latteen ſails, extended to a ſmall latteen yard, the end of which is fixed in a notch or hole in the deck.

Notwithſtanding the inoffenſive diſpoſition of the inhabitants of New Caledonia, they are well provided with

with offenſive weapons ; as clubs, ſpears, darts, and ſlings for throwing ſtones. Their clubs are about two feet and an half long, and variouſly formed ; ſome like a ſcythe, others like a pick-ax ; ſome have a head like a hawk, and others have round heads ; but all are neatly made ; many of their darts and ſpears are no leſs neat, and ornamented with carvings. The ſlings are as ſimple as poſſible ; but they take ſome pains to form the ſtones that they uſe into a proper ſhape, which is ſomething like an egg, ſuppoſing both ends to be like the ſmall one. They drive the dart by the aſſiſtance of ſhort cords knobbed at one end and looped at the other, called by the ſeamen *beckets*. Theſe contain a quantity of red wool taken from the vampyre, or great Indian bat. Bows and arrows are wholly unknown among them.

Their language bears no affinity to that ſpoken in the other South-ſea iſlands, the word *arrekee*, and one or two more, excepted. This is the more extraordinary, as different dialects of one language were ſpoken not only in the eaſterly iſlands, but at New Zealand.

A muſical inſtrument, a kind of whiſtle, was procured here. It was a little poliſhed piece of brown wood about two inches long, ſhaped like a kind of bell, tho' apparently ſolid, with a rope fixed at the ſmall end ; two holes were made in it near the baſe, and another near the inſertion of the rope, all which communicated with each other ; and by blowing in the uppermoſt, a ſhrill ſound like whiſtling was produced : no other inſtrument was ſeen among them that had the leaſt relation to muſic.

Many of the New Caledonians were ſeen with prodigiouſly thick legs and arms, which ſeemed to be affected with a kind of leproſy ; the ſwelling was found to be extremely hard, but the ſkin was not alike harſh and ſcaly in all thoſe who were afflicted with the diſorder. The preternatural expanſion of the arm or leg did not appear to be a great inconvenience to thoſe who ſuffered it ; and they ſeemed to intimate that they very rarely felt any pain in it ; but in ſome the diſorder began to form blotches, which are marks of a great degree of virulence.

Here they bury their dead in the ground. The grave of a chief who had been ſlain in battle here reſembled a large mole-hill, and was decorated with ſpears, darts, paddles, &c. all ſtuck upright in the ground round about it. Lieutenant Pickerſgill was ſhowed a chief whom they named *Tea-booma*, and ſtyled their *arrekee* or *king ;* but nothing further is known of their government, and nothing at all of their religion.

CALEFACTION, the production of heat in a body from the action of fire, or that impulſe impreſſed by a hot body on others around it. This word is uſed in pharmacy, by way of diſtinction from *coction*, which implies boiling ; whereas calefaction is only heating a thing.

CALENBERG, a caſtle of Germany, in the duchy of Brunſwic and principality of Calenberg. It is ſeated on the river Leine, and is 15 miles ſouth of Hanover. It is ſubject to the duke of Brunſwic Lunenburg, elector of Hanover, and king of Great Britain. E. Long. 9. 43. N. Lat. 52. 20.

Calenberg, a principality of Lower Saxony, and one of the three parts of the duchy of Brunſwic, is bounded on the north by the duchy of Verden, on the eaſt by the principality of Zell, on the ſouth by the principalities of Grubenhagen and Wolfenbuttle, and on the weſt by Weſtphalia. It belongs to the elector of Hanover.

CALENDAR, in aſtronomy and chronology. See Kalender.

Calender of priſoners, in law, a liſt of all the priſoners names in the cuſtody of each reſpective ſheriff.*

CALENDARIUM Floræ, in botany, a calendar containing an exact regiſter of the reſpective times in which the plants of any given province or climate germinate, expand, and ſhed their leaves and flowers, or ripen and diſperſe their ſeeds. For particulars on this curious ſubject, ſee the articles Defoliatio, Efflorescentia, Frondescentia, Fructescentia, and Germinatio.

CALENDER, a machine uſed in manufactories to preſs certain woollen and ſilken ſtuffs and linens, to make them ſmooth, even, and gloſſy, or to give them waves, or water them, as may be ſeen in mohairs and tabbies. This inſtrument is compoſed of two thick cylinders or rollers, of very hard and well poliſhed wood, round which the ſtuffs to be calendered are wound : theſe rollers are placed croſs-wiſe between two very thick boards, the lower ſerving as a fixed baſe, and the upper moveable by means of a thick ſcrew with a rope faſtened to a ſpindle which makes its axis : the uppermoſt board is loaded with large ſtones weighing 20,000lb. or more. At Paris they have an extraordinary machine of this kind, called the *royal calender*, made by order of M. Colbert. The lower table or plank is made of a block of ſmooth marble, and the upper is lined with a plate of poliſhed copper.—The alternate motion of the upper board ſometimes one way and ſometimes another, together with the prodigious weight laid upon it, gives the ſtuffs their gloſs and ſmoothneſs ; or gives them the waves, by making the cylinders on which they are put roll with great force over the undermoſt board. When they would put a roller from under the calender, they only incline the undermoſt board of the machine. The dreſſing alone, with the many turns they make the ſtuffs and linens undergo in the calender, gives the waves, or waters them, as the workmen call it. It is a miſtake to think, as ſome have aſſerted, and Mr Chambers among others, that they uſe rollers with a ſhallow indenture or engraving cut into them.

CALENDER of Monteith, a diſtrict in the ſouth-weſt corner of Perthſhire in Scotland, from which a branch of the ancient family of Livingſton had the title of Earl. The chief ſeat of the family near Falkirk is alſo called *Calender*. Both eſtate and title were forfeited for being engaged in the rebellion 1715.

CALENDERS, a ſort of Mahometan friars, ſo called from Santon Calenderi their founder. This Santon went bare-headed, without a ſhirt, and with the ſkin of a wild beaſt thrown over his ſhoulders. He wore a kind of apron before, the ſtrings of which were adorned with counterfeit precious ſtones. His diſciples are rather a ſect of Epicureans than a ſociety of religious. They honour a tavern as much as they do a moſque ; and think they pay as acceptable worſhip to God by the

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* See the article *Execution*.

the free uſe of his creatures, as others do by the greateſt auſterities and acts of devotion. They are called, in Perſia and Arabia, *Abdals*, or *Abdallat*, i. e. perſons conſecrated to the honour and ſervice of God. Their garment is a ſingle coat, made up of a variety of pieces, and quilted like a rug. They preach in the market-places, and live upon what their auditors beſtow on them. They are generally very vicious perſons; for which reaſon they are not admitted into any houſes.

CALENDS, in Roman antiquity. See KALENDS.

CALENDULA, the MARIGOLD: A genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked, there is no pappus, the calyx is polyphyllous and equal, the ſeeds of the diſk membranaceous. Of this there are eight ſpecies, none of them natives of Europe. The common kind is ſo well known as to need no definition; and none of the others merit any, except the fruticoſa, which hath lately been introduced from the Cape of Good Hope. It hath a ſlender ſhrubby perennial ſtalk, which riſes to the height of ſeven or eight feet, but requires ſupport: this ſends out a great number of weak branches from the bottom to the top, which hang downward unleſs they are ſupported: they are garniſhed with oval leaves, having ſhort flat footſtalks; theſe are of a ſhining green colour on their upper ſide, but paler underneath: the flowers come out at the end of the branches, on ſhort naked footſtalks. This is eaſily propagated by cuttings; which may be planted at any time in ſummer in a ſhady border, or otherwiſe ſhaded with mats in the heat of the day: in five or ſix weeks theſe will have taken root, when they ſhould be ſeparately taken up, each put in a ſeparate pot, and placed in the ſhade till they have taken freſh root; then they may be placed, with other hardy exotic plants, in a ſheltered ſituation, where they may remain till the froſt begins, when they muſt be removed into the green-houſe, placing them near the windows, that they may enjoy the free air; for this plant only requires protection from froſt. The ſeeds of the common ſort may be ſown in March or April, where the plants are to remain; and will require no other culture but to keep them clear of weeds, and to thin the plants where they are too thick. The flowers of the common marigold are ſuppoſed to be aperient and attenuating, as alſo cardiac, alexipharmac, and ſudorific; they are principally celebrated in uterine obſtructions, the jaundice, and for throwing out the ſmall-pox. Their ſenſible qualities, however, give little foundation for theſe virtues: thay have ſcarce any taſte, and have no conſiderable ſmell. The leaves of the plant diſcover a viſcid ſweetiſhneſs, accompanied with a more durable ſaponaceous pungency and warmth; theſe ſeem capable of anſwering ſome uſeful purpoſes as a ſtimulating, aperient, and antiſcorbutic medicine.

CALENTIUS (Eliſius), a Neapolitan poet and proſe author. He was preceptor to Frederic the ſon of Ferdinand king of Naples, and the earlieſt writer on the illegality of putting criminals to death, except for murder. He died in 1503.

CALENTURE, a feveriſh diſorder incident to ſailors in hot countries; the principal ſymptom of which is their imagining the ſea to be green fields: hence, attempting to walk abroad in theſe imaginary places of delight, they are frequently loſt. Vomiting, bleeding, a ſpare diet, and the neutral ſalts, are recommended in this diſorder; a ſingle vomit commonly removing the delirium, and the cooling medicines completing the cure.

CALEPIN (Ambroſius), an Auguſtin monk of Calepio, whence he took his name, in the 16th century. He is author of a dictionary of eight languages, ſince augmented by Paſſerat and others.

CALES (anc. geog.), a municipal city of ſome note in Campania, at no great diſtance from Caſilinum. The epithet *Calenus* is by Horace and Juvenal applied to a generous wine which the territory produced.

CALETES (anc. geog.), a people of Gallia Celtica, on the confines of Belgica, ſituated between the ſea and the Sequana. Now called *le Pais de Caux*, in Normandy.

CALETURE, a fort on the iſland of Ceylon, at the mouth of a river of the ſame name. The Dutch became maſters of it in 1655; but were afterwards obliged to leave it. E. Long. 80. 51. N. Lat 6. 38.

CALF, in zoology, the young of the ox kind.

There are two ways of breeding calves that are intended to be reared. The one is to let the calf run about with its dam all the year round; which is the method in the cheap breeding countries, and is generally allowed to make the beſt cattle. The other is to take them from the dam after they have ſucked about a fortnight: they are then to be taught to drink flat milk, which is to be made but juſt warm for them, it being very dangerous to give it them too hot. The beſt time of weaning calves is from January to May: they ſhould have milk for 12 weeks after; and a fortnight before that is left off, water ſhould be mixed with the milk in larger and larger quantities. When the calf has been fed on milk for about a month, little whiſps of hay ſhould be placed all about him in cleft ſticks to induce him to eat. In the beginning of April they ſhould be turned out to graſs; only for a few days they ſhould be taken in for the night, and have milk and water given them: the ſame may alſo be given them in a pail ſometimes in the field, till they are ſo able to feed themſelves that they do not regard it. The graſs they are turned into muſt not be too rank, but ſhort and ſweet, that they may like it, and yet get it with ſome labour. Calves ſhould always be weaned at graſs; for if it be done with hay and water, they often grow big-belly'd on it, and are apt to rot. When thoſe among the males are ſelected which are to be kept as bulls, the reſt ſhould be gelt for oxen: the ſooner the better. Between 10 and 20 days is a proper age. About London almoſt all the calves are fatted for the butcher. The reaſon of this is, that there is a good market for them; and the lands there are not ſo profitable to breed upon as in cheaper countries. The way to make calves fat and fine is, the keeping them very clean; giving them freſh litter every day; and the hanging a large chalk-ſtone in ſome corner where they can eaſily get at it to lick it, but where it is out of the way of being fouled by their dung and urine. The coops are to be placed ſo as not to have too much ſun upon them, and ſo high above the ground that the urine may ran off. They alſo bleed them once when they are a month old, and a ſecond time before they

kill

kill them; which is a great addition to the beauty and whiteneſs of their fleſh: the bleeding is by ſome repeated much oftener, but this is ſufficient. Calves are very apt to be looſe in their bowels; which waſtes and very much injures them. The remedy is to give them chalk ſcraped among milk, pouring it down with a horn. If this does not ſucceed, they give them bole armenic in large doſes, and uſe the cold bath every morning. If a cow will not let a ſtrange calf ſuck her, the common method is to rub both her noſe and the calf's with a little brandy; this generally reconciles them after a few ſmellings.

Golden CALF, an idol ſet up and worſhipped by the Iſraelites at the foot of Mount Sinai in their paſſage through the wilderneſs to the land of Canaan. Our verſion makes Aaron faſhion this calf with a graving tool after he had caſt it in a mould: the Geneva tranſlation makes him engrave it firſt, and caſt it afterwards. Others, with more probability, render the whole verſe thus: "And Aaron received them (the golden earrings), and tied them up in a bag, and got them caſt into a molten calf;" which verſion is authoriſed by the different ſenſes of the word *tzur*, which ſignifies to tie up or bind, as well as to ſhape or form; and of the word *cherret*, which is uſed both for a graving tool and a bag. Some of the ancient fathers have been of opinion that this idol had only the face of a calf, and the ſhape of a man from the neck downwards, in imitation of the Egyptian Iſis. Others have thought it was only the head of an ox without a body. But the moſt general opinion is, that it was an entire calf in imitation of the Apis worſhipped by the Egyptians; among whom, no doubt, the Iſraelites had acquired their propenſity to idolatry. This calf Moſes is ſaid to have *burnt with fire*, reduced to powder, and ſtrewed upon the water which the people were to drink. How this could be accompliſhed hath been a queſtion. Moſt people have thought, that as gold is indeſtructible, it could only be burnt by the miraculous power of God; but M. Stahl conjectures that Moſes diſſolved it by means of liver of ſulphur*. The Rabbins tell us that the people were made to drink of this water in order to diſtinguiſh the idolaters from the reſt; for that as ſoon as they had drunk of it, the beards of the former turned red. The cabbaliſts add, that the calf weighed 125 quintals; which they gather from the Hebrew word *maſſekah*, whoſe numerical letters make 125.

CALF-*Skins*, in the leather manufacture, are prepared and dreſſed by the tanners, ſkinners, and curriers, who ſell them for the uſe of the ſhoe-makers, ſadlers, bookbinders, and other artificers, who employ them in their ſeveral manufactures.

CALF-*Skin dreſſed in ſumach*, denotes the ſkin of this animal curried black on the hair ſide, and dyed of an orange colour on the fleſh ſide, by means of ſumach, chiefly uſed in the making of belts.

The Engliſh calf-ſkin is much valued abroad, and the commerce thereof very conſiderable in France and other countries; where divers attempts have been made to imitate it, but hitherto in vain. What is like to baffle all endeavours for imitating the Engliſh calf in France is, the ſmallneſs and weakneſs of the calves about Paris; which at fifteen days old are not ſo big at the Engliſh ones when they come into the world.

Sea-CALF. See PHOCA.

CALI, a town of Popayan in South America, ſeated in a valley of the ſame name on the river Cauca. The governor of the province uſually reſides there. W. Long. 78. 5. N. Lat. 3. 15.

CALIBER, or CALIPER, properly denotes the diameter of any body; thus we ſay, two columns of the ſame caliber, the caliber of the bore of a gun, the caliber of a bullet, &c.

CALIBER-*Compaſſes*, a ſort of compaſſes made with arched legs to take the diameter of round or ſwelling bodies. See COMPASSES.

Caliber-compaſſes, are chiefly uſed by gunners, for taking the diameters of the ſeveral parts of a piece of ordnance, or of bombs, bullets, &c. Their legs are therefore circular; and move on an arch of braſs, whereon is marked the inches and half inches, to ſhow how far the points of the compaſſes are opened aſunder.

Some are alſo made for taking the diameter of the bore of a gun or mortar.

The gaugers alſo ſometimes uſe calibers, to embrace the two heads of any caſk, in order to find its length.

The calibers uſed by carpenters and joiners, is a piece of board notched triangular-wiſe in the middle for the taking of meaſure.

CALIBER-*Rule*, or *Gunner's* CALLIPERS, is an inſtrument wherein a right line is ſo divided as that the firſt part being equal to the diameter of an iron or leaden ball of one pound weight, the other parts are to the firſt as the diameters of balls of two, three, four, &c. pounds are to the diameter of a ball of one pound. The caliber is uſed by engineers, from the weight of the ball given, to determine its diameter or caliber, or *vice verſa*.

The gunner's callipers conſiſt of two thin plates of braſs joined by a rivet, ſo as to move quite round each other: its length from the centre of the joint is between ſix inches and a foot, and its breadth from one to two inches; that of the moſt convenient ſize is about nine inches long. Many ſcales, tables, and proportions, &c. may be introduced on this inſtrument; but none are eſſential to it, except thoſe for taking the caliber of ſhot and cannon, and for meaſuring the magnitude of ſaliant and entering angles. The moſt complete callipers is exhibited Plate CXII. the furniture and uſe of which we ſhall now briefly deſcribe. Let the four faces of this inſtrument be diſtinguiſhed by the letters A, B, C, D: A and D conſiſt of a circular head and leg; B and C conſiſt only of a leg.

On the circular head adjoining to the head of the face A are diviſions denominated *ſhot diameters*; which ſhow the diſtance in inches and tenths of an inch of the points of the callipers when they are opened; ſo that if a ball not exceeding ten inches be introduced between them, the bevil edge E marks its diameter among theſe diviſions.

On the circular bevil part E of the face B is a ſcale of diviſions diſtinguiſhed by *lb. weight of iron ſhot*. When the diameter of any ſhot is taken between the points of the callipers, the inner edge of the leg A ſhows its weight in avoirdupoiſe pounds, provided it be lb. ½, 1½, 2, 3, 4, 5¼, 6, 8, 9, 12, 16, 18, 24, 26, 32, 36, or 42; the figures neareſt the bevil edge anſwering to the ſhort lines in the ſcale, and thoſe behind them to the longer ſtroke. This ſcale is con-

ſtructed

* See *Chemiſtry Index*

ſtructed on the following geometrical theorem, *viz.* that the weights of ſpheres are as the cubes of their diameters.

On the lower part of the circular head of the face A is a ſcale of diviſions marked *bores of guns;* for the uſe of which, the legs of the callipers are ſlipped acroſs each other, till the ſteel points touch the concave ſurface of the gun in its greateſt breadth; then the bevil edge F of the face B will cut a diviſion in the ſcale ſhowing the diameter of the bore in inches and tenths.

Within the ſcales of *ſhot* and *bore* diameters on the circular part of A, are diviſions marked *pounders:* the inner figures $\frac{1}{2}$, 1$\frac{1}{2}$, 3, 5$\frac{1}{4}$, 8, 12, 18, 26, 36, correſpond to the longeſt lines; and the figures 1, 2, 4, 6, 9, 16, 24, 32, 42, to the ſhort ſtrokes. When the bore of a gun is taken between the points of the callipers, the bevil edge F will either cut or be near one of theſe diviſions, and ſhow the weight of iron-ſhot proper for that gun.

On the upper half of the circular head of the face A are three concentric ſcales of degrees; the outer ſcale conſiſting of 180 degrees numbered from right to left, 10, 20, &c. the middle numbered the contrary way, and the outer ſcale beginning at the middle with 0, and numbered on each ſide to 90 degrees. Theſe ſcales ſerve to take the quantity of an angle, either entering or ſaliant. For an entering or internal angle, apply the legs of the callipers ſo that its outward edges coincide with the legs of the given angle, the degree cut by the bevil edge F in the outer ſcale ſhows the meaſure of the angle ſought: for a ſaliant or external angle, ſlip the edges of the callipers acroſs each other, ſo that their outward edges may coincide with the legs forming the angle, and the degree marked on the middle ſcale by the bevil edge E will ſhow the meaſure of the angle required. The inner ſcale will ſerve to determine the elevation of cannon and mortars, or of any oblique plane. Let one end of a thread be fixed into the notch on the plate B, and any weight tied to the other end: apply the ſtraight ſide of the plate A to the ſide of the body whoſe inclination is ſought; hold it in this poſition, and move the plate B, till the thread falls upon the line near the centre marked *Perp.* Then with the bevil edge F cut the degrees on the inner ſcale, ſhowing the inclination of that body to the horizon.

On the face C near the point of the callipers is a little table ſhowing the proportion of troy and avoirdupoiſe weights, by which one kind of weight may be eaſily reduced into another.

Near the extreme of the face D of the callipers are two tables ſhowing the proportion between the pounds weight of London and Paris, and alſo between the lengths of the foot meaſure of England and France.

Near the extreme on the face A is a table containing four rules of the circle and ſphere; and geometrical figures with numbers annexed to them: the firſt is a circle including the proportion in round numbers of the diameter to its circumference; the ſecond is a circle inſcribed in a ſquare, and a ſquare within that circle, and another circle in the inner ſquare: the numbers 28, 22, above this figure exhibit the proportion of the outward ſquare to the area of the inſcribed circle; and the numbers 14, 11, below it ſhow the proportion between the area of the inſcribed ſquare and the area of its inſcribed circle. The third is a cube inſcribed in a ſphere; and the number 89$\frac{1}{3}$ ſhows that a cube of iron, inſcribed in a ſphere of 12 inches in diameter, weighs 89$\frac{1}{3}$. The fourth is a ſphere in a cube, and the number 243 expreſſes the weight in pounds of a ſphere inſcribed in a cube whoſe ſide is 12 inches: the fifth repreſents a cylinder and cone of one foot diameter and height: the number in the cylinder ſhows, that an iron cylinder of that diameter and height weighs 364,5 lb. and the number 121.5 in the cone expreſſes the weight of a cone, the diameter of whoſe baſe is 12 inches, and of the ſame height: the ſixth figure ſhows that an iron cube, whoſe ſide is 12 inches, weighs 464 lb. and that a ſquare pyramid of iron, whoſe baſe is a ſquare foot, and height 12 inches, weighs 154$\frac{2}{3}$ lb. The numbers which have been hitherto fixed to the four laſt figures were not ſtrictly true; and therefore they have been corrected in the figure here referred to; and by theſe the figures on any inſtrument of this kind ſhould be corrected likewiſe.

On the leg B of the callipers, is a table ſhowing the weights of a cubic inch or foot of various bodies in pounds avoirdupoiſe.

On the face D of the circular head of the callipers is a table contained between five concentric ſegments of rings: the inner one marked *Guns* ſhows the nature of the gun or the weight of ball it carries; the two next rings contain the quantity of powder uſed for proof and ſervice to braſs guns, and the two outermoſt rings ſhow the quantity for proof and ſervice in iron cannon.

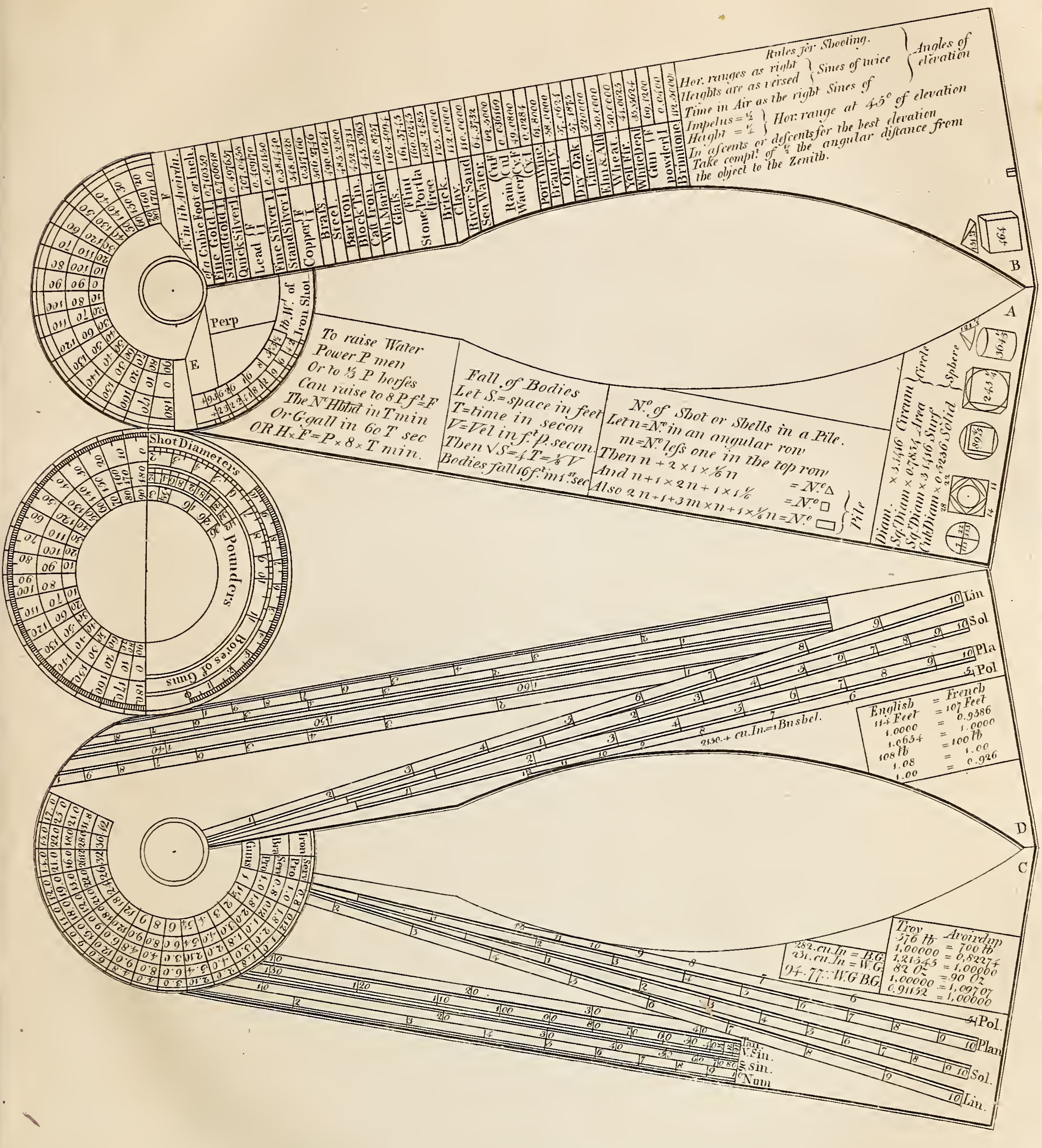
On the face A is a table exhibiting the method of computing the *number of ſhot or ſhells* in a triangular, ſquare, or rectangular pile. Near this is placed a table containing the principal rules relative to the *fall of bodies*, expreſſed in an algebraic manner: nearer the centre we have another table of rules for raiſing water, calculated on the ſuppoſition, that one horſe is equal in this kind of labour to five men, and that one man will raiſe a hogſhead of water to eight feet of height in one minute, and work at that rate for ſome hours. N. B. Hogſheads are reckoned at ſixty gallons.

Some of the leading principles in gunnery, relating to *ſhooting* in cannon and mortars, are expreſſed on the face B of the callipers. Beſides the articles already enumerated, the ſcales uſually marked on the ſector are laid down on this inſtrument: thus, the line of inches is placed on the edge of the callipers, or on the ſtraight borders of the faces C, D: the logarithmic ſcales of numbers, ſines, verſed ſines, and tangents, are placed along theſe faces near the ſtraight edges: the line of lines is placed on the ſame faces in an angular poſition, and marked *Lin.* The lines of planes or ſuperficies are alſo exhibited on the faces C and D, tending towards the centre, and marked *Plan.* Finally, the lines of ſolids are laid on the ſame faces tending towards the centre, and diſtinguiſhed by *Sol.*

CALICOULAN, or QUILLON, a town of Aſia, in the Eaſt-Indies, on the coaſt of Malabar, and in the peninſula on this ſide the Ganges, where the Dutch have a factory. E. Long. 75. 21. N. Lat. 9. 5.

CALICUT, a kingdom of India, on this ſide the Ganges, upon the coaſt of Malabar. It is about 63 miles long, and as much broad. It has many woods, rivers and marſhes, and is very populous; but does not produce much corn, abundance of rice being im-

CALIBER Rule.



Thackara & Vallance Sculp.t

ported from Canara. The land along the ſea-coaſt is low and ſandy, and produces a number of cocoa-trees. The higher grounds produce pepper and cardamoms of a very good quality. They have likewiſe timber for building, white and yellow ſanders, caſſia lignea, caſſia fiſtula, nux vomica, and cocculus indicus. The woods abound with parrots and monkeys, as well as different kinds of game. They have alſo plenty of fiſh, ſeveral ſorts of medicinal drugs, and their mountains produce iron. The *ſamorin*, or king, of Calicut, was once maſter of all the coaſt of Malabar; but at his death, he left it by will among four of his nephews. He who governs Calicut has a palace of ſtone, and there is ſome appearance of grandeur about his court. He carries on a conſiderable trade, which makes the people of Calicut richer than their neighbours. In former times they had ſeveral ſtrange cuſtoms, ſome of which are ſtill kept up; particularly the ſamorin's wife muſt be firſt enjoyed by the high prieſt, who may have her three nights if he pleaſes. The nobles permit the other prieſts to take the ſame liberty, but the lower people cannot have that honour. A woman may marry a number of huſbands; each of whom has her ten days or more by turns, as they agree among themſelves: and provides her all things neceſſary during that time. When ſhe proves with child, ſhe names the father; who, after the child is weaned, takes care of its education. Theſe people have no pens, ink, or paper; but write with a bodkin on flags that grow by the ſides of the rivers. By this means the letters are in ſome ſenſe engraved; and ſo tough are the flags, that they will laſt for a great number of years. This was the firſt land diſcovered by the Portugueſe in 1498.

CALICUT, a town of Aſia, in the kingdom of that name on the coaſt of Malabar. It contains a great number of mean low houſes, each of which has a garden. The Engliſh had a factory here, but it is removed to Tilichery. E. Long. 76. 4. N. Lat. 11. 21.

CALIDÆ PLANTÆ (from *calor* heat); plants that are natives of warm climates. Such are thoſe of the Eaſt Indies, South America, Egypt, and the Canary Iſlands. Theſe plants, ſays Linnæus, will bear a degree of heat which is as 40 on a ſcale in which the freezing point is 0, and 100 the heat of boiling water. In the 10th degree of cold they ceaſe to grow, loſe their leaves, become barren, are ſuffocated, and periſh.

CALIDUCT, in antiquity, a kind of pipes or canal diſpoſed along the walls of houſes or apartments, uſed by the ancients for conveying heat to ſeveral remote parts of the houſe from one common furnace.

CALIFORNIA, the moſt northerly of all the Spaniſh dominions on the continent of America, is ſometimes diſtinguiſhed by the name of *New Albion*, and the *Iſlas Carabiras:* but the moſt ancient appellation is *California*; a word probably owing to ſome accident, or to ſome words ſpoken by the Indians and miſunderſtood by the Spaniards. For a long time California was thought to be an iſland; but Father Caino, a German Jeſuit, diſcovered it to be a peninſula joining to the coaſt of New Mexico and the ſouthern parts of America. This peninſula extends from Cape St Sebaſtian, lying in north latitude 43. 30. to Cape St Lucar which lies in north latitude 22. 32. It is divided from New Mexico by the gulph, or as ſome call it the *lake*, of California, or *Vermilion Sea*, on the eaſt; on the north, by that part of the continent of North America which is leaſt known; and on the weſt and ſouth, by the Pacific Ocean or great South Sea. The coaſts, eſpecially towards the Vermilion Sea, are covered with inhabited iſlands, on ſome of which the Jeſuits have eſtabliſhed ſettlements, ſuch as St Clement, Paxaros, St Anne, Cedars (ſo called from the great number of theſe trees it produces), St Joſeph, and a multitude of others. But the iſlands beſt known are three lying off Cape St Lucar, towards the Mexican coaſt. Theſe are called *Les Tres Marias*, "the three Maries." They are but ſmall, have good wood and water, ſalt pits, and abundance of game; therefore the Engliſh and French pirates have ſometimes wintered there, when bound on cruizes in the South Seas.

As California lies altogether within the temperate zone, the natives are neither chilled with cold nor ſcorched with heat; and indeed the improvements in agriculture made by the Jeſuits afford ſtrong proofs of the excellency of the climate. In ſome places the air is extremely hot and dry; and the earth wild, rugged, and barren. In a country ſtretching about 800 miles in length, there muſt be conſiderable variations of ſoil and climate; and indeed, we find from good authority, that California produces ſome of the moſt beautiful lawns, as well as many of the moſt inhoſpitable deſarts, in the univerſe. Upon the whole, although California is rather rough and craggy, we are aſſured by the Jeſuit Vinegas, and other good writers, that with due culture it furniſhes every neceſſary and conveniency of life; and that, even where the atmoſphere is hotteſt, vapours riſing from the ſea, and diſperſed by pleaſant breezes, render it of a moderate temperature.

The peninſula of California is now ſtocked with all ſorts of domeſtic animals known in Spain and Mexico. Horſes, mules, aſſes, oxen, ſheep, hogs, goats, and all other quadrupeds imported, thrive and increaſe in this country. Among the native animals is a ſpecies of deer of the ſize of a young heifer, and greatly reſembling it in ſhape; the head is like that of a deer, and the horns thick and crooked like thoſe of a ram. The hoof of the animal is large, round, and cloven, the ſkin ſpotted, but the hair thinner and the tail ſharper than thoſe of a deer. Its fleſh is greatly eſteemed. There is another animal peculiar to this country, larger and more bulky than a ſheep, but greatly reſembling it in figure, and, like it, covered with a fine black or white wool. The fleſh of this animal is nouriſhing and delicious; and, happily for the natives, it is ſo abundant, that nothing more is required than the touble of hunting, as theſe animals wander about in droves in the foreſts and on the mountains. Father Torquemado deſcribes a creature which he calls a *ſpecies of large bear*, ſomething like a buffalo, of the ſize of a ſteer, and nearly of the figure of a ſtag. Its hair is a quarter of a yard in length, its neck long and aukward, and on its forehead are horns branched like thoſe of a ſtag. The tail is a yard in length, and half a yard in breadth, and the hoofs cloven like thoſe of an ox. With regard to birds, we have but an imperfect account; only, in general, Father Vinegas tells us that the coaſt is plentifully ſtored with peacocks, buſtards, geeſe, cranes, and moſt of the birds common in other parts of the world. The quantity of fiſh which reſort to theſe coaſts are incredible. Salmon, turbot, barbel, ſkate, mackarel, &c. are caught here with very little trouble; together with pearl oyſters, common oyſters, lobſters, and a variety of exquiſite ſhell-fiſh. Plenty of turtle are alſo caught on the coaſts. On the South Sea coaſts are ſome ſhell-fiſh peculiar to it, and perhaps the moſt beautiful in the world; their luſtre ſurpaſſing that of the fineſt pearl, and darting their rays through a tranſparent varniſh of an elegant vivid blue, like the lapis lazuli. The fame of California for pearls ſoon drew forth great numbers of adventurers, who ſearched every part of the gulph, and are ſtill employed in that work, notwithſtanding faſhion has greatly diminiſhed the value of this elegant natural production. Father Torquimado obſerves that the ſea of California affords very rich pearl fiſheries; and that the *hoſtias*, or beds of oyſters, may be ſeen in three or four fathom water, almoſt as plain as if they were on the ſurface.

The extremity of the peninſula towards Cape St Lucar is more level, temperate, and fertile, than the other parts, and conſequently more woody. In the more diſtant parts, even to the fartheſt miſſions on the eaſt coaſt, no large timber hath yet been diſcovered. A ſpecies of manna is found in this country, which, according to the accounts of the Jeſuits, has all the ſweetneſs of refined ſugar without its whiteneſs. The natives firmly believe that this juice drops from heaven.

The Californians are well made, and very ſtrong. They are extremely puſilanimous, inconſtant, ſtupid, and even inſenſible, and ſeem extremely deſerving of the character given to the Indians in general, under the article AMERICA. Before the Europeans penetrated into California, the natives had no form of religion. The miſſionaries indeed tell us many tales concerning them, but they ſo evidently bear the marks of forgery as not to be worth repeating. Each nation was then an aſſemblage of ſeveral cottages more or leſs numerous, that were all mutually confederated by alliances, but without any chief. They were ſtrangers even to filial obedience. No kind of dreſs was uſed by the men; but the women made uſe of ſome coverings, and were even fond of ornamenting themſelves with pearls and ſuch other trinkets as the country afforded. What moſtly diſplayed their ingenuity was the conſtruction of their fiſhing nets, which are ſaid by the Jeſuits to have even exceeded in goodneſs thoſe made in Europe. They were made by the women, of a coarſe kind of flax procured from ſome plants which grow there. Their houſes were built of branches and leaves of trees; nay, many of them were only incloſures of earth and ſtone, raiſed half a yard high, without any covering; and even theſe were ſo ſmall, that they could not ſtretch themſelves at length in them. In winter, they dwelt under ground in caves either natural or artificial.

In 1526, Ferdinand Cortez having reduced and ſettled Mexico, attempted the conqueſt of California; but was obliged to return, without even taking a ſurvey of the country, a report of his death having diſpoſed the Mexicans to a general inſurrection. Some other attempts were made by the officers of Cortez, but theſe were alſo unſucceſsful; and this valuable coaſt was long neglected by the Spaniards, who, to this day, have but one ſettlement upon it. In 1595, a galleon was ſent to make diſcoveries on the Californian ſhore; but the veſſel was unfortunately loſt. Seven years after the count de Monteroy, then viceroy of New Spain, ſent Sebaſtian Biſcayno on the ſame deſign with two ſhips and a tender; but he made no diſcovery of importance. In 1684, the marquis de Laguna, alſo viceroy of New Spain, diſpatched two ſhips with a tender to make diſcoveries on the lake of California. He returned with an indifferent account, but was among the firſt that aſſerted that California was not an iſland; which was afterwards confirmed by Father Caino, as already related. In 1697, the Spaniards being diſcouraged by their loſſes and diſappointments, the Jeſuits ſolicited and obtained permiſſion to undertake the conqueſt of California. They arrived among the ſavages with curioſities that might amuſe them, corn for their food, and clothes for which they could not but perceive the neceſſity. The hatred theſe people bore the Spaniſh name could not ſupport itſelf againſt theſe demonſtrations of benevolence. They teſtified their acknowledgments as much as their want of ſenſibility and their inconſtancy would permit them. Theſe faults were partly overcome by the religious inſtitutors, who purſued their project with a degree of warmth and reſolution peculiar to the ſociety. They made themſelves carpenters, maſons, weavers, and huſbandmen; and by theſe means ſucceeded in imparting knowledge, and in ſome meaſure a taſte for the uſeful arts, to this ſavage people, who have been all ſucceſſively formed into one body. In 1745, they compoſed 43 villages ſeparated from each other by the barrenneſs of the ſoil and the want of water. The inhabitants of theſe ſmall villages ſubſiſt principally on corn and pulſe, which they cultivate; and on the fruits and domeſtic animals of Europe, the breeding of which laſt is an object of continual attention. The Indians have each their field, and the property of what they reap; but ſuch is their want of foreſight, that they would ſquander in a day what they had gathered, if the miſſionary did not take upon himſelf to diſtribute it to them as they ſtand in need of it. They manufacture ſome coarſe ſtuffs; and the neceſſaries they are in want of are purchaſed with pearls, and with wine nearly reſembling that of Madeira, which they ſell to the Mexicans and to the galleons, and which experience hath ſhown the neceſſity of prohibiting in California. A few laws, which are very ſimple, are ſufficient to regulate this riſing ſtate. In order to enforce them, the miſſionary chooſes the moſt intelligent perſon of the village; who is empowered to whip and impriſon; the only puniſhments of which they have any knowledge. In all California there are only two garriſons, each conſiſting of 30 men and a ſoldier with every miſſionary. Theſe troops were choſen by the legiſlators, though they are paid by the government. Were the court of Madrid to puſh their intereſt with half the zeal of the Jeſuits, California might become one of the moſt valuable of their acquiſitions, on account of the pearls and other valuable articles of commerce which the country contains. At preſent the little Spaniſh town near Cape St Lucar is made uſe of for no other purpoſe than as a place of refreſhment for the Manila ſhips, and the head reſidence of the miſſionaries.

CALIGA, in Roman antiquity, was the proper ſol-

ſoldier's ſhoe, made in the ſandal faſhion, without upper leather to cover the ſuperior part of the foot, tho' otherwiſe reaching to the middle of the leg, and faſtened with thongs. The ſole of the caliga was of wood, like the ſabot of the French peaſants, and its bottom ſtuck full of nails; which clavi are ſuppoſed to have been very long in the ſhoes of the ſcouts and ſentinels; whence theſe were called by way of diſtinction, *caligæ ſpeculatoriæ;* as if by mounting the wearer to a higher pitch, they gave a greater advantage to the ſight: though others will have the *caligæ ſpeculatoriæ* to have been made ſoft and woolly, to prevent their making a noiſe. From theſe *caligæ* it was that the emperor Caligula took his name, as having been born in the army, and afterwards bred up in the habit of a common ſoldier.

According to Du Cange, a ſort of *caligæ* was alſo worn by monks and biſhops, when they celebrated maſs pontifically.

CALIGATI, an appellation given by ſome ancient writers to the common ſoldiers in the Roman armies, by reaſon of the caliga which they wore. The caliga was the badge or ſymbol of a ſoldier; whence to take away the caliga and belt, imported a diſmiſſing or caſhiering.

CALIGO, or CALIGATIO, in Medicine, an opacity, or cloudineſs of the anterior ſurface of the cryſtalline, cauſing a dimneſs or ſuffuſion of ſight.

CALIGULA, the Roman emperor and tyrant, A. D. 37, began his reign with every promiſing appearance of becoming the real father of his people; but at the end of eight months he was ſeized with a fever, which, it is thought, left a frenzy on his mind: for his diſpoſition totally changed, and he committed the moſt atrocious acts of impiety, cruelty, and folly; ſuch as proclaiming his horſe conſul, feeding it at his table, introducing it to the temple in the veſtments of the prieſts of Jupiter, &c. and cauſing ſacrifices to be offered to himſelf, his wife, and the horſe. After having murdered many of his ſubjects with his own hand, and cauſed others to be put to death without any juſt cauſe, he was aſſaſſinated by a tribune of the people as he came out of the amphitheatre, A. D. 41, in the 29th year of his age, and 4th of his reign.

CALIN, a compound metal, whereof the Chineſe make tea-caniſters, and the like. The ingredients ſeem to be lead and tin.

CALIPH, or KHALIF, the ſupreme eccleſiaſtical dignity among the Saracens; or, as it is otherwiſe defined, a ſovereign dignity among the Mahometans, veſted with abſolute authority in all matters relating both to religion and policy. In the Arabic it ſignifies *ſucceſſor* or *vicar;* the caliphs bearing the ſame relation to Mahomet that the popes pretend they do to Jeſus Chriſt or St Peter. It is at this day one of the Grand Signior's titles, as ſucceſſor of Mahomet; and of the Sophi of Perſia, as ſucceſſor of Ali. One of the chief functions of the caliph, in quality of imâm or chief prieſt of Muſſulmaniſm, was to begin the public prayers every Friday in the chief moſque, and to deliver the *khothbak* or ſermon. In after-times, they had aſſiſtants for this latter office; but the former the caliphs always performed in perſon. The caliph was alſo obliged to lead the pilgrims to Mecca in perſon, and to march at the head of the armies of his empire. He granted inveſtiture to princes; and ſent ſwords, ſtandards, gowns, and the like, as preſents to princes of the Mahometan religion; who, though they had thrown off the yoke of the caliphate, nevertheleſs held of it as vaſſals. The caliphs uſually went to the moſque mounted on mules; and the ſultans ſelgiucides, though maſters of Bagdad, held their ſtirrups, and led their mule by the bridle ſome diſtance on foot, till ſuch time as the caliphs gave them the ſign to mount on horſeback. At one of the windows of the caliph's palace, there always hung a piece of black velvet 20 cubits long, which reached to the ground, and was called the *caliph's ſleeve;* which the grandees of his court never failed to kiſs every day, with great reſpect. After the deſtruction of the caliphate by Hulaku, the Mahometan princes appointed a particular officer, in their reſpective dominions, who ſuſtains the ſacred authority of caliph. In Turkey, he goes under the denomination of *mufti,* and in Perſia under that of *ſadne.*

CALIPHATE, the office or dignity of caliph: See the preceding article. The ſucceſſion of caliphs continued from the death of Mahomet till the 655th year of the Hegira, when the city of Bagdad was taken by the Tartars. After this, however, there were perſons who claimed the caliphate, as pretending to be of the family of the Abaſſides, and to whom the ſultans of Egypt rendered great honours at Cairo, as the true ſucceſſors of Mahomet: but this honour was merely titular, and the rights allowed them only in matters relating to religion; and though they bore the ſovereign title of *caliphs,* they were nevertheleſs ſubjects and dependents of the ſultans. In the year of the Hegira 361, a kind of caliphate was erected by the Fatemites in Africa, and laſted till it was ſuppreſſed by Saladdin. Hiſtorians alſo ſpeak of a third caliphate in Gemen or Arabia Felix, erected by ſome princes of the family of the Jobites. The emperors of Morocco aſſume the title of *grand cheriſs;* and pretend to be the true caliphs, or ſucceſſors of Mahomet, though under another name.

CALIPPIC PERIOD, in chronology, a ſeries of ſeventy-ſix years, perpetually recurring; which elapſed, the middle of the new and full moons, as its inventor Calippus, an Athenian, imagined, return to the ſame day of the ſolar year. Meton, an hundred years before, had invented the period, or cycle, of nineteen years: aſſuming the quantity of the ſolar year 365 *d.* 6 *h.* $18' 56'' 50^{3} 31^{4} 34^{5}$; and the lunar month, 29 *d.* 12 *h.* $45' 47'' 26^{3} 48^{4} 30^{5}$: but Calippus, conſidering that the Metonic quantity of the ſolar year was not exact, multiplied Meton's period by 4, and thence aroſe a period of 76 years, called the *Calippic.* The Calippic period, therefore, contains 2,7759 days: and ſince the lunar cycle contains 235 lunations, and the *Calippic period* is quadruple of this, it contains 940 lunations. This period began in the third year of the 112th Olympiad, or the 4384th of the Julian period. It is demonſtrated, however, that the Calippic period itſelf is not accurate; that it does not bring the new and full moons preciſely to their places: 8 *h.* $5' 52'' 60'''$, being the exceſs of 940 lunations above 76 ſolar years; but brings them too late, by a whole day in 225 years.

CALISTA, in fabulous hiſtory, the daughter of Lycaon king of Arcadia, and one of the nymphs of

Dianna. Being beloved by Jupiter, that god aſſumed the form of the goddeſs of chaſtity, by which means he debauched her: but her diſgrace being revealed, as ſhe was bathing with her patroneſs, the incenſed deity turned her and the ſon with which ſhe was pregnant into bears; when Jupiter, in compaſſion to her ſufferings, took them up into the heavens, and made them the conſtellations Urſa Major and Urſa Minor.

CALIX. See Calyx.

CALIXTINS, a name given to thoſe, among the Lutherans, who follow the ſentiments of George Calixtus, a celebrated divine, and profeſſor at Helmſtadt, in the duchy of Brunſwick, who died in 1656: he oppoſed the opinion of St Auguſtin, on predeſtination, grace, and free-will, and endeavoured to form an union among the various members of the Romiſh, Lutheran, and reformed churches; or, rather, to join them in the bonds of mutual forbearance and charity.

Calixtins alſo denote a ſect in Bohemia, derived from the Huſſites, about the middle of the 15th century, who aſſerted the uſe of the cup, as eſſential to the euchariſt. And hence their name; which is formed from the Latin *calix*, a cup.

The Calixtins are not ranked by Romaniſts in the liſt of heretics, ſince in the main they ſtill adhered to the doctrine of Rome. The reformation they aimed at terminated in the four following articles. 1. In reſtoring the cup to the laity. 2. In ſubjecting the criminal clerks to the puniſhment of the civil magiſtrate. 3. In ſtripping the clergy of their lands, lordſhips, and all temporal juriſdiction. 4. In granting liberty to all capable prieſts to preach the word of God.

CALKA, a kingdom of Tartary, in Aſia, to the eaſt of Siberia.

CALKING. See Caulking.

CALKINS, the prominent parts at the extremities of a horſe-ſhoe, bent downwards, and forged to a ſort of point.

Calkins are apt to make horſes trip; they alſo occaſion bleymes, and ruin the back ſinews. If faſhioned in form of a hare's ear, and the horn of a horſe's heel be pared a little low, they do little damage; whereas, the great ſquare calkins quite ſpoil the foot.

Calkins are either ſingle or double, that is, at one end of the ſhoe, or at both: theſe laſt are deemed leſs hurtful, as the horſes can tread more even.

CALL, among hunters, a leſſon blown upon the horn, to comfort the hounds.

Call, an Engliſh name for the mineral called Tungſten or Wolfram by the Germans.

Call, among ſailors, a ſort of whiſtle or pipe, of ſilver or braſs, uſed by the boatſwain and his mates to ſummon the ſailors to their duty, and direct them in the different employments of the ſhip. As the call can be ſounded to various ſtrains, each of them is appropriated to ſome particular exerciſe; ſuch as hoiſting, heaving, lowering, veering away, belaying, letting go a tackle, &c. The act of winding this inſtrument is called piping, which is as attentively obſerved by ſailors as the beat of the drum to march, retreat, rally, charge, &c. is obeyed by ſoldiers.

Call, among fowlers, the noiſe or cry of a bird, eſpecially to its young, or to its mate in coupling-time. One method of catching partridges is by the natural call of a hen trained for the purpoſe, which drawing the cocks to her, they are entangled in a net. Different birds require different ſorts of calls; but they are moſt of them compoſed of a pipe or reed, with a little leathern bag or purſe, ſomewhat in form of a bellows; which, by the motion given thereto, yields a noiſe like that of the ſpecies of bird to be taken. The call for partridges is formed like a boat bored through, and fitted with a pipe or ſwan's quill, &c. to be blown with the mouth, to make the noiſe of the cock partridge, which is very different from the call of the hen. Calls for quails, &c. are made of a leathern purſe in ſhape like a pear, ſtuffed with horſe-hair, and fitted at the end with the bone of a cat's, hare's, or coney's leg, formed like a flageolet. They are played, by ſqueezing the purſe in the palm of the hand, at the ſame time ſtriking on the flageolet part with the thumb, to counterfeit the call of the hen-quail.

Call of the Houſe. See Calling.

CALLA, Wake-robin, or *Ethiopian Arum*: A genus of the polyandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 2d order, *Piperitæ*. The ſpatha is plain; the ſpadix covered with florets; there is no calyx; no petals; and the berries are monoſpermous. Of this there is but one ſpecies. It hath thick, fleſhy, tuberous roots, which are covered with a thin brown ſkin, and ſtrike down many ſtrong fleſhy fibres into the ground. The leaves have footſtalks more than a foot long, which are green and ſucculent. The leaves are ſhaped like the point of an arrow; they are eight or nine inches in length, ending in a ſharp point, which turns backward; between the leaves ariſe the footſtalk of the flower, which is thick, ſmooth, of the ſame colour as the leaves, riſes above them, and is terminated by a ſingle flower, ſhaped like thoſe of the arum, the hood or ſpatha being twiſted at bottom, but ſpreads open at the top, and is of a pure white colour. When the flowers fade, they are ſucceeded by roundiſh fleſhy berries, compreſſed on two ſides, each containing two or three ſeeds. This plant grows naturally at the Cape of Good Hope. It propagates very faſt by offsets, which ſhould be taken off in the latter end of Auguſt, at which time the old leaves decay; for at this time the roots are in their moſt inactive ſtate. They are ſo hardy as to live without any cover in mild winters, if planted in a warm border and dry ſoil; but with a little ſhelter in hard froſt, they may be preſerved in full growth very well.

Calla-Suſung, a town of Aſia, in the iſland of Bouton in the Eaſt Indies. It is ſeated about a mile from the ſea, on the top of a ſmall hill ſurrounded with cocoa nut-trees. See Bouton.

CALLAO, a ſtrong town of South America, in Peru. It is the port of Lima, from which it is diſtant about five miles. The town is built on a low flat point of land on the ſea-ſhore. It is fortified; but the fortifications were much damaged by the laſt great earthquake, and have not ſince been repaired. The town is not above nine or ten feet above the level of high-water mark; but the tide does not commonly riſe or fall above five feet. The ſtreets are drawn in a line; but are full of duſt, which is very troubleſome. In a ſquare near the ſea-ſide are the governor's houſe, the viceroy's palace, the pariſh-church, and a battery of three pieces of cannon. On the north ſide are the warehouſes for the merchandiſe brought from Chili, Mexico, and other parts of Peru. The other churches are built with reeds, and covered with timber or clay, but they look tolerably neat. There are five monaſteries and a hoſpital, though the number of families does not exceed 400. The trade of Callao is conſiderable. From Chili they bring cordage, leather, tallow, dried fiſh, and corn; from Chiloe, cedar-planks, woollen manufactures, and carpets; from Peru, ſugars, wines, brandy, maſts, cordage, timber for ſhipping, cacao, tobacco, and molaſſes; from Mexico, pitch, tar, woods for dyeing, ſulphur, balſam of Peru, both white and brown, as well as commodities from China. At the port of Callao the watering is eaſy, but the wood is a mile or two diſtant. Earthquakes are very frequent in theſe parts, which have done vaſt miſchief to Lima and Callao. W. Long. 76. 15. S. Lat. 12. 29.

CALLE, (anc. geog.) a town of Hither Spain, ſituated on an eminence which hangs over the river Durius; whoſe port was at the mouth of the river. Now *Porto*, *Oporto*, or *Port a Port*.

CALLEN, a town of Ireland, in the county of Kilkenny, and province of Leinſter, about ten miles ſouth-weſt of Kilkenny. W. Long. 7. 22. N. Lat. 52. 25.

CALLICARPA. See JOHNSONIA.

CALLICO, in commerce, a ſort of cloth reſembling linens, made of cotton. The name is taken from that of Callicut, a city on the coaſt of Malabar, being the firſt place at which the Portugueſe landed when they diſcovered the India trade. The Spaniards ſtill call it *callicu*.

Callicoes are of different kinds, plain, printed, painted, ſtained, dyed, chints, muſlins, and the like, all included under the general denomination of *callicoes*. Some of them are painted with various flowers of different colours: others are not ſtained, but have a ſtripe of gold and ſilver quite through the piece, and at each end is fixed a tiſſue of gold, ſilver, and ſilk, intermixed with flowers. The printing of callicoes was firſt ſet on foot in London about the year 1676.

CALLICRATES, an ancient ſculptor, who engraved ſome of Homer's verſes on a grain of millet, made an ivory chariot that might be concealed under the wing of a fly, and an ant of ivory in which all the members were diſtinct: but Ælian juſtly blames him for exerting his genius and talents in things ſo uſeleſs, and at the ſame time ſo difficult. He flouriſhed about the year 472 before Chriſt.

CALLIGONUM, in botany: A genus of the digynia order belonging to the polyandria claſs of plants; and in the natural method ranking under the 12th order *Holoraceæ*. The calyx is pentaphyllous, without petals or ſtyles; the fruit hiſpid and monoſpermous. There is but one ſpecies, which is found on Mount Arrarat.

CALLIGRAPHUS anciently denoted a copyiſt, or ſcrivener, who tranſcribed fair, and at length, what the notaries had taken down in notes or minutes. The word is compounded of καλλος, *beauty*, and γραφω, *I write*. The minutes of acts, &c. were always taken in a kind of cypher, or ſhort-hand; ſuch as the notes of Tyro in Gruter; by which means the notaries, as the Latins called them, or the σημειογραφοι and ταχυγραφοι, as the Greeks called them, were enabled to keep pace with a ſpeaker or perſon who dictated. Theſe notes, being underſtood by few, were copied over fair, and at length, by perſons who had a good hand, for ſale, &c. Theſe perſons were called *calligraphi*; a name frequently met with in the ancient writers.

CALLIGRAPHY, the art of fair writing. Callicrates is ſaid to have written an elegant diſtich on a ſeſamum ſeed. Junius ſpeaks of a perſon, as very extraordinary, who wrote the apoſtles creed, and beginning of St John's Goſpel, in the compaſs of a farthing. What would he have ſaid of the famous Peter Bale, who in 1575 wrote the Lord's prayer, creed, ten commandments, and two ſhort prayers in Latin, with his own name, motto, day of the month, year of the Lord, and reign of the queen, in the compaſs of a ſingle penny, inchaſed in a ring and border of gold, and covered with a cryſtal, all ſo accurately wrought as to be very legible?

CALLIMACHUS, a celebrated architect, painter, and ſculptor, born at Corinth, having ſeen by accident a veſſel about which the plant called *acanthus* had raiſed its leaves, conceived the idea of forming the Corinthian capital. (See ACANTHUS, and Plate XXXIV. fig 4.) The ancients aſſure us, that he worked in marble with wonderful delicacy. He flouriſhed about 540 B. C.

CALLIMACHUS, a celebrated Greek poet, native of Cyrene in Libya, flouriſhed under Ptolemy, Philadelphus and Ptolemy Evergetes kings of Egypt, about 280 years before Chriſt. He paſſed, according to Quintilian, for the prince of the Greek elegiac poets. His ſtyle is elegant, delicate, and nervous. He wrote a great number of ſmall poems, of which we have only ſome hymns and epigrams remaining. Catullus has cloſely imitated him, and tranſlated into Lain verſe his ſmall poem on the locks of Berenice. Callimachus was alſo a good grammarian and a learned critic. There is an edition of his remains, by Meſſ. le Fevre, quarto; and another in two volumes octavo, with notes by Spanhein, Grævius, Bently, &c.

CALLING *the* HOUSE, in the Britiſh parliament, is the calling over the members names, every one anſwering to his own, and going out of the houſe, in the order in which he is called; this they do in order to diſcover whether there be any perſons there not returned by the clerk of the crown, or if any member be abſent without leave of the houſe.

CALLINICUS of Heliopolis, inventor of a compoſition to burn in the water, called the *Greek*, and ſitince *Wild*, *Fire*. See *Grecian* FIRE.

CALLINUS of Epheſus a very ancient Greek poet, inventor of elegiac verſe; ſome ſpecimens of which are to be found in the collection of Stobeus. He flouriſhed about 776 years before Chriſt.

CALLIONYMUS, the DRAGONET, in ichthyology, a genus of fiſhes belonging to the order of jugularies. The upper lip is doubled up; the eyes are very near each other; the membrane of the gills has ſix radii; the operculum is ſhut; the body is naked; and the belly-fins are at a great diſtance from each other. There are three ſpecies of callionymus, viz. 1. The lyra, with the firſt bone of the back-fin as long at the body of the animal, and a cirrhus at the anus. Is is found as far north as Norway and Spitzbergen, and as far

far ſouth as the Mediterranean ſea, and is not unfrequent on the Scarborough coaſt, where it is taken by the hook in 30 or 40 fathoms water. It is often found in the ſtomach of the cod-fiſh. 2. The dracunculus, with the firſt bone of the back-fin ſhorter than its body, which is of a ſpotted yellow colour. It frequents the ſhores of Genoa and Rome. 3. The indicus has a ſmooth head, with longitudinal wrinkles; the lower jaw is a little longer than the upper one; the tongue is obtuſe and emarginated; the apertures of the gills are large: it is of a livid colour, and the anus is in the middle of the body. It is a native of Aſia.

CALLIOPE, in the Pagan mythology, the muſe who preſides over eloquence and heroic poetry. She was thus called from the ſweetneſs of her voice, and was reckoned the firſt of the nine ſiſters. Her diſtinguiſhing office was to record the worthy actions of the living; and accordingly ſhe is repreſented with tablets in her hand.

CALLIPÆDIA, the art of getting or breeding fine and beautiful children. We find divers rules and practices relating to this art, in ancient and modern writers. Among the magi, a ſort of medicine called *ermeſia* was adminiſtered to pregnant women, as a means of producing a beautiful iſſue. Of this kind were the kernels of pine-nuts ground with honey, myrrh, ſaffron, palm-wine, and milk. The Jews are ſaid to have been ſo ſolicitous about the beauty of their children, that care was taken to have ſome very beautiful child placed at the door of the public baths, that the women at going out being ſtruck with his appearance, and retaining the idea, might all have children as fine as he. The Chineſe take ſtill greater care of their breeding women, to prevent uncouth objects of any kind from ſtriking their imagination. Muſicians are employed at night to entertain them with agreeable ſongs and odes, in which are ſet forth all the duties and comforts of a conjugal and domeſtic life; that the infant may receive good impreſſions even before it is born, and not only come forth agreeably formed in body, but well diſpoſed in mind. Callipædia, nevertheleſs, ſeems to have been firſt erected into a juſt art by Claude Quilliet de Chinon, a French abbot, who under the fictitious name of *Calvidus Lætus*, has publiſhed a fine Latin poem in four books, under the title of *Callipœdia, ſeu de pulchræ prolis habendæ ratione;* wherein are contained all the precepts of that new art. There is a tranſlation of it into Engliſh verſe by Mr Rowe.

CALLIPOLIS, (anc. geog) the name of ſeveral cities of antiquity, particularly one upon the Helleſpont, next the Propontis, and oppoſite to Lampſacus in Aſia. Now GALLIPOLI.

CALLIPPIC PERIOD. See CALIPPIC.

CALLIRRHOE, (anc. geog), ſurnamed *Enneacrunos*, from its nine ſprings or channels; a fountain not far from Athens, greatly adorned by Piſiſtratus, where there were ſeveral wells, but this the only running ſpring. Callirrhoe was alſo the name of a very fine ſpring of hot water beyond Jordan near the Dead Sea, into which it empties itſelf.

CALISIA, in botany: A genus of the monogymia, order, belonging to the triandria claſs of plants; and in the natural method ranking under the 6th order, *Enſatæ*. The calyx is triphyllous; the petals are three: the antheræ are double; and the capſule is bilocular. There is but one ſpecies, a native of America.

CALLISTEA, in Grecian antiquity, a Leſbian feſtival, wherein the women preſented themſelves in Juno's temple, and the prize was aſſigned to the faireſt. There was another of theſe contentions at the feſtival of Ceres Eleuſinia among the Parrhaſians, and another among the Eleans, where the moſt beautiful man was preſented with a complete ſuit of armour, which he conſecrated to Minerva, to whoſe temple he walked in proceſſion, being accompanied by his friends, who adorned him with ribbons, and crowned him with a garland of myrtle.

CALLISTHENES, the philoſopher, diſciple and relation of Ariſtotle, by whoſe deſire he accompanied Alexander the Great in his expedition; but proving too ſevere a cenſurer of that hero's conduct, he was put by him to the torture (on a ſuſpicion of a treaſonable conſpiracy), and died under it, 328 years before Chriſt.

CALLISTRATUS, an excellent Athenian orator, was baniſhed for having obtained too great an authority in the government. Demoſthenes was ſo ſtruck with the force of his eloquence, and the glory it procured him, that he abandoned Plato, and reſolved from thenceforward to apply himſelf to oratory.

CALLITRICHE, or STAR-GRASS, in botany: A genus of the digynia order, belonging to the monandria claſs of plants, and in the natural method ranking under the 12th order, *Holoraceæ*. There is no calyx, but two petals, and the capſule is bilocular and tetraſpermous.

CALLOO, a fortreſs in the Netherlands, in the territory of Waes, on the river Scheld, ſubject to the houſe of Auſtria. The Dutch were defeated here by the Spaniards in 1638. E. Long. 4. 10. N. Lat. 51. 15,

CALLOSUM CORPUS, in anatomy, a whitiſh hard ſubſtance, joining the two hemiſpheres of the brain, and appearing in view when the two hemiſphers are drawn back. See ANATOMY, N° 132.

CALLOT (James), a celebrated engraver born at Nancy in 1593. In his youth he travelled to Rome to learn deſigning and engraving; and from thence went to Florence, where the grand duke took him into his ſervice. After the death of that prince, Callot returned to his native country; when he was very favourably received by Henry duke of Lorrain, who ſettled a conſiderable penſion upon him. His reputation being ſoon after ſpread all over Europe, the infanta of the Netherlands drew him to Bruſſels, where he engraved the ſiege of Breda. Louis XIII. made him deſign the ſiege of Rochelle, and that of the iſle of Rhe. The French king having taken Nancy in 1631, made Callot the propoſal of repreſenting that new conqueſt, as he had already done the taking of Rochelle: but Callot begged to be excuſed; and ſome courtiers reſolving to oblige him to do it, he anſwered, that he would ſooner cut off his thumb than do any thing againſt the honour of his prince and country. This excuſe the king accepted; and ſaid, that the duke of Lorrain was happy in having ſuch faithful and affectionate ſubjects. Callot followed his buſineſs ſo cloſely, that, though he died at 43 years of age, he is ſaid to have left of his own execution about 1500 pieces. The following are a few of the principal. 1. The *murder of the innocents*, a ſmall oval plate, engraved at Florence. Callot engraved the ſame ſubject at Nancy, with ſome difference in the figures on the back-ground. The former is the moſt rare: a fine impreſſion of it is very difficult to be found. 2. The *marriage of Cana in Galilee*, from Paolo Veroneſe, a middling-ſized plate lengthwiſe. 3. The *paſſion of Chriſt*, on twelve very ſmall upright plates: firſt impreſſions very ſcarce. 4. *St John in the iſland of Palma*, a ſmall plate, nearly ſquare. 5. The *temptation of St Anthony*, a middling-ſized plate, lengthwiſe. He alſo engraved the ſame ſubject larger; which, though not the beſt, is notwithſtanding the ſcarceſt print. There is a conſiderable difference in the treatment of the ſubject in the two prints. 6. The *puniſhments*, wherein is ſeen the execution of ſeveral criminals. The marks of the beſt impreſſions of this plate are, a ſmall ſquare tower which appears above the houſes, towards the left, and a very ſmall image of the Virgin placed in an angle of the wall, near the middle of the print. 7. The *miſeries of war*, eighteen ſmall plates, lengthwiſe. There is another ſet on the ſame ſubject, conſiſting of ſeven plates leſs than the former. 8. The *geat fair of Florence*, ſo called becauſe it was engraved at Florence. As ſeveral parts of this plate were not equally bitten by the aquafortis, it is difficult to meet with a fine impreſſion. Callot, on his return to Nancy, re-engraved this plate without any alteration. The copy, however, is by no means equal to the original. The firſt is diſtinguiſhed from the ſecond by the words *in Firenza*, which appear below at the right-hand corner of the plate. The ſecond has theſe words in the ſame place, *Fe Florientis, & excudit Nancei*. There is alſo a large copy of this print, reverſed, publiſhed by Savery; but the difference is eaſily diſtinguiſhed between it and the true print. 9. The *little fair*, otherwiſe called the *players at bowls;* where alſo ſome peaſants are repreſented dancing. This is one of the ſcarceſt of Callot's prints; and it is very difficult to meet with a fine impreſſion of it, for the diſtances and other parts of the plate failed in the biting it with the aquafortis. 10. The *titling, or the new ſtreet at Nancy*, a middling-ſized plate, lengthwiſe. 11. The *Garden of Nancy*, where young men are playing with a balloon, the ſame. 12. *View of the Port Neuf*, a ſmall plate, lengthwiſe. 13. *View of the Louvre*, the ſame. 14. *Four landſcapes*, ſmall plates, lengthwiſe.

CALLUS, or CALLOSITY, in a general ſenſe, any cutaneous, corneous, or oſſeous hardneſs, whether natural or preternatural; but moſt frequently it means the callus generated about the edges of a fracture, provided by nature to preſerve the fractured bones, or divided parts, in the ſituation in which they are replaced by the ſurgeon. A callus, in this laſt ſenſe, is a ſort of jelly, or liquid viſcous matter, that ſweats out from the ſmall arteries and bony fibres of the divided parts, and fills up the chinks or cavities between them. It firſt appears of a cartilaginous ſubſtance; but at length becomes quite bony, and joins the fractured part ſo firmly together, that the limb will often make greater reſiſtance to any external violence with this part than with thoſe which were never broken.

CALLUS is alſo a hard, denſe, inſenſible knob, riſing on the hands, feet, &c. by much friction and preſſure againſt hard bodies.

CALM, the ſtate of reſt which appears in the air and ſea when there is no wind ſtirring. A calm is more dreaded by a ſea-faring man than a ſtorm if he has a ſtrong ſhip and ſea-room enough; for under the line exceſſive heat ſometimes produces ſuch dead calms, that ſhips are obliged to ſtay two or three months without being able to ſtir one way or other. Two oppoſite winds will ſometimes make a calm. This is frequently obſerved in the gulph of Mexico, at no great diſtance from the ſhore, where ſome guſt or land-wind will ſo poiſe the general eaſterly wind, as to produce a perfect calm.

Calms are never ſo great on the ocean as on the Mediterranean, by reaſon the flux and reflux of the former keep the water in a continual agitation, even where there is no wind; whereas there being no tides in the latter, the calm is ſometimes ſo dead, that the face of the water is as clear as a looking-glaſs; but ſuch calms are almoſt conſtant preſages of an approaching ſtorm. On the coaſts about Smyrna, a long calm is reputed a prognoſtic of an earthquake.

It is not uncommon for the veſſels to be calmed, or becalmed, as the ſailors expreſs it, in the road of the conſtant Levantine winds, in places where they ride near the land. Thus between the two capes of Cartooche toward the main, and cape Antonio in Cuba, the ſea is narrow, and there is often a calm produced by ſome guſt of a land-wind, that poiſes the Levantine wind, and renders the whole perfectly ſtill for two or three days. In this caſe, the current that runs here is of uſe to the veſſels, if it ſets right; when it ſets eaſterly, a ſhip will have a paſſage in three or four days to the Havannah; but if otherwiſe, it is often a fortnight or three weeks ſail, the ſhip being embayed in the gulf of Mexico.

When the weather is perfectly calm, no wind at all ſtirring, the ſailors try which way the current ſets, by means of a boat which they ſend out, and which will ride at anchor though there is no bottom to be found, as regularly and well as if faſtened by the ſtrongeſt anchor to the bottom. The method is this: they row the boat to a little diſtance from the ſhip, and then throw over their plummet, which is about forty pounds weight; they let this ſink to about two hundred fathom; and then, though it never reaches the bottom, the boat will turn head againſt the current, and ride as firmly as can be.

CALM Latitudes, in ſea language, are ſituated in the Atlantic ocean, between the tropic of Cancer and the latitude of 29° N. or they denote the ſpace that lies between the trade and variable winds, becauſe it is frequently ſubject to calms of long duration.

CALMAR, a ſtrong ſea-port of Sweden, in the province of Smaland, divided into two towns, the old and the new; but of the former there remains only the church and a few houſes. The new town is built a little way from the other, and has large handſome houſes. E. Long. 16. 15. N. Lat. 56. 48.

CALMET (Auguſtine), one of the moſt learned and laborious writers of the 18th century, was born at Meſnil le Horgne, a village in the dioceſe of Toul in France, in the year 1672, and took the habit of the

Benedictines in 1688. Among the many works he publiſhed are, 1. A literal expoſition, in French, of all the books in the Old Teſtament, in nine volumes folio. 2. An hiſtorical, critical, chronological, geographical, and literal, dictionary of the Bible, in four vols folio, enriched with a great number of figures of Jewiſh antiquities. 3. A civil and eccleſiaſtical hiſtory of Lorrain, three vols folio. 4. A hiſtory of the Old and New Teſtament, and of the Jews, in two volumes folio, and ſeven vols duodecimo. 5. An univerſal ſacred and profane hiſtory, in ſeveral volumes quarto. He died in 1757.

CALMUCKS. See KALMUCKS.

CALNE, a town of Wiltſhire in England, ſeated on a river of the ſame name. It has a handſome church, and ſends two members to parliament. W. Long. 1. 59. N. Lat. 51. 30.

CALNEH, (anc. geog.) a city in the land of Shinar, built by Nimrod, and the laſt city mentioned (Gen. x. 10.) as belonging to his kingdom. It is believed to be the ſame with Calno mentioned in Iſaiah (x. 9.), and with Canneh in Ezekiel (xxvii. 23.) with ſtill greater variation. It is obſerved, that it muſt have been ſituated in Meſopotamia, ſince theſe prophets join it with Haran, Eden, Aſſyria, and Chilmad, which carried on a trade with Tyre. It is ſaid by the Chaldee interpreters, as alſo by Euſebius and Jerom, to be the ſame with Cteſiphon, ſtanding upon the Tigris, about three miles diſtant from Selecucia, and that for ſome time it was the capital city of the Parthians.

CALOGERI, in church-hiſtory, monks of the Greek church, divided into three degrees: the novices, called *archari*; the ordinary profeſſed, called *microchemi*; and the more perfect, called *megalochemi*: they are likewiſe divided into cænobites, anchorets, and recluſes. The cænobites are employed in reciting their offices from midnight to ſun-ſet; they are obliged to make three genuflexions at the door of the choir, and, returning, to bow to the right and to the left, to their brethren. The anchorites retire from the converſation of the world, and live in hermitages in the neighbourhood of the monaſteries; they cultivate a little ſpot of ground, and never go out but on Sundays and holidays to perform their devotions at the next monaſtery. As for the recluſes, they ſhut themſelves up in grottos and caverns on the tops of mountains, which they never go out of, abandoning themſelves entirely to Providence: they live on the alms ſent them by the neighbouring monaſteries.

CALOMEL, or dulcified ſublimate of mercury. See PHARMACY, *Index*.

CALOPHYLLUM, in botany: A genus of the monogynia order belonging to the polyandria claſs of plants: and in the natural method claſſed under thoſe called *doubtful* by Linnæus. The corolla is tetrapetalous; the calyx tetraphyllous and coloured; the fruit a globoſe plum. There are two ſpecies, both natives of India.

CALOTTE, a cap or coif of hair, ſattin, or other ſtuff; an eccleſiaſtical ornament in moſt Popiſh countries. See CAP.

CALOTTE, in architecture, a round cavity or depreſſure, in form of a cap or cup, lathed and plaſtered, uſed to diminiſh the riſe or elevation of a moderate chapel, cabinet, alcove, &c. which, without ſuch an expedient, would be too high for other pieces of the apartment.

CALPE, a mountain of Andaluſia in Spain; at the foot of which, towards the ſea, ſtands the town of Gibraltar. It is half a league in height towards the land, and ſo ſteep that there is no approaching it on that ſide.

CALPURNIUS, (Titus), a Latin Sicilian poet, lived under the emperor Carus and his ſon. We have ſeven of his eclogues remaining.

CALQUING, or CALKING, a term uſed in painting, &c. where the back-ſide of any thing is covered over with a black or red colour, and the ſtrokes or lines traced through on a waxed plate, wall, or other matter, by paſſing lightly over each ſtroke of the deſign with a point, which leaves an impreſſion of the colour on the plate or wall.

CALTHA, in botany: A genus of the monogynia order belonging to the polyandria claſs of plants; and in the natural method ranking under the 26th order, *Multiſiliquæ*. There is no calyx; there are five petals; no nectaria; the capſules are many, and polyſpermous. There is only one ſpecies known, which grows naturally in moiſt boggy lands in many parts of England and Scotland. There is a variety, with very double flowers, which for its beauty is preſerved in gardens. It is propagated by parting the roots in autumn. It ſhould be planted in a moiſt ſoil and ſhady ſituation; and as there are often ſuch places in gardens where few other plants will thrive, ſo theſe may be allowed room, and during their ſeaſon of flowering will afford an agreeable variety. The flowers gathered before they expand, and preſerved in ſalted vinegar, are a good ſubſtitute for capers. The juice of the petals, boiled with a little allum, ſtains paper yellow. The remarkable yellowneſs of the butter in ſpring is ſuppoſed to be cauſed by this plant: but cows will not eat it, unleſs compelled by extreme hunger; and then, Boerhaave ſays, it occaſions ſuch an inflammation, that they generally die. Upon May-day, the country people ſtrew the flowers upon the pavement before their doors. Goats and ſheep eat this plant; horſes, cows, and ſwine refuſe it.

CALTROP, in botany. See TRIBULUS.

CALTROP, in military affairs, an inſtrument with four iron points, diſpoſed in a triangular form, ſo that three of them are always on the ground, and the fourth in the air. They are ſcattered over the ground where the enemy's cavalry is to paſs, in order to embarraſs them.

CALVARIA, in anatomy, the hairy ſcalp or upper part of the head, which, either by diſeaſe or old age, grows bald firſt.

CALVART (Denis), a celebrated painter, was born at Antwerp in 1552; and had for his maſters Proſpero Fontana and Lorenzo Sabbatini. He opened a ſchool at Bologna, which became celebrated; and from which proceeded Guido, Albani, and other great maſters. Calvart was well ſkilled in architecture, perſpective, and anatomy, which he conſidered as neceſſary to a painter, and taught them to his pupils. His principal works are at Bologna, Rome, and Reggio. He died at Bologna in 1619.

CALVARY, a term uſed in Catholic countries for a kind of chapel of devotion raiſed on a hillock near a city, in memory of the place where Jeſus Chriſt was crucified near the city of Jeruſalem. The word comes from the Latin *calvarium;* and that from *calvus*, bald; in regard the top of that hillock was bare and deſtitute of verdure: which is alſo ſignified by the Hebrew word *golgotha*. Such is the Calvary of St Valerian near Paris; which is accompanied with ſeveral little chapels, in each of which is repreſented in ſculpture one of the myſteries of the paſſion.

CALVARY, in heraldry, a croſs ſo called, becauſe it reſembles the croſs on which our Saviour ſuffered. It is always ſet upon ſteps.

CALVERT, (George) afterwards lord Baltimore, was born at Kipling in Yorkſhire about the year 1582, and educated at Oxford, where he took the degree of bachelor of arts, and afterwards travelled. At his return, he was made ſecretary to Sir Robert Cecil: he was afterwards knighted, and in 1618 appointed one of the principal ſecretaries of ſtate. But after he had enjoyed that poſt about five years, he willingly reſigned it; freely owning to his majeſty that he was become a Roman-catholic, ſo that he muſt either be wanting to his truſt, or violate his conſcience in diſcharging his office. This ingenuous confeſſion ſo affected king James, that he continued him privy-counſellor all his reign, and the ſame year created him baron of Baltimore in the kingdom of Ireland. He had before obtained a patent for him and his heirs, for the province of Avelon in Newfoundland: but that being expoſed to the inſults of the French, he abandoned it, and afterwards obtained the grant of a country on the north part of Virginia from Charles I. who called it *Maryland*, in honour of his queen: but he died in April 1632 (aged 50), before the patent was made out. It was, however, filled up to his ſon Cecil Calvert lord Baltimore; and bears date June 20th, 1632. It is held from the crown as part of the manor of Windſor, on one very ſingular condition, viz. to preſent two Indian arrows yearly, on Eaſter Tueſday, at the caſtle, where they are kept and ſhown to viſitors.—His lordſhip wrote, 1. A Latin poem on the death of Sir Henry Upton. 2. Speeches in parliament. 3. Various letters of ſtate. 4. The anſwer of Tom Tell-truth. 5. The practice of princes. And, 6. The lamentation of the kirk.

CALVI, a town of the province of Lavoro, in the kingdom of Naples, ſituated near the ſea, about fifteen miles north of the city of Naples. E. Long. 14. 45. N. Lat. 41. 15.

CALVI is alſo the name of a ſea-port in the iſland of Corſica, ſituated on a bay, on the weſt ſide of the iſland, about 40 miles ſouth-weſt of Baſtia. E. Long. 9. 5. N. Lat. 42. 16.

CALVIN (John), the celebrated reformer of the Chriſtian church from Romiſh ſuperſtitions and doctrinal errors, and founder of the ſect ſince called *Calviniſts*, was born in 1509. He was the ſon of a cooper of Noyon in Picardy; and his real name was *Chauvin*, which he choſe to latinize into *Calvinus*, ſtyling himſelf in the title-page to his firſt work (a Commentary on *Seneca de clementia*), "Lucius Calvinus, Civis Romanus;" an early proof of his pride, at about 24 years of age. In 1529, he was rector of Pont l'Eveque; and in 1534, he threw up this benefice, ſeparating himſelf entirely from the Romiſh church. The perſecution againſt the Proteſtants in France (with whom he was now aſſociated) obliged him to retire to Baſle in Switzerland: here he publiſhed his famous Inſtitutes of the Chriſtian religion in 1535. The following year, he was choſen profeſſor of divinity, and one of the miniſters of the church, at Geneva. The next year, *viz.* 1537, he made all the people ſolemnly ſwear to a body of doctrines; but finding that religion had not yet had any great influence on the morals of the people, he, aſſiſted by other miniſters, declared, that ſince all their admonitions and warnings had proved unſucceſsful, they could not celebrate the holy ſacrament as long as theſe diſorders reigned; he alſo declared, that he could not ſubmit to ſome regulations made by the ſynod of Berne. Upon which the Syndics having ſummoned the people, it was ordered that Calvin and two other miniſters ſhould leave the city within two days. Upon this Calvin retired to Straſburg, where he eſtabliſhed a French church, of which he was the firſt miniſter, and was alſo choſen profeſſor of divinity there. Two years after he was choſen to aſſiſt at the diet appointed by the emperor to meet at Worms and at Ratiſbon in order to appeaſe the troubles occaſioned by the difference of religion. He went with Bucer, and entered into a conference with Melancton. The people of Geneva now entreated him to return; to which he conſented, and arrived at Geneva, September 13th 1541. He began with eſtabliſhing a form of eccleſiaſtical diſcipline, and a conſiſtorial juriſdiction, with the power of inflicting all kinds of canonical puniſhments. This was greatly diſliked by many perſons, who imagined that the papal tyranny would ſoon be revived. Calvin, however, aſſerted on all occaſions the rights of his conſiſtory with inflexible ſtrictneſs; and he cauſed Michael Servetus to be burnt at the ſtake for writing againſt the doctrine of the Trinity. But though the rigour of his proceedings ſometimes occaſioned great tumults in the city, yet nothing could ſhake his ſteadineſs and inflexibility. Amongſt all the diſturbances of the commonwealth, he took care of the foreign churches in England, France, Germany, and in Poland; and did more by his pen than his preſence, ſending his advice and inſtructions by letter, and writing a great number of books. This great reformer died on the 27th of May 1564, aged 55. His works were printed together at Amſterdam in 1671, in nine volumes folio: the principal of which are his Inſtitutions, in Latin, the beſt edition of which is that of Robert Stephens in 1553, in folio; and his Commentaries on the Holy Scriptures.—Calvin is univerſally allowed to have had great talents, an excellent genius, and profound learning. His ſtyle is grave and polite. Independent of his ſpiritual pride, his morals were exemplary; for he was pious, ſober, chaſte, laborious, and diſintereſted. But his memory can never be purified from the ſtain of burning Servetus: it ill became a reformer to adopt the moſt odious practice of the corrupt church of Rome.

CALVINISM, the doctrine and ſentiments of Calvin and his followers. Calviniſm ſubſiſts in its greateſt purity in the city of Geneva; and from thence it was firſt propagated into Germany, France, the United Provinces, and England. In France it was aboliſhed by the revocation of the edict of Nantz in 1685.

It has been the prevailing religion in the United Provinces ever ſince the year 1571. The theological ſyſtem of Calvin was adopted, and made the public rule of faith in England, under the reign of Edward VI. and the church of Scotland was modelled by John Knox, the diſciple of Calvin, agreeably to the doctrine, rites, and form of eccleſiaſtical government eſtabliſhed at Geneva. In England it has declined ſince the time of queen Elizabeth; though it ſtill ſubſiſts, ſome ſay a little allayed, in the articles of the eſtabliſhed church; and in its rigour in Scotland.

The diſtinguiſhing theological tenets of Calviniſm, as the term is now generally applied, reſpect the doctrines of PREDESTINATION, or particular ELECTION and REPROBATION, original SIN, particular REDEMPTION, effectual, or, as ſome have called it, irreſiſtible GRACE in regeneration, JUSTIFICATION by faith, PERSEVERANCE, and the TRINITY. See each of theſe articles.

Beſides the doctrinal part of Calvin's ſyſtem, which, ſo far as it differs from that of other reformers of the ſame period, principally regarded the abſolute decree of God, whereby the future and eternal condition of the human race was determined out of mere ſovereign pleaſure and free-will; it extended likewiſe to the diſcipline and government of the Chriſtian Church, the nature of the Euchariſt, and the qualification of thoſe who were entitled to the participation of it. Calvin conſidered every church as a ſeparate and independent body, inveſted with the power of legiſlation for itſelf. He propoſed that it ſhould be governed by preſbyteries and ſynods compoſed of clergy and laity, without biſhops, or any clerical ſubordination; and maintained, that the province of the civil magiſtrate extended only to its protection and outward accommodation. In order to facilitate an union with the Lutheran church, he acknowledged a real, though ſpiritual, preſence of Chriſt, in the Euchariſt, that true Chriſtians were united to the man Chriſt in this ordinance, and that divine grace was conferred upon them, and ſealed to them, in the celebration of it; and he confined the privilege of communion to pious and regenerate believers. In France the Calviniſts are diſtinguiſhed by the name of *Huguenots;* and, among the common people, by that of *Parpaillots.* In Germany they are confounded with the Lutherans, under the general title *Proteſtants;* only ſometimes diſtinguiſhed by the name *Reformed.*

CALVINISTS, in chrch-hiſtory, thoſe who follow the opinions of CALVIN. See the two preceding articles.

*Crypto-*CALVINISTS, a name given to the favourers of Calviniſm in Saxony, on account of their ſecret attachment to the Genevan doctrine and diſcipline. Many of them ſuffered by the decrees of the convocation of Torgaw, held in 1576. The Calviniſts in their progreſs have divided into various branches, or leſſer ſects.

CALVISIUS, (Seth) a celebrated German chronologer in the beginning of the 17th century. He wrote *Elenchus calendarii Gregoriani, et duplex calendarii melioris forma,* and other learned works, together with ſome excellent treatiſes on muſic. He died in 1617, aged 61.

CALVITIES, or CALVITIUM, in medicine, baldneſs, or a want of hair, particularly on the ſinciput, occaſioned by the moiſture of the head, which ſhould feed it, being dried up, by ſome diſeaſe, old age, or the immoderate uſe of powder, &c. See ALOPECIA.

CALUMET, a ſymbolical inſtrument of great importance among the American Indians.—It is nothing more than a pipe, whoſe bowl is generally made of a ſoft red marble, the tube of a very long reed, ornamented with the wings and feathers of birds. No affair of conſequence is tranſacted without the calumet. It ever appears in meetings of commerce or exchanges; in congreſſes for determining of peace or war; and even in the very fury of a battle. The acceptance of the calumet is a mark of concurrence with the terms propoſed; as the refuſal is a certain mark of rejection. Even in the rage of a conflict this pipe is ſometimes offered; and if accepted, the weapons of deſtruction inſtantly drop from their hands, and a truce enſues. It ſeems the ſacrament of the ſavages; for no compact is ever violated which is confirmed by a whiff from this holy reed. When they treat of war, the pipe and all its ornaments are uſually red, or ſometimes red only on one ſide. The ſize and decorations of the calumet are for the moſt part proportioned to the quality of the perſons to whom they are preſented, and to the importance of the occaſion. The calumet of peace is different from that of war. They make uſe of the former to ſeal their alliances and treaties, to travel with ſafety, and to receive ſtrangers; but of the latter to proclaim war. It conſiſts of a red ſtone, like marble, formed into a cavity reſembling the head of a tobacco pipe, and fixed to a hollow reed. They adorn it with feathers of various colours; and name it the calumet of the ſun, to which luminary they preſent it, in expectation of thereby obtaining a change of weather as often as they deſire. From the winged ornaments of the calumet and its conciliating uſes, writers compare it to the caduceus of Mercury, which was carried by the caduceatores, or meſſengers of peace, with terms to the hoſtile ſtates. It is ſingular, that the moſt remote nations, and the moſt oppoſite in their other cuſtoms and manners, ſhould in ſome things have, as it were, a certain conſent of thought. The Greeks and the Americans had the ſame idea, in the invention of the caduceus of the one, and the calumet of the other.

Dance of the CALUMET, is a ſolemn rite among the Indians on various occaſions. They dare not waſh themſelves in rivers in the beginning of ſummer, nor taſte of the new fruits, without performing it; and the ſame ceremony always confirms a peace or precedes a war. It is performed in the winter-time in their cabins, and in ſummer in the open fields. For this purpoſe they chooſe a ſpot among trees to ſhade them from the heat of the ſun, and lay in the middle a large mat, as a carpet, ſetting upon it the monitor, or god, of the chief of the company. On the right hand of this image they place the calumet, as their great deity, erecting around it a kind of trophy with their arms. Things being thus diſpoſed, and the hour of dancing come, thoſe who are to ſing take the moſt honourable ſeats under the ſhade of the trees. The company is then ranged round, every one before he ſits down, ſaluting the monitor, which is done by blowing

upon

upon it the ſmoke of their tobacco. Each perſon next receives the calumet in rotation, and holding it with both hands, dances to the cadence of the vocal muſic, which is accompanied with the beating of a ſort of drum. During this exerciſe, he gives a ſignal to one of their warriors, who takes a bow, arrow, and axe, from the trophies already mentioned, and fights him; the former defending himſelf with the calumet only, and both of them dancing all the while. This mock engagement being over, he who holds the calumet makes a ſpeech, in which he gives an account of the battles he has fought, and the priſoners he has taken, and then receives a cloak, or ſome other preſent, from the chief of the ball. He then reſigns the calumet to another, who having acted a ſimilar part, delivers it to a third, who afterwards gives it to his neighbour, till at laſt the inſtrument returns to the perſon that began the ceremony, who preſents it to the nation invited to the feaſt, as a mark of their friendſhip, and a confirmation of their alliance, when this is the occaſion of the entertainment.

CALUMNY, the crime of accuſing another falſely, and knowingly ſo, of ſome heinous offence.

Oath of CALUMNY, *Juramentum* (or rather *Juſjurandum*) *Calumniæ*, among civilians and canoniſts, was an oath which both parties in a cauſe were obliged to take: the plaintiff that he did not bring his charge, and the defendant that he did not deny it, with a deſign to abuſe each other, but becauſe they believed their cauſe was juſt and good; that they would not deny the truth, nor create unneceſſary delays, nor offer the judge or evidence any gifts or bribes. If the plaintiff refuſed this oath, the complaint or libel was diſmiſſed; if the defendant, it was taken *pro confeſſo*. This cuſtom was taken from the ancient athletæ; who, before they engaged, were to ſwear that they had no malice, nor would uſe any unfair means for overcoming each other. The *juramentum calumniæ* is much diſuſed, as a great occaſion of perjury. Anciently the advocates and proctors alſo took this oath; but of late it is diſpenſed with, and thought ſufficient that they take it once for all at their firſt admiſſion to practice. See alſo LAW, Part III. n° clxxxiv. 7.

CALVUS (Cornelius Licinius), a celebrated Roman orator, was the friend of Catullus; and flouriſhed 64 B. C. Catullus, Ovid, and Horace, ſpeak of him.

CALX properly ſignifies *lime*, but is alſo uſed by chemiſts and phyſicians for a fine powder remaining after the calcination or corroſion of metals and other mineral ſubſtances. All metallic calces, at leaſt all thoſe made by fire, are found to weigh more than the metal from which they were originally produced. See the article FIRE.

CALX Nativa, in natural hiſtory, a kind of marly earth, of a dead whitiſh colour, which, if thrown into water, makes a conſiderable bubbling and hiſſing noiſe, and has, without previous burning, the quality of making a cement like lime or plaſter of Paris.

CALX Viva, or *Quick-lime*, that whereon no water has been caſt, in contradiſtinction to lime which has been ſlaked by pouring water on it.

CALYBITES, the inhabitants of a cottage, an appellation given to divers ſaints on account of their long reſidence in ſome hut, by way of mortification. The word is formed from *καλυπτω*, *tego*, *I cover*; whence *καλυϐη*, *a little cot*.—The Romiſh church commemorates St John the calybites on the 15th of December.

CALYCANTHEMÆ, in botany, an order of plants in the *Fragmenta methodi naturalis* of Linnæus, in which are the following genera, viz. epilopium, œnothera, juſſiæa, ludivigia, oldenlandia, iſnarda, &c. See BOTANY, ſect. vi. 17.

CALYCANTHUS, in botany: A genus of the polygynia order, belonging to the icoſandria claſs of plants; and in the natural method claſſed with thoſe of which the order is doubtful. The calyx is monophyllous, urceolate, or blown up; ſquarroſe, or frizzled with ſmall coloured leaves, the corolla conſiſting of the leaves on the calyx; the ſtyles are numerous, each with a glandular ſtigma; the ſeeds are many, each with a train, within a ſucculent calyx. There are two ſpecies; namely, 1. The præcox, which is not quite inured to England; and, 2. The floridus, a flowering calycanthus, or Carolina alſpice tree, a native of Carolina. It ſeldom grows, in Britain, to more than five feet high. It divides into many branches irregularly near the ground. They are of a brown colour, and being bruiſed emit a moſt agreeable odour. The leaves that garniſh this delightful aromatic are of an oval figure, pointed: They are near four inches long, and are at leaſt two and a half broad, and are placed oppoſite by pairs on the branches. At the end of theſe ſtand the flowers, of a kind of chocolate-purple colour, and which are poſſeſſed of the oppoſite qualities of the bark on the branches. They ſtand ſingle on their ſhort footſtalks, come out in May and June, and are ſucceeded by ripe ſeeds in England. The propagation of this ſhrub is not very difficult; though more than common care muſt be taken, after ſmall plants are obtained, to preſerve them till they are of a ſize to be ventured abroad. The laſt year's ſhoots, if laid in the ground, the bark eſpecially being a little bruiſed, will ſtrike root within the compaſs of twelve months, particularly if the layers are ſhaded, and now and then watered in the ſummer's drought. In the ſpring they ſhould be taken off, and planted in pots; and if theſe are afforded a ſmall degree of heat in a bed, they will ſtrike ſo much the ſooner and ſtronger. After they have been in this bed a month or ſix weeks, they ſhould be taken out. In the heat of the ſummer they ſhould be placed in the ſhade; and if the pots are plunged into the natural ground, it will be ſo much the better. At the approach of the ſucceeding winter's bad weather, the pots ſhould be removed into the green-houſe, or ſome ſhelter, and in the ſpring may reſume their old ſtations: and this ſhould be repeated till they are of a proper ſize and ſtrength to be planted out to ſtand. If the pots in which they were firſt planted were ſmall, they may be ſhifted into larger a ſpring or two after; and, when they have got to be pretty ſtrong plants, they may be turned out, mould and all, into the places where they are to remain. By this care of potting them, and houſing them during the ſevere weather in winter, the young crop will be preſerved; otherwiſe, if they were planted immediately abroad, the firſt hard froſt the enſuing winter would deſtroy them all: Tanner's bark about their roots will be the moſt proper ſecurity; as they are at beſt, when full grown, but tender plants, and muſt have the warmeſt ſituation and the drieſt ſoil.

CALYCIFLORÆ, in botany, the 16th order in Linnæus's *Fragmenta methodi naturalis*, conſiſting of plants which, as the title imports, have the ſtamina (the flower) inſerted into the calyx. This order contains the following genera, viz. eleagnus, hippophae, oſyris, and trophis. See BOTANY, ſect. vi. 16.

CALYCISTÆ (from *calyx* the flower-cup), ſyſtematic botaniſts, ſo termed by Linnæus, who have arranged all vegetables from the different ſpecies, ſtructure, and other circumſtances, of the calyx or flower-cup. The only ſyſtems of this kind are the *Character plantarum novus*, a poſthumous work of Magnolius, profeſſor of botany at Montpelier, publiſhed in 1720; and Linnæus's *Methodus calycina*, publiſhed in his *Claſſes plantarum*, at Leyden, in 1738. See BOTANY, p. 425.

CALYDON, (anc. geog.), a town of Æolia, ſituated ſeven miles and a half from the ſea, and divided by the river Evenus: the country was anciently called *Æolis*, from the Æolians its inhabitants. This country was famous for the ſtory of Meleager and the Calydonian boar.

CALYPSO, in fabulous hiſtory, a goddeſs, who was the daughter of Oceanus and Tethys, or, as others ſay, of Atlas. She was queen of the iſland of Ogygia, which from her was called the iſland of *Calypſo*. According to Homer, Ulyſſes ſuffered ſhipwreck on her coaſt, and ſtaid with her ſeveral years.

CALYPTRA, among botaniſts, a thin membranaceous involucrum, uſually of a conic figure, which covers the parts of fructification. The capſules of moſt of the moſſes have calyptræ.

CALYX, among botaniſts, a general term expreſſing the cup of a flower, or that part of a plant which ſurrounds and ſupports the other parts of the flower.

The cups of flowers are very various in their ſtructure, and on that account diſtinguiſhed by ſeveral names, as *perianthium, involucrum, ſpatha, gluma*, &c. See BOTANY, p. 439.

CALZADA, a town of Old Caſtile in Spain, ſeated on the river Leglera. W. Long 2. 47. N. Lat. 42. 12.

CAMÆA, in natural hiſtory, a genus of the ſemipellucid gems approaching to the onyx ſtructure, being compoſed of zones, and formed on a chryſtalline baſis; but having their zones very broad and thick, and laid alternately one on another, with no common matter between; uſually leſs tranſparent, and more debaſed with earth, than the onyxes.

1. One ſpecies of the camæa is the dull-looking onyx, with broad black and white zones; and is the camæa of the moderns, and the Arabian onyx. This ſpecies is found in Egypt, Arabia, Perſia, and the Eaſt Indies. 2. Another ſpecies of the camæa is the dull broad zoned, green and white camæa, or the jaſpicameo of the Italians: it is found in the Eaſt Indies, and in ſome parts of America. 3. The third is the hard camæa, with broad white and cheſnut coloured veins. 4. The hard camæa, with bluiſh, white, and fleſh-coloured broad veins, being the ſardonyx of Pliny's time, only brought from the Eaſt Indies.

CAMAIEU, or CAMAY EU, a word uſed to expreſs a peculiar ſort of onyx: alſo by ſome to expreſs a ſtone, whereon are found various figures, and repreſentations of landſcapes, &c. formed by a kind of *luſus naturæ*; ſo as to exhibit pictures without painting. The word comes from *camehuia*, a name the Orientals give to the onyx, when they find, in preparing it, another colour; as who ſhould ſay, *a ſecond ſtone*. It is of theſe *camaieux* Pliny is to be underſtood when he ſpeaks of the manifold picture of gems, and the party-coloured ſpots of precious ſtones: *Gemmarum pictura tam multiplex, lapidumque tam diſcolores maculæ*.

CAMAIEU is alſo applied by others to thoſe precious ſtones, as onyxes, cornelians, and agates, whereon the lapidaries employ their art to aid nature, and perfect thoſe repreſentations. See CAMÆA.

CAMAIEU is alſo frequently applied to any kind of gem, whereon figures may be engraven either indentedly or in relievo. In this ſenſe the lapidaries of Paris are called in their ſtatutes, *cutters of camayeux*.

A ſociety of learned men at Florence undertook to procure all the *cameos* or *camayeux*, and intaglios in the great duke's gallery to be engraven; and began to draw the heads of divers emperors in *cameos*.

CAMAIEU is alſo uſed for a painting, wherein there is only one colour; and where the lights and ſhadows are of gold, wrought on a golden or azure ground. When the ground is yellow, the French call it *cirage*; when grey, *griſſaile*. This kind of work is chiefly uſed to repreſent baſſo relievos: the Greeks call pieces of this ſort μονοχρωματα.

CAMALDULIANS, CAMALDUNIANS, or CAMALDOLITES, an order of religious, founded by Romuald, an Italian fanatic, in 1023, in the horrible deſart of Camaldoli, otherwiſe called Campo-Malduli, ſituate in the ſtate of Florence, on the Apennines. Their rule is that of St Benedict; and their houſes, by the ſtatutes, are never to be leſs than five leagues from cities. The *Camaldulians* have not borne that title from the beginning of their order; till the cloſe of the eleventh century they were called *Romualdins*, from the name of their founder. Till that time, *Camaldulian* was a particular name for thoſe of the deſart Camaldoli; and D. Grandi obſerves, was not given to the whole order, in regard it was in this monaſtery that the order commenced, but becauſe the regulation was beſt maintained here.

Guido Grandi, mathematician of the great duke of Tuſcany, and a monk of this order, has publiſhed *Camaldulian* Diſſertations, on the origin and eſtabliſhment of it.

The *Camaldolites* were diſtinguiſhed into two claſſes, of which the one were COENOBITES, and the other EREMITES.

CAMALODUNUM (anc. geog.), a town of the Trinobantes, the firſt Roman colony in Britain, of veterans, under the emperor. From the Itineraries it appears to have ſtood where now Malden ſtands. It continued to be an open place under the Romans; a place of pleaſure rather than ſtrength; yet not unadorned with ſplendid works, as a theatre and a temple of Claudius: which the Britons conſidered as badges of ſlavery, and which gave riſe to ſeveral ſeditions and commotions. It ſtands on a bay of the ſea, at the mouth of the Chelmer, in the county of Eſſex; the modern name is curtailed from the ancient.

CAMARANA, an iſland of Arabia, in the Red Sea, whoſe inhabitants are little and black. It is the beſt of all the iſlands in this ſea, and here they fiſh for coral and pearls. N. Lat. 15. 0.

CAMASSEI, or CAMACE, (Andrea), painter of hiſtory and landſcape, was born at Bevagna, and at firſt learned the principles of deſign and colouring from Domenichino; but afterwards he ſtudied in the ſchool of Andrea Sacchi, and proved a very great painter. He was employed in St Peter's at Rome, as alſo at John Lateran; and his works are extremely admired, for the ſweetneſs of his colouring, the elegance of his thoughts and deſign, and likewiſe for the delicacy of his pencil. Sandrart laments that the world was deprived of ſo promiſing a genius, in the very bloom of life, when his reputation was daily advancing. He died in 1657. At St John Lateran are to be ſeen, the Battle of Conſtantine and Maxentius; and the Triumph of Conſtantine; which are noble and grand compoſitions; and they afford ſufficient proofs of the happineſs of his invention and the correctneſs of his execution. Alſo at Wilton, the ſeat of the earl of Pembroke, there is a picture of Venus with the Graces, ſaid to be by the hand of Camaſſei.

CAMARCUM, (anc. geog.), the capital of the Nervii, a people of Gallia Belgica, (Antonine, Peutinger); before whoſe time no mention was made of it. Now Cambray, capital of the Cambreſis, in French Flanders. E. Long. 3. 15. N. Lat. 50. 15.

CAMARINA, (anc. geog.) a city of Sicily, built by the Syracuſans on an eminence near the ſea, in the ſouth of Sicily, to the weſt of the promontory Pachynum, between two rivers, the Hipparis and Oanus. Of ſo famous a city nothing now remains but its name and ancient walls, a mile and a half in compaſs, with the ſlight remains of houſes: now called *Camarana*.

CAMARINA Palus, a marſh or lake, near the city Camarina, and from which it took its name. In a time of drought, the ſtench of the lake produced a peſtilence; upon which the inhabitants conſulted the oracle, whether they ſhould not quite drain it. The oracle diſſuaded them: they notwithſtanding drained it, and opened a way for their enemies to come and plunder their city: hence the proverb, *Ne moveas Camarinam*, that is, not to remove one evil to bring on a greater. Now *Lago di Camarana*, ſituate in a beautiful plain, under the very walls of Camarina, and of a triangular form.

CAMAYEU. See CAMAIEU.

CAMBAIA, or CAMPAY, a town of Aſia, in India, and in the peninſula on this ſide the Ganges; capital of a province of the ſame name; but more commonly called *Guzarat*. It is ſeated at the bottom of a gulph of the ſame name, on a ſmall river; is a large place with high walls, and has a pretty good trade. The product and manufactures are inferior to few towns in India; for it abounds in corn, cattle, and ſilk; and cornelian and agate ſtones are found in its rivers. The inhabitants are noted for embroidery; and ſome of their quilts have been valued at 40l. It is ſubject to the Great Mogul. E. Long. 72. 15. N. Lat. 22. 30.

CAMBAYES, in commerce, cotton cloths made at Bengal, Madras, and ſome other places on the coaſt of Coromandel. They are proper for the trade of Marſeilles, whither the Engliſh at Madras ſend great numbers of them. Many are alſo imported into Holland.

CAMBER, according to monkiſh hiſtorians, one of the three ſons of Brute, who, upon his father's death, had that part of Britain aſſigned him for his ſhare, called from him *Cambria*, now *Wales*.

CAMBER-Beam, among builders, a piece of timber in an edifice cut archwiſe, or with an obtuſe angle in the middle, commonly uſed in platforms, as church-leads, and on other occaſions where long and ſtrong beams are required.

CAMBERED-DECKS, among ſhip-builders. The deck or flooring of a ſhip is ſaid to be cambered, or to lie cambering, when it is higher in the middle of the ſhip's length, and droops toward the ſtem and ſtern, or the two ends. Alſo when it lies irregular; a circumſtance which renders the ſhip very unfit for war.

CAMBERT, a French muſician in the 17th century, was at firſt admired for the manner in which he touched the organ, and became ſuperintendant of the muſic to Anne of Auſtria the queen-mother. The abbe Perrin aſſociated him in the privilege he obtained of his majeſty, of ſetting up an opera in 1669. Cambert ſet to muſic two paſtorals, one entitled *Pomona*; the other *Ariadne*, which were the firſt operas given in France. He alſo wrote a piece entitled *The pains and pleaſures of love*. Theſe pieces pleaſed the public; yet in 1672, Lully obtaining the privilege of the opera, Cambert was obliged to go to England, where he became ſuperintendant of the muſic to king Charles II. and died there in 1677.

CAMBIO, an Italian word which ſignifies *exchange*; commonly uſed at Provence, and in ſome other countries, particularly Holland.

CAMBIST, a name given in France to thoſe who trade in notes and bills of exchange. The word cambiſt, though a term of antiquity, is even now a technical word, of ſome uſe among merchants, traders, and bankers. Some derive it from the Latin *cambium*, or rather *cambio*.

CAMBLET, or CHAMBLET, a ſtuff ſometimes of wool, ſometimes ſilk, and ſometimes hair, eſpecially that of goats, with wool or ſilk: in ſome, the warp is ſilk and wool twiſted together, and the woof hair.

The true or oriental camblet is made of the pure hair of the ſort of goat, frequent about Angora, and which makes the riches of that city, all the inhabitants whereof are employed in the manufacture and commerce of camblets. It is certain we find mentioned in middle-age writers of ſtuffs made of camel's hair, under the denominations of *cameletum* and *camelinum*, whence probably the origin of the term; but theſe are repreſented as ſtrangely coarſe, rough, and prickly, and ſeem to have been chiefly uſed among the monks by way of mortification, as the hair-ſhirt of later times.

We have no camblets made in Europe of the goats hair alone; even at Bruſſels, they find it neceſſary to add a mixture of woollen thread.

England, France, Holland, and Flanders, are the chief places of this manufacture. Bruſſels exceeds them all in the beauty and quality of its camblets: thoſe of England are reputed the ſecond.

Figured CAMBLETS, are thoſe of one colour, whereon are ſtamped various figures, flowers, foliage, &c. by means of hot irons, which are a kind of moulds, paſſed together with the ſtuff, under a preſs. Theſe are chiefly brought from Amiens and Flanders: the commerce of theſe was anciently much more conſiderable than at preſent.

*Watered-*CAMBLETS, thoſe which, after weaving, receive a certain preparation with water; and are afterwards paſſed under a hot-preſs, which gives them a ſmoothneſs and luſtre.

*Waved-*CAMBLETS, are thoſe whereon waves are impreſſed, as on tabbies; by means of a calender under which they are paſſed and repaſſed ſeveral times.

The manufacturers, &c. of camblets are to take care they do not acquire any falſe and needleſs plaits; it being almoſt impoſſible to get them out again. This is notorious, even to a proverb: we ſay, a perſon is like camblet, he has taken his plait.

CAMBODIA, a kingdom of Aſia, in the Eaſt-Indies, bounded on the north by the kingdom of Laos, on the eaſt by Cochin-China and Chiapa, and on the ſouth and weſt by the gulph and kingdom of Siam; divided by a large river called *Mecon*. The capital town is of the ſame name, ſeated on the weſtern ſhore of the ſaid river, about 150 miles north of its mouth. This country is annually overflowed in the rainy ſeaſon, between June and October; and its productions and fruits are much the ſame with thoſe uſually found between the tropics. E. Long. 104. 15. N. Lat. 12. 40.

CAMBODUNUM, (Itinerary); a town of the Brigantes, in Britain; now in ruins, near Almonbury, in York-ſhire. Weſtcheſter, (Talbot.) Alſo a town of Vindelicia, on the Cambus: now Kempten, in Suabia.

CAMBOGIA, in botany: A genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The corolla is tetrapetalous; the calyx tetraphyllous; and the fruit is a pome with eight cells, and ſolitary ſeeds. There is but one ſpecies, the gutta, a native of India, which yields the gum-reſin known by the name of *gamboge* in the ſhops. See GAMBOGE.

CAMBRASINES, in commerce, fine linen made in Egypt, of which there is a conſiderable, trade at Cairo, Alexandria, and Roſetta, or Raſchit. They are called *cambraſines* from their reſemblance to cambrics.

CAMBRAY, an archiepiſcopal city, the capital of the Cambreſis, in the Low Countries, ſeated on the Scheld. It is defended by good fortifications, and has a fort on the ſide of the river; and as the land is low on that ſide, they can lay the adjacent parts under water by means of ſluices. Its ditches are large and deep, and thoſe of the citadel are cut into a rock. Clodion became maſter of Crambray in 445. The Danes burnt it afterwards; ſince which time it became a free imperial city. It has been the ſubject of conteſt between the emperors, the kings of France, and the earls of Flanders. Francis I. let it remain neutral during the war with Charles V. but this laſt took poſſeſſion of it in 1543. After this it was given to John of Montluc by Henry III. of France, whom he created prince of Crambray; but the Spaniards took it from Montluc in 1593, which broke his heart. It continued under the dominion of the Houſe of Auſtria till 1677, when the king of France became maſter of it, in whoſe hands it has continued ever ſince.

The buildings of Cambray are tolerably handſome, and the ſtreets fine and ſpacious. The place or ſquare for arms is of an extraordinary largeneſs, and capable of receiving the whole garriſon in order of battle. The cathedral dedicated to the Virgin Mary is one of the fineſt in Europe. The body of the church is very large, and there are rich chapels, the pillars of which are adorned with marble tombs that are of exquiſite workmanſhip, and add greatly to the beauty of the place. There are two galleries, one of which is of copper, finely wrought. The door of the choir is of the ſame metal, and well carved. The ſteeple of this church is very high, and built in the form of a pyramid; and from its top you have a view of the city, which is one of the fineſt and moſt agreeable in the Low Countries. There are nine pariſhes, four abbeys, and ſeveral convents for both ſexes. The citadel is very advantageouſly ſituated on high ground, and commands the whole city. Cambray is one of the moſt opulent and commercial cities in the Low Countries; and makes every year a great number of pieces of cambric, with which the inhabitants drive a great trade. E. Long 3. 20. N. Lat. 50. 11.

CAMBRAY (M. de Fenelon, archbiſhop of). See FENELON.

CAMBRESIS, a province of France in the Netherlands, about 25 miles in length. It is bounded on the north and eaſt by Hainhalt, on the ſouth by Picardy, and on the weſt by Artois. It is a very fertile and populous country; and the inhabitants are induſtrious, active, and ingenious. The trade conſiſts principally in corn, ſheep, very fine wool, and fine linen cloth. Cambray is the capital town.

CAMBRIA, a name for the principality of Wales.

CAMBRIC, in commerce, a ſpecies of linen made of flax, very fine and white; the name of which was originally derived from the city of Cambray, where they were firſt manufactured. They are now made at other places in France.

The manufacture of cambrics hath long ſince proved of extraordinary advantage to France. For many years it appeared that England did not in this article contribute leſs than 200,000l. per annum to the intereſt of France. This proved motive ſufficient to induce the parliament of Great Britain to enact many ſalutary laws to prevent this great loſs of wealth. See 18 Geo. II. c. 36. and 21 Geo. II. c. 26. See alſo ſtat. 32 Geo. II. c. 32 and 4 Geo. III. c. 37. which regulates the cambric manufactory, not long ſince introduced into Winchelſea in Suſſex; but very ſoon aboliſhed. The cambrics now allowed in Britain are manufactured in Scotland and Ireland. Any perſons convicted of wearing, ſelling (except for exportation), or making up for hire any cambric or French lawns, are liable to a penalty of 5l. by the two firſt ſtatutes cited above.

CAMBRIDGE, a town of England, and capital of the county of that name. It takes the name of Cambridge from the bridge over the Cam, which divides the town into two parts. Either it or a place in the neighbourhood was ſtyled *Camboritum* in the time of the Romans. It ſuffered much during the wars with the Danes. Here was a caſtle built by William the Conqueror, of which the gatehouſe yet remains, and is now the county goal. By Doomſday-book it appears, that it then had ten wards, containing 387 houſes. In William Rufus's reign it was quite deſtroyed by Roger de Montgomery; but Henry I. beſtowed many privileges upon it, particularly an exemption from the power of the ſheriff, on condition of its paying

Cambridge

paying yearly into the exchequer 100 merks (equivalent to 1000 pounds now), and from tolls, laſtage, pontage, paſſage, and ſtallage, in all fairs of his dominions.

The univerſity enjoys great privileges. It is governed by the chancellor, who is always ſome nobleman, and may be changed every three years, and has a commiſſary under him; the high ſteward, choſen by the ſenate; the vice-chancellor choſen by the whole body of the univerſity, out of two named by the heads of the colleges; two proctors choſen every year; two taxers, who, with the proctors, regulate the weights and meaſures. The other officers are, a regiſter, or keeper of the archives, three eſquire beadles, one yeoman beadle, and a library keeper. Each college has its ſchools and library, as at Oxford, of which thoſe of Trinity and St John are the moſt conſiderable. King George I. purchaſed for 1000l. the library of Dr Moor biſhop of Ely, conſiſting of 30,000 volumes, and made a preſent of it to the univerſity; which, out of gratitude, erected, in 1739, a fine marble ſtatue of that prince in the ſenate-hall of King's-college. A profeſſor of modern languages and hiſtory was alſo eſtabliſhed here and at Oxford, with a ſalary of 400l. for himſelf and two to teach under him, by king George I. in 1724. In 1728, a profeſſorſhip for natural philoſophy was erected by Dr Woodward, a profeſſor at Greſham college, London, with a ſalary of 150l. a-year. The ſame gentleman left them alſo his collection of foſſils, and a part of his library. The maſter and fellows of Catherine-hall are truſtees of an hoſpital for the cure of poor diſeaſed people gratis; for the building and furniſhing of which, Dr Addenbroke left 4000l. Each college has its chapel for worſhip; but public ſermons are preached at St Mary's church. The following are the moſt remarkable ſtructures: 1. The chapel of king's-college, which for its contrivance and extent, fine carved work in wood and ſtone, and painted windows, is hardly to be equalled in the world. It is entirely of free ſtone, roof and all, without one pillar to ſupport it. 2. Trinity-college and library, wonderful both for the deſign and execution. We muſt not omit to obſerve, that a fellowſhip was founded at Magdalen-college, called *the travelling Norfolk fellowſhip*, becauſe it is appropriated to gentlemen of that country. E. Long. 0. 7. N. Lat. 52. 15.

CAMBRIDGESHIRE, a county of England, bounded on the eaſt by Norfolk, on the ſouth by Eſſex and Hertfordſhire, on the weſt by Bedfordſhire and Huntingdonſhire, and on the north by Lincolnſhire. It is about 40 miles long, 25 broad, and 130 in circumference. It lies in the dioceſe of Ely; and ſends ſix members to parliament, two for the county, two for the univerſity, and two for the town of Cambridge. The air is very different in different parts of the county. In the fens it is moiſt and foggy, and therefore not ſo wholeſome; but in the ſouth and eaſt parts it is very good, theſe being much drier than the other: but both, by late improvements, having been rendered very fruitful, the former by draining, and the latter by cinquefoil: ſo that it produces plenty of corn, eſpecially barley, ſaffron, and hemp, and affords the richeſt paſtures. The rivers abound with fiſh, and the fens with wild fowl. The principal manufactures of the county are malt, paper, and baſkets. The chief rivers are the Ouſe, which divides the county into two parts, and is navigable from Cambridge to Lynn in Norfolk; the Cam, which in the Britiſh ſignifies *crooked*, to denote its winding; the Welland, the Glene, the Witham, and that called *Peterborough river*, which is navigable to that city from Wiſbech. The fens called *Bedford level* conſiſt of about 300,000 acres of marſhy ground, lying in Cambridgeſhire, Norfolk, Suffolk, Huntingdonſhire, Northamptonſhire, and Lincolnſhire, and ſurrounded on all hands, except towards the ſea, with high lands. As it appears to have been dry land formerly, the great change it has undergone muſt have been owing either to a violent breach and inundation of the ſea, or to earthquakes. As the towns in and about the fens were great ſufferers by the ſtagnation of the waters in ſummer, and want of proviſions in winter, many attempts were made to drain them, but without ſucceſs, until the time of Charles I. in which, and that of his ſon, the work was happily completed. In theſe fens are a great many DECOYS, in which incredible numbers of ducks, and other wild fowl, are caught during the ſeaſon.

Cambridgeſhire.

Morſe's Geography.

CAMBRIDGE, in New-England, a pleaſant village, four miles from Boſton, famous for its univerſity, conſiſting of four elegant brick edifices, viz. Harvard Hall, Maſſachuſetts Hall, Hollis Hall, and Holden chapel, handſomely incloſed. Harvard Hall is divided into ſix apartments; one of which is appropriated for the library, one for the muſeum, two for the philoſophical apparatus, one is uſed for a chapel, and the other for a dining hall. The library in 1787, conſiſted of 12,000 volumes; and will be continually increaſing from the intereſt of permanent funds, as well as from caſual benefactions. The philoſophical apparatus belonging to this univerſity, coſt between 1400 and 1500l. lawful money, and is the moſt elegant and complete of any in America.

Agreeably to the preſent conſtitution of Maſſachuſetts, his excellency the governor, the council and ſenate, the preſident of the univerſity, and the miniſters of the congregational churches in the towns of Boſton, Charleſtown, Cambridge, Watertown, Roxbury, and Dorcheſter, are *ex officiis*, overſeers of the univerſity.

The corporation is a diſtinct body, conſiſting of ſeven members, in whom is veſted the property of the univerſity.

The inſtructors in the univerſity, are a preſident, Holliſian profeſſor of divinity, Holliſian profeſſor of the mathematics and natural philoſophy, Hancock profeſſor of oriental languages, profeſſor of anatomy and ſurgery, profeſſor of the theory and practice of phyſic, profeſſor of chemiſtry and materia medica, and four tutors.

This univerſity as to its library, philoſophical apparatus and profeſſorſhips, is at preſent the firſt literary inſtitution on this continent. It has generally from 120 to 150 ſtudents.

CAMBRIDGE, in Maryland, a pleaſant village on Choptank river, about ten miles from its entrance into Cheſapeak Bay, a place of conſiderable trade. N. Lat. 38. 35. W. Lat. W. Long. 76. 20.

CAMBRIDGE Manuſcript, a copy of the Goſpels and Acts of the Apoſtles in Greek and Latin. Beza found it in the monaſtery of Irenæus at Lyons, in the year 1562, and gave it to the univerſity of Cambridge in 1582. It is a quarto ſize, and written on vellum; ſixty-ſix leaves of it are much torn and mutilated, ten of of which are ſupplied by a later tranſcriber. Beza conjectures, that this manuſcript might have exiſted ſo early as the time of Irenæus: Wetſtein apprehends, that it either returned or was firſt brought from Egypt into France; that it is the ſame copy which Druthmar, an ancient expoſitor, who lived about the year 840, had ſeen, and which, he obſerves, was aſcribed to St Hilary; and that R. Stephens had given a particular account of it in his edition of the New Teſtament in 1550. It is uſually called *Stephens's ſecond manuſcript*. Mill agrees with F. Simon in opinion, that it was written in the weſtern part of the world by a Latin ſcribe, and that it is to a great degree interpolated and corrupted: he obſerves, that it agrees ſo much with the Latin Vulgate, as to afford reaſon for concluding, that it was corrected or formed upon a corrupt and faulty copy of that tranſlation. From this and the Clermont copy of St Paul's Epiſtles, Beza publiſhed his larger Annotations in 1582.

CAMBYSES. See (*Hiſtory of*) PERSIA.

CAMCHATKA. See KAMTCHATKA.

CAMDEN (William), the great antiquarian, was born in London in the year 1551. His father was a native of Litchfield in Staffordſhire, who ſettling in London, became a member of the company of painter-ſtainers, and lived in the Old Bailey. His mother was of the ancient family of Curwen, of Wirkington, in Cumberland. He was educated firſt at Chriſt's hoſpital, and afterwards at St Paul's ſchool; from thence he was ſent in 1566 to Oxford, and entered ſervitor of Magdalen college; but being diſappointed of a demy's place, he removed to Broad-gate hall, and ſomewhat more than two year's after, to Chriſt-church, where he was ſupported by his kind friend and patron Dr Thornton. About this time he was a candidate for a fellowſhip of All-Souls college, but loſt it by the intrigues of the Popiſh party. In 1570, he ſupplicated the regents of the univerſity to be admitted bachelor of arts; but in this alſo he miſcarried. The following year Mr Camden came to London, where he proſecuted his favourite ſtudy of antiquity, under the patronage of Dr Goodman, dean of Weſtminſter, by whoſe intereſt he was made ſecond maſter of Weſtminſter ſchool in 1575. From the time of his leaving the univerſity to this period, he took ſeveral journeys to different parts of England, with a view to make obſervations and collect materials for his *Britannia*, in which he was now deeply engaged. In 1581 he became intimately acquainted with the learned preſident Briſſon, who was then in England; and in 1586 he publiſhed the firſt edition of his Britannia. In 1593 he ſucceeded to the head maſterſhip of Weſtminſter ſchool on the reſignation of Dr Grant. In 1597 he publiſhed his Greek grammar, and the ſame year was made Clarenceux king at arms. In the year 1660 Mr Camden made a tour to the north, as far as Carliſle, accompanied by his friend Mr (afterwards Sir Robert) Cotton. In 1606 he began his correſpondence with the celebrated preſident de Thou, which continued to the death of that faithful hiſtorian. In the following year he publiſhed his laſt edition of the Britannia, which is that from which the ſeveral Engliſh tranſlations have been made; and in 1608 he began to digeſt his materials for a hiſtory of the reign of queen Elizabeth. In 1609, after recovering from a dangerous illneſs, he retired to Chiſlehurſt in Kent, where he continued to ſpend the ſummer-months during the remainder of his life. The firſt part of his annals of the queen did not appear till the year 1615, and he determined that the ſecond volume ſhould not appear till after his death (A). The work was entirely finiſhed in 1617; and from that time he was principally employed in collecting more materials for the further improvement of his Britannia. In 1622, being now upwards of 70, and finding his health decline apace, he determined to loſe no time in executing his deſign of founding a hiſtory-lecture in the univerſity of Oxford. His deed of gift was accordingly tranſmitted by his friend Mr Heather, to Mr Gregory Wheare, who was, by himſelf, appointed his firſt profeſſor. He died at Chiſlehurſt, in 1623, in the 73d year of his age; and was buried with great ſolemnity in Weſtminſter-abbey in the ſouth aiſle, where a monument of white marble was erected to his memory. Camden was a man of ſingular modeſty and integrity; profoundly learned in the hiſtory and antiquities of Britain, and a judicious and conſcientious hiſtorian. He was reverenced and eſteemed by the literati of all nations, and will be ever remembered as an honour to the age and country wherein he lived. Beſides the works already mentioned, he was author of an excellent Greek grammar, and of ſeveral tracts in Hearne's collection.

CAMEL, in zoology. See CAMELUS.

CAMEL, in mechanics, a kind of machine uſed in Holland for raiſing or lifting ſhips, in order to bring them over the Pampus, which is at the mouth of the river Y, where the ſhallowneſs of the water hinders large ſhips from paſſing. It is alſo uſed in other places, particularly at the dock of Peterſburg, the veſſels built here being in their paſſage to Cronſtadt lifted over the bar by means of camels. Theſe machines were originally invented by the celebrated De Wit, for the purpoſe abovementioned; and were introduced into Ruſſia by Peter the Great, who obtained the model of them when he worked in Holland as a common ſhipwright. A camel is compoſed of two ſeparate parts, whoſe outſides are perpendicular, and whoſe inſides are concave, ſhaped ſo as to embrace the hull of a ſhip on both ſides. Each part has a ſmall cabin with ſixteen pumps and ten plugs, and contain twenty men. They are braced to a ſhip underneath by means of cables, and entirely encloſe its ſides and bottom; being then towed to the

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(A) The reign of queen Elizabeth was ſo recent when the firſt volume of the annals was publiſhed, that many of the perſons concerned, or their dependents, were ſtill living. It is no wonder, therefore, that the honeſt hiſtorian ſhould offend thoſe whoſe actions would not bear inquiry. Some of his enemies were clamorous and troubleſome; which determined him not to publiſh the ſecond volume during his life, but that poſterity might be in no danger of diſappointment, he depoſited one copy in the Cotton library, and tranſmitted another to his friend Dupuy at Paris. It was firſt printed at Leyden in 1625.

bar, the plugs are opened, and the water admitted until the camel ſinks with the ſhip and runs a-ground. Then, the water being pumped out, the camel riſes, lifts up the veſſel, and the whole is towed over the bar. This machine can raiſe the ſhip eleven feet, or, in other words, make it draw eleven feet leſs water.

CAMELFORD, a borough town of Cornwall in England, conſiſting of about 100 houſes, badly built; but the ſtreets are broad and well paved. W. Long. 5. 4. N. Lat. 50. 40. It ſends two members to parliament; and gives title of baron to Thomas Pitt, elder brother of the great earl of Chatham.

CAMELLIA, in botany: A genus of the polyandria order, belonging to the monodelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The calyx is imbricated and polyphyllous, with the interior leaves larger than the exterior ones. Of this genus there is but one ſpecies, a native both of China and Japan. Thunberg, in his *Flora Japonica*, deſcribes its growing every where in the groves and gardens of Japan, where it becomes a prodigiouſly large and tall tree, highly eſteemed by the natives for the elegance of its large and very variable bloſſoms, and its evergreen leaves; it is there found with ſingle and double flowers, which alſo are white, red, and purple, and produced from April to October. Repreſentations of this flower are frequently met with in Chineſe paintings. In Britain, the *Camellia* is generally treated as a ſtove plant, and propagated by layers; it is ſometimes placed in the greenhouſe; but it appears to be one of the propereſt plants imaginable for the conſervatory. At ſome future time it may, perhaps, not be uncommon to treat it as a *Lauruſtinus* or *Magnolia*: the high price at which it has hitherto been ſold, may have prevented its being hazarded in this way. The bloſſoms are of a firm texture, but apt to fall off long before they have loſt their brilliancy; it therefore is a practice with ſome to ſtick ſuch deciduous bloſſoms on ſome freſh bud, where they continue to look well for a conſiderable time. Petiver conſidered this plant as a ſpecies of tea-tree; and future obſervations will probably confirm his conjecture.

CAMELODUM. See CAMALODUNUM.

CAMELOPARDALIS, in zoology, the trivial name of a ſpecies of CERVUS.

CAMELUS, or CAMEL, in zoology, a genus of quadrupeds belonging to the order of pecora. The characters of the camel are theſe: It has no horns; it has ſix fore-teeth in the under jaw; the laniarii are wide ſet, three in the upper, and two in the lower jaw; and there is a fiſſure in the upper lip, reſembling a cleft in the lip of a hare. The ſpecies are:

1. The dromedarius, or Arabian camel, with one bunch of protuberance on the back. It has four callous protuberances on the fore-legs, and two on the hind ones. This ſpecies is common in Africa, and the warmer parts of Aſia; not that it is ſpread over either of the continents. It is a common beaſt of burden in Egypt, and along the countries which border on the Mediterranean Sea; in the kingdom of Morocco, Sara or the Deſert, and in Ethiopia: but no where ſouth of thoſe kingdoms. In Aſia, it is equally common in Turkey and Arabia; but is ſcarcely ſeen farther north than Perſia, being too tender to bear a more ſevere climate. India is deſtitute of this animal.

2. The Bactrianus, or Bactrian camel, has two bunches on the back, but is in all other reſpects like the preceding; of which it ſeems to be a mere variety, rather than a different ſpecies; and is equally adapted for riding or carrying loads. It is ſtill found wild in the deſerts of the temperate parts of Aſia, particularly in thoſe between China and India. Theſe are larger and more generous than the domeſticated race. The Bactrian camel, which is very common in Aſia, is extremely hardy, and in great uſe among the Tartars and Mongols, as a beaſt of burden, from the Caſpian Sea to the empire of China. It bears even ſo ſevere a climate as that of Siberia, being found about the lake Baikal, where the Burats and Mongols keep great numbers. They are far leſs than thoſe which inhabit Weſtern Tartary. Here they live during winter on willows and other trees, and are by this diet reduced very lean. They loſe their hair in April, and go naked all May, amidſt the foreſts of that ſevere climate. To thrive, they muſt have dry ground and ſalt marſhes. There are ſeveral varieties among the camels. The Turkman is the largeſt and ſtrongeſt. The Arabian is hardy. What is called the Dromedary, Maihary, and Raguahl, is very ſwift. The common ſort travel about 30 miles a day. The laſt, which has a leſs bunch, and more delicate ſhape, and alſo as much inferior in ſize, never carries burdens; but is uſed to ride on. In Arabia, they are trained for running-matches: and in many places for carrying couriers, who can go above 100 miles a day on them; and that for nine days together, over burning deſerts, unhabitable by any living creature. The African camels are the moſt hardy, having more diſtant and more dreadful deſerts to paſs over than any of the others, from Numidia to the kingdom of Ethiopia. In Weſtern Tartary there is a white variety, very ſcarce, and ſacred to the idols and prieſts. The Chineſe have a ſwift variety, which they call by the expreſſive name of Fong Kyo Fo, or camels with feet of the wind. Fat of camels, or, as thoſe people call it, oil of bunches, being drawn from them, is eſteemed in many diſorders, ſuch as ulcers, numbneſs, and conſumptions. This ſpecies of camel is rare in Arabia, being an exotic, and only kept by the great men.

Camels have conſtituted the riches of Arabia from the time of Job to the preſent day. The patriarch reckoned 600 camels among his paſtoral treaſures, and the modern Arabs eſtimate their wealth by the numbers of theſe uſeful animals. Without them great part of Africa would be wretched; by them the whole commerce is carried through arid and burning tracts, impaſſable but by beaſts which Providence formed expreſsly for the ſcorched deſerts. Their ſoles are adapted to the ſands they are to paſs over, their toughneſs and ſpungy ſoftneſs preventing them from cracking. Their great powers of ſuſtaining abſtinence from drinking, enables them to paſs over unwatered tracts for many days, without requiring the leaſt liquid; and their patience under hunger is ſuch, that they will travel many days fed only with a few dates, or ſome ſmall balls of bean or barley-meal, or on the miſerable thorny plants they meet with in the deſerts.

The Arabians regard the camel as a preſent from heaven, a ſacred animal, without whoſe aſſiſtance they could neither ſubſiſt, carry on trade, nor travel. Camel's milk is their common food. They alſo eat its fleſh, that of the young camel being reckoned highly ſavoury. Of the hair of thoſe animals, which is fine and ſoft, and which is completely renewed every year, the Arabians make ſtuffs for clothes, and other furniture. With their camels, they not only want nothing, but have nothing to fear. In one day they can perform a journey of fifty leagues into the deſert, which cuts off every approach from their enemies. All the armies of the world would periſh in purſuit of a troop of Arabs. Hence they never ſubmit, unleſs from choice, to any power. With a view to his predatory expeditions, the Arab inſtructs, rears, and exerciſes his camels. A few days after their birth, he folds their limbs under their belly, forces them to remain on the ground, and, in this ſituation, loads them with a pretty heavy weight, which is never removed but for the purpoſe of replacing a greater. Inſtead of allowing them to feed at pleaſure, and to drink when they are dry, he begins with regulating their meals, and makes them gradually travel long journeys, diminiſhing, at the ſame time, the quantity of their aliment. When they acquire ſome ſtrength, they are trained to the courſe. He excites their emulation by the example of horſes, and, in time, renders them more robuſt. In fine, after he is certain of the ſtrength, fleetneſs, and ſobriety of his camels, he loads them both with his own and their food, ſets off with them, arrives unperceived at the confines of the deſert, robs the firſt paſſengers he meets, pillages the ſolitary houſes, loads his camels with the booty, and, if purſued, he is obliged to accelerate his retreat. It is on theſe occaſions that he unfolds his own talents and thoſe of the camels. He mounts one of the fleeteſt, conducts the troop, and makes them travel night and day, without, almoſt, either ſtopping, eating, or drinking; and, in this manner, he eaſily performs a journey of three hundred leagues in eight days. During this period of motion and fatigue, his camels are perpetually loaded, and he allows them each day, one hour only of repoſe, and a ball of paſte. They often run in this manner nine or ten days, without finding water; and when, by chance, there is a pool at ſome diſtance, they ſcent the water half a league off. Thirſt makes them double their pace, and they drink as much at once as ſerves them for the time that is paſt, and as much to come; for their journeys often laſt ſeveral weeks, and their abſtinence continues an equal time.

Of all carriages, that by camels is the cheapeſt and moſt expeditious. The merchants and other paſſengers unite in a caravan, to prevent the inſults and robberies of the Arabs. Theſe caravans are often very numerous, and are always compoſed of more camels than men. Each camel is loaded in proportion to his ſtrength; and, when overloaded, he refuſes to march, and continues lying till his burden is lightened. The large camels generally carry a thouſand, or even twelve hundred pounds weight, and the ſmalleſt from ſix to ſeven hundred. In theſe commercial travels, their march is not haſtened: As the route is often ſeven or eight hundred leagues, their motions and journeys are regulated. They walk only, and perform about from ten to twelve leagues each day. Every night they are unloaded, and allowed to paſture at freedom. When in a rich country, or fertile meadow, they eat, in leſs than an hour, as much as ſerves them to ruminate the whole night, and to nouriſh them during twenty-four hours. But they ſeldom meet with ſuch paſtures; neither is this delicate food neceſſary for them. They even ſeem to prefer wormwood, thiſtles, nettles, broom, caſſia, and other prickly vegetables, to the ſofteſt herbage. As long as they find plants to brouſe, they eaſily diſpenſe with drink. This facility of abſtaining long from drink proceeds not, however, from habit alone, but is rather an effect of their ſtructure. Independent of the four ſtomachs, which are common to ruminating animals, the camels have a fifth bag, which ſerves them as a reſervoir for water. This fifth ſtomach is peculiar to the camel. It is ſo large as to contain a vaſt quantity of water, where it remains without corrupting, or mixing with the other aliments. When the animal is preſſed with thirſt, and has occaſion for water to macerate his dry food in ruminating, he makes part of this water mount into his paunch, or even as high as the œſophagus, by a ſimple contraction of certain muſcles. It is by this ſingular conſtruction that the camel is enabled to paſs ſeveral days without drinking, and to take at a time a prodigious quantity of water, which remains in the reſervoir pure and limpid, becauſe neither the liquors of the body, nor the juices of digeſtion, can mix with it. Travellers, when much oppreſſed with drought, are ſometimes obliged to kill their camels in order to have a ſupply of drink from theſe reſervoirs. Theſe inoffenſive creatures muſt ſuffer much; for they utter the moſt lamentable cries, eſpecially when overloaded. But, though perpetually oppreſſed, their fortitude is equal to their docility. At the firſt ſignal, they bend their knees and lie down to be loaded, which ſaves their conductor the trouble of raiſing the goods to a great height. As ſoon as they are loaded, they riſe ſpontaneouſly, and without any aſſiſtance. One of them is mounted by their conductor, who goes before, and regulates the march of all the followers. They require neither whip nor ſpur. But, when they begin to be tired, their courage is ſupported, or rather their fatigue is charmed, by ſinging, or by the ſound of ſome inſtrument. Their conductors relieve each other in ſinging; and, when they want to prolong the journey, they give the animals but one hour's reſt; after which, reſuming their ſong, they proceed on their march for ſeveral hours more, and the ſinging is continued till they arrive at another reſting place, when the camels again lie down; and their loads, by unlooſing the ropes, are allowed to glide off on each ſide of the animals. Thus they ſleep on their bellies in the middle of their baggage, which, next morning is fixed on their backs with equal quickneſs and facility as it had been detached the evening before.

Fatigue, hunger, thirſt, and meagreneſs, are not the only inconveniences to which theſe animals are ſubjected: To all theſe evils they are prepared by caſtration. One male is only left for eight or ten females; and the labouring camels are generally geldings. They are unqueſtionably weaker than unmutilated males; but they are more tractable, and at all ſeaſons ready for ſervice. While the former are not only unmanageable, but almoſt furious, during the rutting ſeaſon, which laſts forty days, and returns annually in the ſpring. It is then ſaid, that they foam continually, and that one or two red veſicles, as large as a hog's bladder, iſſue from their mouths. In this ſeaſon they eat little, attack and bite animals, and even their own maſters, to whom at all other times they are very ſubmiſſive. Their mode of copulating differs from that of all other quadrupeds; for the female, inſtead of ſtanding, lies down on her knees, and receives the male in the ſame poſition that ſhe repoſes, or is loaded. This poſture, to which the animals are early accuſtomed, becomes natural, ſince they aſſume it ſpontaneouſly in coition. The time of geſtation is near twelve months, and, like all large quadrupeds, the females bring forth only one at a birth. Her milk is copious and thick; and, when mixed with a large quantity of water, affords an excellent nouriſhment to men. The females are not obliged to labour, but are allowed to paſture and produce at full liberty. The advantage derived from their produce and their milk is perhaps ſuperior to what could be drawn from their working. In ſome places, however, moſt of the females are caſtrated, in order to fit them for labour; and it is alleged, that this operation, inſtead of diminiſhing, augments their ſtrength, vigour, and plumpneſs. In general, the fatter camels are, they are the more capable of enduring great fatigue. Their bunches ſeem to proceed from a redundance of nouriſhment; for, during long journeys, in which their conductor is obliged to huſband their food, and where they often ſuffer much hunger and thirſt, theſe bunches gradually diminiſh, and become ſo flat, that the place where they were is only perceptible by the length of the hair, which is always longer on theſe parts than on the reſt of the back. The meagreneſs of the body augments in proportion as the bunches decreaſe. The Moors, who tranſport all articles of merchandiſe from Barbary and Numidia, as far as Æthiopia, ſet out with their camels well laden, which are very fat and vigorous; and bring back the ſmall animals ſo meagre, that they commonly ſell at a low price to the Arabs of the Deſert, to be again fattened.

We are told by the ancients, that camels are in a condition for propagating at the age of three years. This aſſertion is ſuſpicious; for, in three years, they have not acquired one half of their growth. The penis of the male, like that of the bull, is very long, and very ſlender. During erection, it ſtretches forward, like that of all other quadrupeds; but, in its ordinary ſtate, the ſheath is drawn backward, and the urine is diſcharged from between the hind legs; ſo that both males and females urine in the ſame manner. The young camel ſucks his mother twelve months; but, when meant to be trained, in order to render him ſtrong and robuſt in the chace, he is allowed to ſuck and paſture at freedom during the firſt years, and is not loaded, or made to perform any labour, till he is four years old. He generally lives forty and ſometimes fifty years, which duration of life is proportioned to the time of his growth. There is no foundation for what has been advanced by ſome authors, that he lives one hundred years.

By conſidering, under one point of view, all the qualities of this animal, and all the advantages derived from him, it muſt be acknowledged that he is the moſt uſeful creature ſubjected to the ſervice of man. Gold and ſilk conſtitute not the true riches of the Eaſt. The camel is the genuine treaſure of Aſia. He is more valuable than the elephant; for he may be ſaid to perform an equal quantity of labour at a twentieth part of the expence. Beſides, the whole ſpecies are under ſubjection to man, who propagates and multiplies them at pleaſure. But he has no ſuch dominion over the elephants, whom he cannot multiply, and the individuals of whom he conquers with great labour and difficulty. The camel is not only more valuable than the elephant, but is perhaps equal in utility to the horſe, the aſs, and the ox, when their powers are united. He carries as much as two mules; though he eats as little, and feeds upon herbs equally coarſe as the aſs. The female furniſhes milk longer than the cow. The fleſh of a young camel is as good and wholeſome as veal: The Africans and Arabs fill their pots and tubs with it, which is fried with greaſe, and preſerved in this manner during the whole year for their ordinary repaſts: The hair is finer and more in requeſt than the beſt wool. Even their excrements are uſeful: for ſal ammoniac is made of their urine; and their dung, dried in the ſun and pulveriſed, ſerves for litter to themſelves, as well as to horſes, with which people frequently travel in countries where no hay or ſtraw can be had. In fine, their dung makes excellent fuel, which burns freely, and gives as clear and nearly as hot a flame as dry wood, which is of great uſe in the deſerts, where not a tree is to be found, and where, for want of combuſtible materials, fire is as ſcarce as water.

3. The Glama, Llama, or South-American camel-ſheep, has an almoſt even back, ſmall head, fine black eyes, and very long neck, bending much, and very protuberant near the junction with the body: in a tame ſtate, with ſmooth ſhort hair; in a wild ſtate, with long coarſe hair, white, grey, and ruſſet, diſpoſed in ſpots; with a black line from the head along the top of the back to the tail, and belly white. The ſpotted may poſſibly be the tame, the laſt the wild, llamas. The tail is ſhort; the height from four to four feet and a half; the length from the neck to the tail, ſix feet. The carcaſe diveſted of ſkin and offals, according to the editor of Mr Byron's voyage, weighed 200lb. In general, the ſhape exactly reſembles a camel, only it wants the dorſal bunch. It is the camel of Peru and Chili; and, before the arrival of the Spaniards, was the only beaſt of burden known to the Indians. It is very mild, gentle, and tractable. Before the introduction of mules, they were uſed by the Indians to plough the land: at preſent they ſerve to carry burdens of about 100lb. They go with great gravity; and, like their Spaniſh maſters, nothing can prevail upon them to change their pace. They lie down to the burden; and when wearied, no blows can provoke them to go on. Feuillee ſays, they are ſo capricious, that if ſtruck, they inſtantly ſquat down, and nothing but careſſes can make them ariſe. When angry, they have no other method of revenging their injuries than by ſpitting; and they can ejaculate their ſaliva to the diſtance of ten paces: if it falls on the ſkin, it raiſes an itching and a reddiſh ſpot. Their fleſh is eaten, and is ſaid to be as good as mutton. The wool has a ſtrong diſagreeable ſcent. They are very ſure-footed; therefore uſed to carry the Peruvian ores over the ruggedeſt hills and narroweſt paths of the Andes. They

inhabit that vaſt chain of mountains their whole length to the ſtraits of Magellan; but except where theſe hills approach the ſea, as in Patagonia, never appear on the coaſts. Like the camel, they have powers of abſtaining long from drink, ſometimes for four or five days: like that animal, their food is coarſe and trifling. —In a wild ſtate, they keep in great herds in the higheſt and ſteepeſt parts of the hills; and while they are feeding, one keeps centry on the pinnacle of ſome rock: if it perceives the approach of any one, it neighs; the herd takes the alarm, and goes off with incredible ſpeed. They outrun all dogs, ſo there is no other way of killing them but with the gun. They are killed for the ſake of their fleſh and hair; for the Indians weave the laſt into cloth. From the form of the parts of generation in both ſexes, no animal copulates with ſuch difficulty. It is often the labour of a day, *antequam actum ipſum venereum incipiant, et abſolvant.*

4. The Pacos, or ſheep of Chili, has no bunch on the back. It is covered with a fine valuable wool, which is of a roſe red colour on the back of the animal, and white on the belly. They are of the ſame nature with the preceding; inhabit the ſame places, but are more capable of ſupporting the rigour of froſt and ſnow: they live in vaſt herds; are very timid, and exceſſively ſwift. The Indians take the pacos in a ſtrange manner: they tie cords with bits of cloth or wool hanging to them, above three or four feet from the ground, croſs the narrow paſſes of the mountains, then drive thoſe animals towards them, which are ſo terrified by the flutter of the rags, as not to dare to paſs, but, huddling together, give the hunters an opportunity to kill with their ſlings as many as they pleaſe. The tame ones will carry from 50 to 75lb.; but are kept principally for the ſake of the wool and the fleſh, which is exceedingly well taſted.

CAMERA ÆOLIA, a contrivance for blowing the fire, for the fuſion of ores, without bellows; by means of water falling through a funnel into a cloſe veſſel, which ſends from it ſo much air or vapour as continually blows the fire: if there be the ſpace of another veſſel for it to expatiate in by the way, it there lets fall its humidity, which otherwiſe might hinder the work. This contrivance was named *camera Æolia* by Kircher.

CAMERA Lucida, a contrivance of Dr Hook for making the image of any thing appear on a wall in a light room, either by day or night. Oppoſite to the place or wall where the appearance is to be, make a hole of at leaſt a foot in diameter, or if there be a high window with a caſement of this dimenſion in it, this will do much better without ſuch hole or caſement opened. At a convenient diſtance, to prevent its being perceived by the company in the room, place the object or picture intended to be repreſented, but in an inverted ſituation. If the picture be tranſparent, reflect the ſun's rays by means of a looking-glaſs, ſo as that they may paſs through it towards the place of repreſentation; and to prevent any rays from paſſing aſide it, let the picture be encompaſſed with ſome board or cloth. If the object be a ſtatue, or a living creature, it muſt be much enlightened by caſting the ſun's rays on it, either by reflection, refraction, or both. Between this object and the place of repreſentation put a broad convex glaſs, ground to ſuch a convexity as that it may repreſent the object diſtinctly in ſuch place. The nearer this is ſituated to the object, the more will the image be magnified on the wall, and the further the leſs; ſuch diverſity depending on the difference of the ſphere of the glaſſes. If the object cannot be conveniently inverted, there muſt be two large glaſſes of proper ſpheres, ſituated at ſuitable diſtances, eaſily found by trial, to make the repreſentations erect. This whole apparatus of object, glaſſes, &c. with the perſons employed in the management of them, are to be placed without the window or hole, ſo that they may not be perceived by the ſpectators in the room, and the operation itſelf will be eaſily performed. Phil. Tranſ. N° 38. p. 741, ſeq.

CAMERA Obſcura, or *Dark Chamber*, in *Optics*, a machine, or apparatus, repreſenting an artificial eye; whereon the images of external objects, received thro' a double convex glaſs, are exhibited diſtinctly, and in their native colours, on a white matter placed within the machine, in the focus of the glaſs.

The firſt invention of this inſtrument is aſcribed to Baptiſta Porta. See his *Magia Naturalis*, lib. xvii. cap. 6. firſt publiſhed at Francfort about the year 1589 or 1591; the firſt four books of this work were publiſhed at Antwerp in 1560.

The *camera obſcura* affords very diverting ſpectacles; both by exhibiting images perfectly like their objects, and each clothed in their native colours; and by expreſſing, at the ſame time, all their motions; which latter no other art can imitate. By means of this inſtrument, a perſon unacquainted with deſigning will be able to delineate objects with the greateſt accuracy and juſtneſs, and another well verſed in painting will find many things herein to perfect his art. See the conſtruction under DIOPTRICS.

CAMERARIA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. There are two horizontal follicles at the baſe of the ſeed-caſe. The ſeeds are inſerted into a proper membrane. Of this there are two ſpecies; the latifolia, and the anguſtifolia. The firſt is a native of the iſland of Cuba, and riſes with a ſhrubby ſtalk to the height of 10 or 12 feet, dividing into ſeveral branches, garniſhed with roundiſh pointed leaves placed oppoſite. The flowers are produced at the end of the branches in looſe cluſters, which have long tubes enlarging gradually upward, and at the top are cut into five ſegments, broad at their baſe, but ending in ſharp points; the flower is of a yellowiſh white colour. The ſecond ſort has an irregular ſhrubby ſtalk, which riſes about eight feet high, ſending out many branches which are garniſhed with very narrow thin leaves placed oppoſite at each joint. The flowers are produced ſcatteringly at the end of the branches, which are ſhaped like thoſe of the former ſort, but ſmaller. It is a native of Jamaica. Both theſe plants abound with an acrid milky juice like the ſpurge. They are propagated by ſeeds, which muſt be procured from the places of their growth. They may alſo be propagated by cuttings planted in a hot-bed during the ſummer-months: they muſt have a bark-ſtove, for they are very tender plants; but in warm weather they muſt have plenty of air.

CAMERARIUS (Joachim), one of the moſt learned ed writers of his time, was born in 1500, at Bamberg, a city of Franconia; and obtained great reputation by his writings. He tranſlated into Latin Herodotus, Demoſthenes, Xenophon, Euclid, Homer, Theocritus, Sophocles, Lucian, Theodoret Nicephorus, &c. He publiſhed a catalogue of the biſhops of the principal ſees; Greek epiſtles; Accounts of his journeys, in Latin verſe; a Commentary on Plautus; the Lives of Helius Eobanus, Heſſus, and Philip Melancthon, &c. He died in 1574.

Camerarius (Joachin), ſon of the former, and a learned phyſician, was born at Nuremberg in 1534. After having finiſhed his ſtudies in Germany, he went into Italy, where he obtained the eſteem of the learned. At his return he was courted by ſeveral princes to live with them; but he was too much devoted to books, and the ſtudy of chemiſtry and botany, to comply. He wrote an hourtus medicus, and ſeveral other works. He died in 1598.

CAMERATED, among builders the ſame with vaulted or arched.

CAMERET-bay, in the province of Brittany in France, forms the harbour of Breſt. See Brest.

CAMERINO, a town of the eccleſiaſtical ſtate in Italy, ſituated in E. Long. 13. 7. N. Lat. 45. 5.

CAMERLINGO, according to Ducange, ſignified formerly the pope's or emperor's treaſure: at preſent, camerlingo is no where uſed but at Rome, where it denotes the cardinal who governs the eccleſiaſtical ſtate and adminiſters juſtice. It is the moſt eminent office at the court of Rome, becauſe he is at the head of the treaſury. During a vacation of the papal chair, the cardinal camerlingo publiſhes edicts, coins money, and exerts every other prerogative of a ſovereign prince; he has under him a treaſurer-general, auditor-general, and 12 prelates called *clerks of the chamber*.

CAMERON (John), one of the moſt famous divines among the Proteſtants of France in the 17th century, was born at Glaſgow in Scotland, where he taught the Greek tongue; and having read lectures upon that language for about a year, travelled, and became profeſſor at ſeveral univerſities, and miniſter at Bourdeaux. He publiſhed, 1. Theological lectures; 2. *Icon Johannis Cameronis*; and ſome miſcellaneous pieces. He died in 1625, aged 60.

CAMERONIANS, a ſect or party in Scotland, who ſeparated from the Preſbyterians in 1666, and continued to hold their religious aſſemblies in the fields.

The Cameronians took their denomination from Richard Cameron, a famous field-preacher, who, refuſing to accept the indulgence to tender conſciences, granted by king Charles II. as ſuch an acceptance ſeemed an acknowledgment of the king's ſupremacy, and that he had before a right to ſilence them, made a defection from his brethren, and even headed a rebellion in which he was killed. His followers were never entirely reduced till the Revolution, when they voluntarily ſubmitted to king William.

The Cameronians adhered rigidly to the form of government eſtabliſhed in 1648.

Cameronians, or *Cameronites*, is alſo the donomination of a party of Calviniſts in France, who aſſerted that the will of man is only determined by the practical judgment of the mind; that the cauſe of mens doing good or evil proceeds from the knowledge which God infuſes into them; and that God does not move the will phyſically, but only morally, in virtue of its dependence on the judgment of the mind. They had this name from John Cameron, a famous profeſſor, firſt at Glaſgow, where he was born, in 1580, and afterwards at Bordeaux, Sedan and Saumur; at which laſt place he broached his new doctrine of grace and free-will, which was formed by Amyrant, Cappel, Bochart, Daille, and others of the more learned among the reformed miniſters, who judged Calvin's doctrines on theſe points too harſh. The Cameronians are a ſort of mitigated Calviniſts, and approach to the opinion of the Armenians. They are alſo called *Univerſaliſts*, as holding the univerſality of Chriſt's death; and ſometimes *Amyraldiſts*. The rigid adherents to the ſynod of Dort accuſed them of Pelagianiſm, and even of Manicheiſm. The controverſy between the parties was carried on with a zeal and ſubtilty ſcarce conceivable; yet all the queſtion between them was only, Whether the will of man is determined by the immediate action of God upon it, or by the intervention of a knowledge which God impreſſes into the mind? The ſynod of Dort had defined that God not only illuminates the underſtanding, but gives motion to the will by making an internal change therein. Cameron only admitted the illumination, whereby the mind is morally moved, and explained the ſentiment of the ſynod of Dort ſo as to make the two opinions conſiſtent.

CAMES, a name given to the ſmall ſlender rods of caſt-lead, of which the glaziers make their turned lead.

Their lead being caſt into ſlender rods of twelve or fourteen inches long each, is called the *came*; ſometimes alſo they call each of theſe rods a *came*, which being afterwards drawn through their vice, makes their turned lead.

CAMILLUS (Marcus Furius), was the firſt who rendered the family of *Furius* illuſtrious. He triumphed four times, was five times dictator, and was honoured with the title of the *ſecond founder of Rome*. In a word, he acquired all the glory a man can gain in his own country. Lucius Apuleius, one of the tribunes, proſecuted him to make him give an account of the ſpoils taken at Veii. Camillus anticipated judgment, and baniſhed himſelf voluntarily. During his baniſhment, inſtead of rejoicing at the devaſtation of Rome by the Gauls, he exerted all his wiſdom and bravery to drive away the enemy; and yet kept with the utmoſt ſtrictneſs the ſacred law of Rome, in refuſing to accept the command which ſeveral private perſons offered him. The Romans, who were beſieged in the capitol, created him dictator in the year 363; in which office he acted with ſo much bravery and conduct, that he entirely drove the army of the Gauls out of the territories of the commonwealth. He died in the 81ſt year of his age, 365 years before the Chriſtian æra

CAMILLI and Camillæ, in antiquity, boys and girls of ingenuous birth, who miniſtered in the ſacrifices of the gods; and eſpecially thoſe who attended the *flamen dialis*, or prieſt of Jupiter. The word ſeems borrowed from the language of the ancient Hetrurians,

Caminha
||
Camoens.

where it ſignified miniſter, and was changed from *caſmillus*. The Tuſcans alſo give the appellation *Camillus* to Mercury in quality of miniſter of the gods.

CAMINHA, a maritime town of Portugal, in the province of Entre-Duero-e-Minho, with the title of a duchy. It is ſituated at the mouth of the river Minho, in W. Long. 9. 15. N. Lat. 41. 44.

CAMIS or KAMIS, in the *Japaneſe Theology*, denote deified ſouls of ancient heroes, who are ſuppoſed ſtill to intereſt themſelves in the welfare of the people over whom they anciently commanded.

The camis anſwer to the heroes in the ancient Greek and Roman theology, and are venerated like the ſaints in the modern Romiſh church.

Beſides the heroes or camis beatified by the conſent of antiquity, the *mikaddos*, or pontiffs have deified many others, and continue ſtill to grant the apotheoſis to new worthies; ſo that they ſwarm with *camis:* the principal one is *Tenſio Dai Sin*, the common father of Japan, to whom are paid devotions and pilgrimages extraordinary.

CAMISADE, in the art of war, an attack by ſurpriſe in the night, or at the break of day, when the enemy is ſuppoſed to be a-bed. The word is ſaid to have taken its riſe from an attack of this kind: wherein, as a badge or ſignal to know one another by, they bore a ſhift, in French called *chemiſe*, or *camiſe*, over their arms.

CAMISARDS, a name given by the French to the Calviniſts of the Cevennes, who formed a league, and took up arms in their own defence, in 1688.

CAMLETINE, a ſlight ſtuff, made of hair and coarſe ſik, in the manner of camblet. It is now out of faſhion.

CAMMA, and GOBBI, two provinces of the kingdom of Loango in Africa. The inhabitants are continually at war with each other. The weapons they formerly uſed in their wars were the ſhort pike, bows and arrows, ſword and dagger; but ſince the Europeans have become acquainted with that coaſt, they have ſupplied them with fire-arms. The chief town of Gobbi lies about a day's journey from the ſea. Their rivers abound with a variety of fiſh; but are infeſted with ſea-horſes, which do great miſchief both by land and water. The principal commerce with the natives is in logwood, elephants teeth, and tails, the hair of which is highly valued, and uſed for ſeveral curious purpoſes.

CAMMIN, a maritime town of Germany, in Brandenburg Pomerania, ſituated in E. Long. 15° N. Lat. 54°.

CAMOENS (Louis de), a famous Portugueſe poet, the honour of whoſe birth is claimed by different cities. But according to N. Antonio, and Manuel Correa, his intimate friend, this event happened at Liſbon in 1517. His family was of conſiderable note, and originally Spaniſh. In 1370, Vaſco Perez de Caamans, diſguſted at the court of Caſtile, fled to that of Liſbon, where king Ferdinand immediately admitted him into his council, and gave him the lordſhips of Sardoal, Punnete, Marano, Amendo, and other conſiderable lands; a certain proof of the eminence of his rank and abilities. In the war of the ſucceſſion, which broke out on the death of Ferdinand, Camoens ſided with the

Camoens.

king of Caſtile, and was killed in the battle of Aljabarota. But though John I. the victor, ſeized a great part of his eſtate, his widow, the daughter of Gonſalo, Tereyro, grand maſter of the order of Chriſt, and general of the Portugueſe army, was not reduced beneath her rank. She had three ſons who took the name of *Camoens*. The family of the eldeſt intermarried with the firſt nobility of Portugal; and even, according to Caſtera, with the blood royal. But the family of the ſecond brother, whoſe fortune was ſlender, had the ſuperior honour to produce the author of the Luſiad.

Early in his life the misfortunes of the poet began. In his infancy, Simon Vaz de Camoens, his father, commander of a veſſel, was ſhipwrecked at Goa, where, with his life, the greateſt part of his fortune was loſt. His mother, however, Anne de Macedo of Santarene, provided for the education of her ſon Louis at the univerſity of Coimbra. What he acquired there, his works diſcover; an intimacy with the claſſics, equal to that of a Scaliger, but directed by the taſte of a Milton or a Pope.

When he left the univerſity, he appeared at court. He was handſome; had ſpeaking eyes, it is ſaid; and the fineſt complexion. Certain it is, however, he was a poliſhed ſcholar, which, added to the natural ardour and gay vivacity of his diſpoſition, rendered him an accompliſhed gentleman. Courts are the ſcenes of intrigue; and intrigue was faſhionable at Liſbon. But the particulars of the amours of Camoens reſt unknown. This only appears: he had aſpired above his rank, for he was baniſhed from the court; and in ſeveral of his ſonnets he aſcribes this misfortune to love.

He now retired to his mother's friends at Santarene. Here he renewed his ſtudies, and began his poem on the diſcovery of India. John III. at this time prepared an armament againſt Africa. Camoens, tired of his inactive obſcure life, went to Ceuta in this expedition, and greatly diſtinguiſhed his valour in ſeveral rencounters. In a naval engagement with the Moors in the ſtraits of Gibraltar, in the conflict of boarding, he was among the foremoſt, and loſt his right eye. Yet neither hurry of actual ſervice nor the diſſipation of the camp could ſtifle his genius. He continued his *Luſiadas*, and ſeveral of his moſt beautiful ſonnets were written in Africa, while as he expreſſed it,

One hand the pen, and one the ſword, employed.

The fame of his valour had now reached the court, and he obtained permiſſion to return to Liſbon. But, while he ſolicited an eſtabliſhment which he had merited in the ranks of battle, the malignity of evil tongues, as he calls it in one of his letters, was injuriouſly poured upon him. Though the bloom of his early youth was effaced by ſeveral years reſidence under the ſcorching heavens of Africa, and though altered by the loſs of an eye, his preſence gave uneaſineſs to the gentlemen of ſome families of the firſt rank where he had formerly viſited. Jealouſy is the characteriſtic of the Spaniſh and Portugueſe; its reſentment knows no bounds, and Camoens now found it prudent to baniſh himſelf from his native country. Accordingly in 1553, he ſailed for India, with a reſolution never to return. As the ſhip left the Tagus, he exclaimed, in the words of the ſepulchral monument of Scipio Africanus, *Ingrata patria, non poſſidebis oſſa mea!* "Ungrateful

ful country, thou ſhalt not poſſeſs my bones!" But he knew not what evils in the Eaſt would awake the remembrance of his native fields.

When Camoens arrived in India, an expedition was ready to ſail to revenge the king of Cochin on the king of Pimenta. Without any reſt on ſhore after his long voyage he joined this armament, and in the conqueſt of the Alagada iſlands diſplayed his uſual bravery.

In the year following, he attended Manual de Vaſconcello in an expedition to the Red Sea. Here, ſays Faria, as Camoens had no uſe for his ſword, he employed his pen. Nor was his activity confined in the fleet or camp. He viſited Mount Felex and the adjacent inhoſpitable regions of Africa, which he ſo ſtrongly pictures in the Luſiad, and in one of his little pieces where he laments the abſence of his miſtreſs.

When he returned to Goa, he enjoyed a tranquillity which enabled him to beſtow his attention on his Epic Poem. But this ſerenity was interrupted, perhaps by his own imprudence. He wrote ſome ſatires which gave offence; and by order of the viceroy Franciſco Barreto, he was baniſhed to China.

The accompliſhments and manners of Camoens ſoon found him friends, though under the diſgrace of baniſhment. He was appointed commiſſary of the defunct in the iſland of Macao, a Portugueſe ſettlement in the bay of Canton. Here he continued his Luſiad; and here alſo, after five years reſidence, he acquired a fortune, though ſmall, yet equal to his wiſhes. Don Conſtantine de Braganza was now viceroy of India; and Camoens, deſirous to return to Goa, reſigned his charge. In a ſhip, freighted by himſelf, he ſet ſail; but was ſhipwrecked in the gulph near the mouth of the river Mehon on the coaſt of China. All he had acquired was loſt in the waves: his poems, which he held in one hand, while he ſwimmed with the other, were all he found himſelf poſſeſſed of when he ſtood friendleſs on the unknown ſhore. But the natives gave him a moſt humane reception: this he has immortaliſed in the prophetic ſong in the tenth Luſiad; and in the ſeventh he tells us, that here he loſt the wealth which ſatisfied his wiſhes.

Agora da eſperança ja adquirida, &c.
Now bleſt with all the wealth fond hope could crave,
Soon I beheld that wealth beneath the wave
For ever loſt;——
My life, like Judah's heaven-doom'd king of yore,
By miracle prolong'd——

On the banks of the Mehon, he wrote his beautiful paraphraſe of the pſalm, where the Jews, in the fineſt ſtrain of poetry, are repreſented as hanging their harps on the willows by the rivers of Babylon, and weeping their exile from their native country. Here Camoens continued ſome time till an opportunity offered to carry him to Goa. When he arrived at that city, Don Conſtantine de Braganza, the viceroy, whoſe characteriſtic was politeneſs, admitted him into intimate friendſhip, and Camoens was happy till count Redondo aſſumed the government. Thoſe who had formerly procured the baniſhment of the ſatiriſt, were ſilent while Conſtantine was in power; but now they exerted all their arts againſt him. Redondo, when he entered on office, pretended to be the friend of Camoens; yet, with all that unfeeling indifference with which he made his moſt horrible witticiſm on the Zamorim, he ſuffered the innocent man to be thrown into the common priſon. After all the delay of bringing witneſſes, Camoens, in a public trial, fully refuted every accuſation of his conduct while commiſſary at Macao, and his enemies were loaded with ignominy and reproach, But Camoens had ſome creditors; and theſe detained him in priſon a conſiderable time, till the gentlemen of Goa began to be aſhamed that a man of his ſingular merit ſhould experience ſuch treatment among them. He was ſet at liberty; and again he aſſumed the profeſſion of arms, and received the allowance of a gentleman volunteer, a character at this time common in Portugueſe India. Soon after, Pedro Barreto, appointed governor of the fort at Sofala, by high promiſes, allured the poet to attend him thither. The governor of a diſtant fort, in a barbarous country, ſhares in ſome meaſure the fate of an exile. Yet, though the only motive of Baretto was, in this unpleaſant ſituation, to retain the converſation of Camoens at his table, it was his leaſt care to render the life of his gueſt agreeable. Chagrined with his treatment, and a conſiderable time having elapſed in vain dependence upon Barreto, Camoens reſolved to return to his native country. A ſhip, on the homeward voyage, at this time touched at Sofala, and ſeveral gentlemen who were on board were deſirous that Camoens ſhould accompany them. But this the governor ungeneroully endeavoured to prevent, and charged him with a debt for board. Anthony de Cabra, however, and Hector de Sylveyra, paid the demand; and Camoens, ſays Faria, and the honour of Barreto, were ſold together.

After an abſence of 16 years, Camoens, in 1569, returned to Liſbon, unhappy even in his arrival, for the peſtilence then raged in that city, and prevented his publication for three years. At laſt, in 1572, he printed his Luſiad, which in the opening of the firſt book, in a moſt elegant turn of compliment, he addreſſed to his prince, king Sebaſtian then in his 18th year. The king, ſays the French tranſlator, was ſo pleaſed with his merit, that he gave the author a penſion of 4000 reals, on condition that he ſhould reſide at court. But this ſalary, ſays the ſame writer, was withdrawn by cardinal Henry, who ſucceeded to the crown of Portugal, loſt by Sebaſtian at the battle of Alcazar.

Though the great patron of one ſpecies of literature, a ſpecies the reverſe of that of Camoens, certain it is, that the author of the Luſiad was utterly neglected by Henry, under whoſe inglorious reign he died in all the miſery of poverty. By ſome, it is ſaid, he died in an alms-houſe. It appears, however, that he had not even the certainty of ſubſiſtence which theſe houſes provide. He had a black ſervant, who had grown old with him, and who had long experienced his maſters humanity. This grateful Indian, a native of Java, who, according to ſome writers ſaved his maſter's life in the unhappy ſhipwreck where he loſt his effects, begged in the ſtreets of Liſbon for the only man in Portugal on whom God had beſtowed thoſe talents which have a tendency to direct the ſpirit of a downward age. To the eye of a careful obſerver, the fate of Camoens throws great light on that of his country, and will appear ſtrictly connected with it. The ſame ignorance, the ſame degenerated ſpirit, which ſuffered Camoens to depend on his ſhare of the alms begged in the ſtreets by his old hoary ſervant,

vant, the ſame ſpirit which cauſed this, ſunk the kingdom of Portugal into the moſt abject vaſſalage ever experienced by a conquered nation. While the grandees of Portugal were blind to the ruin which impended over them, Camoens beheld it with a pungency of grief which haſtened his exit. In one of his letters he has theſe remarkable words: *Em fim accaberey a vida, e verram todos que fuy efeicoada a minho patria, &c.* "I am ending the courſe of my life, the world will witneſs how I have loved my country. I have returned, not only to die in her boſom, but to die with her."

In this unhappy ſituation, in 1579, in his 62d year, the year after the fatal defeat of Don Sebaſtian, died Louis de Camoens, the greateſt literary genius ever produced by Portugal; in martial courage and ſpirit of honour, nothing inferior to her greateſt heroes. And in a manner ſuitable to the poverty in which he died, was he buried.

CAMOMILE, in botany. See ANTHEMIS.

CAMP, the ground on which an army pitch their tents. It is marked out by the quarter maſter general, who appoints every regiment their ground.

The chief advantages to be minded in chuſing a camp for an army, are, to have it near the water, in a country of forage, where the ſoldiers may find wood for dreſſing their victuals; that it have a free communication with garriſons, and with a country from whence it may be ſupplied with proviſions; and, if poſſible, that it be ſituated on a riſing ground, in a dry gravelly ſoil. Beſides, the advantages of the ground ought to be conſidered, as marſhes, woods, rivers, and incloſures; and if the camp be near the enemy, with no river or marſh to cover it, the army ought to be intrenched. An army always encamps fronting the enemy; and generally in two lines, running parallel about 500 yards diſtance; the horſe and dragoons on the wings, and the foot in the centre; ſometimes a body of two, three, or four brigades is encamped behind the two lines, and is called the *body of reſerve*. The artillery and bread-waggons are generally encamped in the rear of the two lines. A battalion of foot is allowed 80 or 100 paces for its camp; and 30 or 40 for an interval betwixt one battalion and another. A ſquadron of horſe is allowed 30 for its camp, and 30 for an interval, and more if the ground will allow it.

Where the grounds are equally dry, thoſe camps are always the moſt healthful that are pitched on the banks of large rivers; becauſe, in the hot ſeaſon, ſituations of this kind have a ſtream of freſh air from the water, ſerving to carry off the moiſt and putrid exhalations. On the other hand, next to marſhes, the worſt encampments are on low grounds cloſe beſet with trees; for then the air is not only moiſt and hurtful in itſelf, but by ſtagnating becomes more ſuſceptible of corruption. However, let the ſituation of camps be ever ſo good, they are frequently rendered infectious by the putrid effluvia of rotten ſtraw, and the privies of the army; more eſpecially if the bloody flux prevails, in which caſe the beſt method of preventing a general infection, is to leave the ground with the privies, foul ſtraw, and other filth of the camp, behind. This muſt be frequently done, if conſiſtent with the military operations: but when theſe render it improper to change the ground often, the privies ſhould be made deeper than uſual, and once a-day a thick layer of earth thrown into them till the pits are near full; and then they are to be well covered, and ſupplied by others. It may alſo be a proper caution to order the pits to be made either in the front or the rear, as the then ſtationary winds may beſt carry off the effluvia from the camp. Morever, it will be neceſſary to change the ſtraw frequently, as being not only apt to rot, but to retain the infectious ſteams of the ſick. But if freſh ſtraw cannot be procured, more care muſt be taken in airing the tents, as well as the old ſtraw.

The diſpoſition of the Hebrew encampment was at firſt laid out by God himſelf. Their camp was of a quadrangular form, ſurrounded with an incloſure of the height of 10 hands-breadth. It made a ſquare of 12 miles in compaſs about the tabernacle; and within this was another, called the *Levites camp*.

The Greeks had alſo their camps fortified with gates and ditches. The Lacedæmonians made their camp of a round figure, looking upon that as the moſt perfect and defenſible of any form: we are not, however, to imagine, that they thought this form ſo eſſential to a camp, as never to be diſpenſed with when the circumſtances of the place require it. Of the reſt of the Grecian camps, it may be obſerved, that the moſt valiant of the ſoldiers were placed at the extremities, the reſt in the middle. Thus we learn from Homer, that Achilles and Ajax were poſted at the ends of the camp before Troy, as bulwarks on each ſide of the reſt of the princes.

The figure of the Roman camp was a ſquare divided into two principal parts: in the upper parts were the general's pavilion, or prætorium, and the tent of the chief officers; in the lower, thoſe of inferior degree were placed. On one ſide of the prætorium ſtood the quæſtorium, or apartment of the treaſurer of the army; and near this the forum, both for a market place and the aſſembling of councils. On the other ſide of the prætorium were lodged the legati; and below it the tribunes had their quarters, oppoſite to their reſpective legions. Aſide of the tribunes were the præfecti of the foreign troops, over againſt their reſpective wings; and behind theſe were the lodgments of the evocati, then thoſe of the extraordinarii and ablecti equites, which concluded the higher part of the camp. Between the two partitions was a ſpot of ground called *principia*, for the altars and images of the gods, and probably alſo for the chief enſigns. The middle of the lower partition was aſſigned to the Roman horſe; next to them were quartered the triarii; then the principes, and cloſe by them the haſtati; afterwards the foreign horſe, and laſtly the foreign foot. They fortified their camp with a ditch and parapet, which they termed *foſſa* and *vallum*; in the latter ſome diſtinguiſh two parts, viz. the *agger* or earth, and the *ſudes* or wooden ſtakes driven in to ſecure it. The camps were ſometimes ſurrounded by walls made of hewn ſtone; and the tents themſelves formed of the ſame matter.

In the front of the Turkiſh camp are quartered the janizaries and other foot, whoſe tents encompaſs their aga; in the rear are the quarters of the ſpahis and other horſemen. The body of the camp is poſſeſſed by the ſtately tents or pavilions of the vizer or general, rais effendi or chancellor, kahija or ſteward, the teſterdar baſhaw or lord treaſurer, and kapiſlar kahiaſee or maſter of the ceremonies. In the middle of theſe tents is a ſpacious field, wherein are erected a building for the divan, and a haſna or treaſury. When the ground is marked out for a camp, all wait for the pitching of the tent *lailac*, the place where the courts of juſtice are held; it being the diſpoſition of this that is to regulate all the reſt.

The Arabs ſtill live in camps, as the ancient Scenites did. The camp of the Aſſyne Emir, or king of the country about Tadmor, is deſcribed by a traveller who viewed it, as ſpread over a very large plain, and poſſeſſing ſo vaſt a ſpace, that though he had the advantage of a riſing ground he could not ſee the utmoſt extent of it. His own tent was near the middle; ſcarce diſtinguiſhable from the reſt, except that it was bigger, being made, like the others, of a ſort of hair-cloth.

Camp, is alſo uſed by the Siameſe, and ſome other nations in the Eaſt Indies, as the name of the quarters which they aſſign to foreigners who come to trade with them. In theſe camps, every nation forms, as it were, a particular town, where they carry on all their trade, not only keeping all their warehouſes and ſhops there, but alſo live in theſe camps with their whole families. The Europeans, however, are ſo far indulged, that at Siam, and almoſt every where elſe, they may live either in the cities or ſuburbs, as they ſhall judge moſt convenient.

Camp fight, or Kamp fight, in law writers, denotes the trial of a cauſe by duel, or a legal combat of two champions in the field, for deciſion of ſome controverſy.

In the trial by camp fight, the accuſer was, with the peril of his own body, to prove the accuſed guilty; and by offering him his glove, to challenge him to this trial, which the other muſt either accept of, or acknowledge himſelf guilty of the crime whereof he was accuſed.

If it were a crime deſerving death, the camp fight was for life and death: if the offence deſerved only impriſonment, the camp fight was accompliſhed when one combatant had ſubdued the other, ſo as either to make him yield or take him priſoner. The accuſed had liberty to chooſe another to fight in his ſtead, but the accuſer was obliged to perform it in his own perſon, and with equality of weapons. No women were permitted to be ſpectators, nor men under the age of thirteen. The prieſt and the people who looked on, were engaged ſilently in prayer, that the victory might fall to him who had right. None might cry, ſhriek, or give the leaſt ſign; which in ſome places was executed with ſo much ſtrictneſs, that the executioner ſtood ready with an axe to cut off the right hand or foot of the party that ſhould offend herein.

He that, being wounded, yielded himſelf, was at the other's mercy either to be killed or ſuffered to live. But if life were granted him, he was declared infamous by the judge, and diſabled from ever bearing arms, or riding on horſeback.

CAMPAGNA. See Campania.

CAMPAIGN, in the art of war, denotes the ſpace of time that an army keeps the field, or is encamped.—The beginning of every campaign is conſiderably more unhealthy than if the men were to remain in quarters. After the firſt fortnight or three weeks encampment, the ſickneſs decreaſes daily; the moſt infirm being by that time in the hoſpitals, and the weather daily growing warmer. This healthy ſtate continues throughout the ſummer, unleſs the men get wet clothes, or wet beds; in which caſe, a greater or leſs degree of the dyſentery will appear in proportion to the preceding heats. But the moſt ſickly part of the campaign begins about the middle or end of Auguſt, whilſt the days are ſtill hot, but the nights cool and damp, with fogs and dews: then, and not ſooner, the dyſentery prevails; and though its violence is over by the beginning of October, yet the remitting fever gaining ground, continues throughout the reſt of the campaign, and never entirely ceaſes, even in winter-quarters, till the froſts begin. At the beginning of a campaign the ſickneſs is ſo uniform, that the number may be nearly predicted; but for the reſt of the ſeaſon, as the diſeaſes are then of a contagious nature, and depend ſo much upon the heats of ſummer, it is impoſſible to foreſee how many may fall ſick from the beginning to the end of autumn. It is alſo obſerved, that the laſt fortnight of a campaign, if protracted till the beginning of a campaign, is attended with more ſickneſs than the firſt two months encampment: ſo that it is better to take the field a fortnight ſooner, in order to return into winter-quarters ſo much the earlier. As to winter expeditions, though ſevere in appearance, they are attended with little ſickneſs, if the men have ſtrong ſhoes, quarters, fuel, and proviſions. Long marches in ſummer are not without danger, unleſs made in the night, or ſo early in the morning as to be over before the heat of the day.

CAMPANACEÆ, in botany, an order of plants in the *Fragmenta methodi naturalis* of Linnæus, in which are the following genera, viz. convolvulus, ipomæa, polemonium, campanula, roella, viola, &c.*

CAMPANELLA, (Thomas) a famous Italian philoſopher, born at Stilo in Calabria, in 1568. He diſtinguiſhed himſelf by his ſteady proficiency in learning; for at the age of 13 he was a perfect maſter of the ancient orators and poets. His peculiar inclination was to philoſophy, to which he at laſt confined his whole time and ſtudy. In order to arrive at truth, he ſhook off the yoke of authority: by which means the novelty of ſome of his opinions expoſed him to many inconveniences; for at Naples he was thrown into priſon, in which he remained 27 years, and during this confinement wrote his famous work entitled *Atheiſmus triumphatus*. Being at length ſet at liberty, he went to Paris, where he was graciouſly received by Louis XIII. and cardinal Richelieu; the latter procured him a penſion of 2000 livres, and often conſulted him on the affairs of Italy. Campanella paſſed the remainder of his days in a monaſtery of Dominicans at Paris, and died in 1639.

CAMPANI, (Matthew) of Spoletto, curate at Rome, wrote a curious treatiſe on the art of cutting glaſſes for ſpectacles, and made ſeveral improvements in optics, aſſiſted by his brother and pupil Joſeph. He died after 1678.

CAMPANIA, a town of Italy, in the kingdom of Naples, and in the farther principato, with a biſhop's ſee. E. Long. 15. 30. N. Lat. 40. 40.

Campania, or *Campagna di Roma*, anciently Latium, a province of Italy, bounded on the weſt by the

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* See *Botany*, p. 462.

Tiber and the ſea, on the ſouth-weſt by the ſea, on the ſouth by Terra di Lavoro, on the eaſt by Abruzzo, and on the north by Sabina. Though the ſoil is good, it produces little or nothing, on account of the heavy duties on corn; and though the waters are good the air is unwholeſome. It is ſubject to the Pope, and is about 60 miles in length on the Mediterranean ſea.

It hath been generally thought that the air of this country hath ſomething in it peculiarly noxious during the ſummer-time; but Mr Condamine is of opinion that it is not more unhealthy than any other marſhy country. His account follows. "It was after the invaſion of the Goths in the fifth and ſixth centuries that this corruption of the air began to manifeſt itſelf. The bed of the Tiber being covered by the accumulated ruins of the edifices of ancient Rome, could not but raiſe itſelf conſiderably. But what permits us not to doubt of this fact is, that the ancient and well-preſerved pavement of the pantheon and its portico is overflowed every winter; that the water even riſes there ſometimes to the height of eight or ten feet; and that it is not poſſible to ſuppoſe that the ancient Romans ſhould have built a temple in a place ſo low as to be covered with the waters of the Tiber on the leaſt inundation. It is evident, then, that the level of the bed of this river is raiſed ſeveral feet, which could not have happened without forming there a kind of dikes or bars. The choaking up of its canal neceſſarily occaſioned the overflow and reflux of its waters in ſuch places as till then had not been ſubject to inundations: to theſe overflowings of the Tiber were added all the waters that eſcaped out of the ancient aqueducts, the ruins of which are ſtill to be ſeen, and which were entirely broken and deſtroyed by Totila. What need, therefore, of any thing more to infect the air, in a hot climate, than the exhalations of ſuch a maſs of ſtagnating waters, deprived of any diſcharge, and become the receptacle of a thouſand impurities, as well as the grave of ſeveral millions both of men and animals? The evil could not but increaſe from the ſame cauſes while Rome was expoſed to the incurſions and devaſtations of the Lombards, the Normans, and the Saracens, which laſted for ſeveral centuries. The air was become ſo infectious there at the beginning of the 13th century, that Pope Innocent III. wrote, that few people at Rome arrived to the age of forty years, and that nothing was more uncommon there than to ſee a perſon of ſixty. A very ſhort time after, the popes transferred the ſeat of their reſidence to Avignon: during the ſeventy-two years they remained there, Rome became a deſert; the monaſteries in it were converted into ſtables; and Gregory XI. on his return to Rome in 1336, hardly counted there 30,000 inhabitants. At his death began the troubles of the great ſchiſm in the weſt, which continued for upwards of 50 years. Martin V. in whom this ſchiſm ended in the year 1429, and his firſt ſucceſſors, were able to make but feeble efforts againſt ſo inveterate an evil. It was not till the beginning of the 16th century that Leo X. under whom Rome began to reſume her wonted ſplendor, gave himſelf ſome trouble about re-eſtabliſhing the ſalubrity of the air: but the city being ſhortly after beſieged twice ſucceſſively by the emperor Charles V. ſaw itſelf plunged again into all its old calamities; and from 85,000 inhabitants, which it contained under Leo X. it was reduced under Clement VIII. to 32,000. In ſhort, it is only ſince the time of Pius V. and Sextus V. at the end of the 16th century, that the popes have conſtantly employed the neceſſary methods for purifying the air of Rome and its environs, by procuring proper diſcharges for the waters, drying up humid and marſhy grounds, and covering the banks of the Tiber and other places reputed uninhabitable with ſuperb edifices. Since that time a perſon may dwell at Rome, and go in or out of it at all ſeaſons of the year. At the beginning, however, of the preſent century, they were ſtill afraid to lie out of the city in ſummer, when they had reſided there; as they were alſo to return to it, when once they had quitted it. They never ventured to ſleep at Rome, even in broad day, in any other houſe than their own. They are greatly relaxed at preſent from theſe ancient ſcruples: I have ſeen cardinals, in the months of July and Auguſt, go from Rome to lie at Fraſcati, Tivoli, Albano, &c. and return the next or the following days to the city, without any detriment to their health: I have myſelf tried all theſe experiments, without ſuffering the leaſt inconvenience from them: we have even ſeen, in the laſt war in Italy, two armies encamped under the walls of Rome at the time when the heats were moſt violent. Yet, notwithſtanding all this, the greateſt part of the country people dare not ſtill venture to lie during that ſeaſon of the year, nor even as much as ſleep in a carriage, in any part of the territory comprehended under the name of the *Campagna of Rome*."

CAMPANIFORM, or **CAMPANULATED**, an appellation given to flowers reſembling a bell.

CAMPANINI, a name given to an Italian marble dug out of the mountains of Carrara, becauſe, when it is worked, it ſounds like a bell.

CAMPANULA, or BELL-FLOWER; a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 29th order, *Campanaceæ*. The corolla is campanulated, with its fundus cloſed up by the valves that ſupport the ſtamina; the ſtigma is trifid; the capſule inferior, or below the receptacle of the flower, opening and emitting the ſeeds by lateral pores.

Species. Of this genus there are no fewer than 41 ſpecies enumerated by botanical writers; but the following are the moſt worthy of attention. 1. The pyramidalis hath thick tuberous roots filled with a milky juice; it ſends out ſtrong, ſmooth, upright ſtalks, which riſe to the height of four feet, garniſhed with ſmooth oblong leaves a little indented at the edges. The flowers are produced from the ſide of the ſtalks, and are regularly ſet on for more than half their length, forming a ſort of pyramid; theſe are large, open, and ſhaped like a bell. The moſt common colour of the flowers is blue, though ſome are white, but the former are moſt eſteemed. 2. The decurrens, or peach-leaved bell-flower, is a native of the northern parts of Europe; of this there are ſome with white, and ſome with blue flowers, and ſome with double flowers of both colours. Theſe laſt have of late been propagated in ſuch abundance as to have almoſt baniſhed from the gardens thoſe with ſingle flowers. 3. The medium, commonly called *Canterbury bell-flower*, is a biennial plant, which periſhes ſoon after it has ripened its ſeeds. It grows naturally in the woods of Italy and Auſtria; but is cultivated in the Britiſh gardens for the beauty of its flowers, which are blue, purple, white, and ſtriped, with double flowers of all the colours. This ſpecies hath oblong, rough, hairy leaves, ſerrated on their edges; from the centre of theſe riſes a ſtiff, hairy, furrowed ſtalk, about two feet high, ſending out ſeveral lateral branches, garniſhed with long, narrow, hairy leaves ſawed on their edges. From the ſetting on of theſe leaves proceed the footſtalks of the flower; thoſe which are on the lower part of the ſtalk and branches diminiſhing gradually in their length upward, and thereby forming a ſort of pyramid. The flowers of this kind are very large, ſo make a fine appearance. The ſeeds ripen in September, and the plants decay ſoon after. 4. The trachelium, with nettle leaves, hath a perennial root, which ſends up ſeveral ſtiff hairy ſtalks having two ribs or angles. Theſe put out a few ſhort ſide-branches, garniſhed with oblong hairy leaves deeply ſawed on their edges. Toward the upper part of the ſtalks, the flowers came out alternately upon ſhort trifid foot-ſtalks having hairy empalements. The colours of the flowers are a deep and a pale blue and white, with double flowers of the ſame; the double flowered kind only merit a place in gardens. 5. The latifolia, or greateſt bell-flower, hath a perennial root, compoſed of many fleſhy fibres that abound with a milky juice. From theſe ariſe ſeveral ſtrong, round ſingle ſtalks, which never put out branches, but are garniſhed with oval ſpear-ſhaped leaves ſlightly indented on their edges. Towards the upper part of the ſtalk the flowers come out ſingly upon ſhort foot-ſtalks; their colours are blue, purple, and white. 6. The rapunculus, or rampion, hath roundiſh fleſhy roots, which are eatable, and much cultivated in France for ſallads; ſome years paſt it was cultivated in the Engliſh gardens for the ſame purpoſe, but is now generally neglected. It is a native of Britain: but the roots of the wild ſort never grow to half the ſize of thoſe which are cultivated. 7. The ſpeculum, with yellow eye-bright leaves, is an annual plant with ſlender ſtalks riſing a foot high, branching out on every ſide, and garniſhed with oblong leaves a little curled on their edges; from the wings of the leaves come out the flowers ſitting cloſe to the ſtalks, which are of a beautiful purple inclining to a violet colour. In the evening, they contract and fold into a pentagonal figure; from whence it is by ſome called *viola pentagonia*, or *five cornered violet*. 8. The hybrida, or common Venus looking-glaſs. This ſeldom riſes more than ſix inches high, with a ſtalk branching from the bottom upward, and garniſhed with oval leaves ſitting cloſe to the ſtalks, from the baſe of which the branches are produced, which are terminated by flowers very like the former ſort. This was formerly cultivated in the gardens: but ſince the former kind hath been introduced, it hath almoſt ſupplanted this; for the other is a much taller plant, and the flowers larger, though of a leſs beautiful colour. 9. The canarienſis, with an orach leaf and tuberous root, is a native of the Canary iſlands. It hath a thick fleſhy root of an irregular form; ſometimes running downward like a parſnip, at other times dividing into ſeveral knobs near the top; and when any part of the root is broken, there iſſues out a milky juice at the wound. From the head or crown of the root ariſe one, two, three, or more ſtalks, in proportion to the ſize of the root: but that in the centre is generally larger and riſes higher, than the others. Theſe ſtalks are very tender, round, and of a pale green; their joints are far diſtant from each other; and when the roots are ſtrong, the ſtalks will riſe to ten feet high, ſending out ſeveral lateral branches. At each joint they are garniſhed with two, three or four ſpear-ſhaped leaves, with a ſharp pointed beard on each ſide. They are of a ſea-green; and, when they firſt come out, are covered ſlightly with an aſh-coloured pounce. From the joints of the ſtalk the flowers are produced, which are of the perfect bell-ſhape, and hang downward; they are of a flame-colour, marked with ſtripes of a browniſh red: the flower is divided into five parts; at the bottom of each is ſeated a nectarium, covered with a white tranſparent ſkin, much reſembling thoſe of the crown imperial, but ſmaller. The flowers begin to open in the beginning of October, and there is often a ſucceſſion of them till March. The ſtalks decay to the root in June, and new ones ſpring up in Auguſt.

Culture, &c. The firſt ſort is cultivated to adorn halls, and to place before chimnies in the ſummer when it is in flower, for which purpoſe there is no plant more proper; for when the roots are ſtrong, they will ſend out four or five ſtalks which will riſe as many feet high, and are adorned with flowers a great part of their length. When the flowers begin to open, the pots are removed into the rooms, where, being ſhaded from the ſun and rain, the flowers will continue long in beauty; and if the pots are every night removed into a more airy ſituation, but not expoſed to heavy rains, the flowers will be fairer, and continue much longer in beauty. Thoſe plants which are thus treated, are ſeldom fit for the purpoſe the following ſeaſon; therefore a ſupply of young ones muſt be annually raiſed. The plant may be propagated either by dividing the roots or by ſeeds, but the latter produce the moſt vigorous and beſt flowering plants. The ſeeds muſt be ſown in autumn in boxes or pots filled with light undunged earth, and placed in the open air till the froſt or hard rains come on: then they muſt be placed under a hot-bed frame, where they may be ſheltered from both; but in mild weather the glaſſes ſhould be drawn off every day, that they may enjoy the free air: with this management the plants will come up early in the ſpring, and then they muſt be removed out of the frame, placing them firſt in a warm ſituation; but, when the ſeaſon becomes warm, they ſhould be ſo placed as to have the morning ſun only. In September the leaves of the plants will begin to decay, at which time they ſhould be tranſplanted; therefore there muſt be one or two beds prepared, in proportion to the number of plants. Theſe beds muſt be in a warm ſituation, and the earth light, ſandy, and without any mixture of dung. The plants muſt then be taken out of the pots or caſes very carefully, ſo as not to bruiſe their roots; for they are very tender, and on being broken the milky juice will flow out plentifully, which will greatly weaken them. Theſe ſhould be planted at about ſix inches diſtance each way, with the head or crown of the root half an inch below the ſurface. If the ſeaſon proves dry, they muſt be gently watered three or four days after they are planted; the beds ſhould alſo be covered with mats in the day time, but which ſhould be taken off at night to let the dew fall on the plants. Towards the end of November the beds ſhould be covered over with ſome old tanners bark to keep out the froſt; and where there is not conveniency for covering them with frames, they ſhould be arched over with hoops, that in ſevere weather they may be covered with mats. In the ſpring the mats muſt be removed, and, the following ſummer, the plants kept free from weeds. In autumn the earth ſhould be ſtirred between them, ſome freſh earth ſpread over the beds, and the plants covered in winter as before. In theſe beds the plants may remain two years, during which time they are to be treated in the manner before directed. The roots will now be ſtrong enough to flower; ſo, in September they ſhould be carefully taken up, and ſome of the moſt promiſing carefully planted in pots; the others may be planted in warm borders, or in a freſh bed, at a greater diſtance than before, to allow them room to grow. Thoſe plants which are potted ſhould be ſheltered in winter from great rains and hard froſts, otherwiſe they will be in danger of rotting, or at leaſt will be ſo weakened as not to flower with any ſtrength the following ſummer; and thoſe which are planted in the full ground, ſhould have ſome old tanners bark laid round them to prevent the froſt from getting at the roots. The ſecond, third, fourth, and fifth ſorts are ſo eaſily propagated by parting the roots, or by ſeeds, that no particular directions for their culture need be given. The ſixth ſort, which is cultivated for its eſculent roots, may be propagated by ſeeds, which are to be ſown in a ſhady border; and when the plants are about an inch high, the ground ſhall be hoed as is practiſed for onions, to cut up the weeds, and thin the plants, to the diſtance of three or four inches; and when the weeds come up again they muſt be hoed over to deſtroy them: this, if well performed in dry weather, will make the ground clean for a long time; ſo that, being three times repeated, it will keep the plants clean till winter, which is the ſeaſon for eating the roots, when they may be taken up for uſe as wanted. They will continue good till April, at which time they ſend out their ſtalks, when the roots become hard and unfit for uſe.—The ſeventh and eighth ſorts are eaſily propagated by ſeeds, which they produce in plenty. If theſe, and the Venus navelwort, dwarf lychnis, candy-tuft, and other low annual flowers, are properly mixed in the border of the flower-garden, and ſown at two or three different ſeaſons, ſo as to have a ſucceſſion of them in flower, they will make an agreeable variety. If theſe ſeeds are ſown in autumn, the plants will flower early in the ſpring; but if ſown in the ſpring, they will not flower till the middle of June; and if a third ſowing is performed about the middle of May, the plants will flower in Auguſt; but from theſe, good ſeeds muſt not be expected.—The ninth ſort is propagated by parting the roots, which muſt be done with caution: for if they are broken or wounded, the milky juice will flow out plentifully; and if planted before the wounds are ſkinned over, it occaſions their rotting: therefore when any of them are broken, they ſhould be laid in the green-houſe a few days to heal. Theſe roots muſt not be too often parted, if they are expected to flower well; for by this means they are weakened. The beſt time for tranſplanting and parting their roots is in July, ſoon after the ſtalks are decayed. They muſt not be planted in rich earth, otherwiſe they will be very luxuriant in branches, and have but few flowers. They ſucceed beſt in a light ſandy loam, mixed with a fourth part of ſcreened lime-rubbiſh: when the roots are firſt planted the pots ſhould be placed in the ſhade, and unleſs the ſeaſon is very dry they ſhould not be watered; for during the time they are inactive, wet is very injurious to them. About the middle of Auguſt, the roots will begin to put out fibres; at which time, if the pots are placed under a hot bed frame, and, as the nights grow cool, covered with the glaſſes, but opened every day to enjoy the free air, it will greatly forward them for flowering, and increaſe their ſtrength: when the ſtalks appear, they muſt be now and then refreſhed with water; but it muſt not be given too often, nor in too great quantity. The plants thus managed, by the middle of September will have grown ſo tall as not to be kept any longer under the glaſs frame; they muſt, therefore, be removed into a dry airy glaſs-caſe, where they may enjoy the free air in mild weather, but ſcreened from the cold. During the winter ſeaſon they muſt be frequently refreſhed with water, and guarded from froſt; and, in the ſpring, when the ſtalks begin to decay, the pots ſhould be ſet abroad in the ſhade, and not watered.

CAMPBELL, (Archiband) earl and marquis of Argyle, was the ſon of Archibald earl of Argyle, by the lady Anne Douglaſs, daughter of William earl of Morton. He was born in the year 1598; and educated in the profeſſion of the Proteſtant religion, according to the ſtricteſt rules of the church of Scotland, as it was eſtabliſhed immediately after the reformation. During the commonwealth he was induced to ſubmit to its authority. Upon the reſtoration, he was tried for his compliance; a crime common to him with the whole nation, and ſuch a one as the moſt loyal and affectionate ſubject might frequently by violence be induced to commit. To make this compliance appear the more voluntary and hearty, there were produced in court letters which he had wrote to Albermarle, while that general governed Scotland, and which contained expreſſions of the moſt cordial attachment to the eſtabliſhed government. But, beſides the general indignation excited by Albermarle's diſcovery of this private correſpondence, men thought, that even the higheſt demonſtrations of affection might, during jealous times, be exacted as a neceſſary mark of compliance from a perſon of ſuch diſtinction as Argyle; and could not, by any equitable conſtruction, imply the crime of treaſon. The parliament, however, ſcrupled not to paſs ſentence upon him, and he ſuffered with great conſtancy and courage.

Campbell, (Archibald) earl of Argyle, ſon to the former, had from his youth diſtinguiſhed himſelf by his loyalty and his attachment to the royal family. Tho' his father was head of the covenanters, he himſelf refuſed to concur in any of their meaſures; and when a commiſſion of colonel was given him by the convention of ſtates, he forbore to act upon it till it ſhould be ratified by the king. By his reſpectful behaviour, as well as by his ſervices, he made himſelf acceptable to Charles when that prince was in Scotland and even after the battle of Worceſter, all the misfortunes which attended the royal cauſe could not engage him to deſert it. Under Middeton he obſtinately perſevered to haraſs and infeſt the victorious Engliſh; and it was not till he received orders from that general, that he would ſubmit to accept of a capitulation. Such jealouſy of his loyal attachments was entertained by the commonwealth and protector, that a pretence was ſoon after fallen upon to commit him to priſon; and his confinement was rigorouſly continued till the reſtoration. The king, ſenſible of his ſervices, had remitted to him his father's forfeiture, and created him earl of Argyle; and when a moſt unjuſt ſentence was paſſed upon him by the Scots parliament, Charles had anew remitted it. In the ſubſequent part of this reign Argyle behaved himſelf dutifully; and though he ſeemed not diſpoſed to go all lengths with the court, he always appeared, even in his oppoſition, a man of mild diſpoſitions and peaceable deportment.

A parliament was ſummoned at Edinburgh in ſummer 1681, and the duke was appointed commiſſioner. Beſides granting money to the king, and voting the indefeaſible right of ſucceſſion, this parliament enacted a teſt, which all perſons poſſeſſed of offices, civil, military, or eccleſiaſtical, were bound to take. In this teſt the king's ſupremacy was aſſerted, the covenant renounced, paſſive obedience aſſented to, and all obligations diſclaimed of endeavouring any alteration in civil or eccleſiaſtical eſtabliſhments. This was the ſtate of the teſt as propoſed by the courtiers; but the country party propoſed alſo a clauſe of adherence to the Proteſtant religion, which could not with decency be rejected. The whole was of an enormous length, conſidered as an oath; and, what was worſe, a confeſſion of faith was there ratified which had been impoſed a little after the reformation, and which contained many articles altogether forged by the parliament and nation. Among others, the doctrine of reſiſtance was inculcated; ſo that the teſt being voted in a hury, was found on examination to be a medley of abſurdity and contradiction. Though the courtiers could not reject the clauſe of adhering to the Proteſtant religion, they propoſed, as a requiſite mark of reſpect, that all princes of the blood ſhould be exempted from taking that oath. This exception was zealouſly oppoſed by Argyle; who obſerved that the ſole danger to be dreaded for the Proteſtant religion muſt proceed from the perverſion of the royal family. By inſiſting on ſuch topics, he drew on himſelf the ſecret indignation of the duke of York, of which he ſoon felt the fatal conſequences.

When Argyle took the teſt as a privy counſellor, he ſubjoined, in the duke's preſence, an explanation which he had before hand communicated to that prince, and which he believed to have been approved by him. It was in theſe words. "I have conſidered the teſt, and am very deſirous of giving obedience as far as I can. I am confident that the parliament never intended to impoſe contradictory oaths: therefore I think no man can explain it but for himſelf. Accordingly I take it as far as it is conſiſtent with itſelf and the Proteſtant religion. And I do declare that I mean not to bind myſelf, in my ſtation, and in a lawful way, from wiſhing and endeavouring any alteration, which I think to the advantage of church or ſtate, and not repugnant to the Proteſtant religion and my loyalty: and this I underſtand as a part of my oath." The duke, as was natural, heard it with great tranquillity: no one took the leaſt offence: Argyle was admitted to ſit that day in council: and it was impoſſible to imagine that a capital offence had been committed, where occaſion ſeemed not to have been given ſo much as for a frown or reprimand.

Argyle was much ſurpriſed a few days after, to find that a warrant was iſſued for committing him to priſon; that he was indicted for high treaſon, leaſing-making, and perjury; and that from the innocent words abovementioned an accuſation was extracted, by which he was to forfeit life, honours, and fortune. It is needleſs to enter into particulars, where the iniquity of the whole is ſo evidently apparent. Though the ſword of juſtice was diſplayed, even her ſemblance was not put on; and the forms of law were preſerved to ſanctify, or rather aggravate, the oppreſſion. Of five judges, three did not ſcruple to find the guilt of treaſon and leaſing-making to be incurred by the priſoner: a jury of 15 noblemen gave verdict againſt him; and the king being conſulted, ordered the ſentence to be pronounced, but the execution of it to be ſuſpended till further orders. Argyle, however, ſaw no reaſon to truſt to the juſtice or mercy of ſuch enemies: He made his eſcape from priſon, and till he could find a ſhip for Holland he concealed himſelf during ſome time in London. The king heard of his lurking-place, but would not ſuffer him to be arreſted. All the parts, however, of his ſentence, ſo far as the government in Scotland had power, were rigorouſly executed; his eſtate confiſcated, his arms reverſed and torn. Having got over to Holland, he remained there during the remaining part of the reign of Charles II. But thinking himſelf at liberty, before the coronation of James II. to exert himſelf in order to recover the conſtitution by force of arms, he concerted meaſures with the duke of Monmouth, and went into Scotland, to aſſemble his friends: but not meeting with the ſucceſs he expected, he was taken priſoner; and being carried to Edinburgh, was beheaded upon his former unjuſt ſentence, June 30, 1615. He ſhowed great conſtancy and courage under his misfortunes: on the day of his death he ate his dinner very cheerfully: and, according to cuſtom, ſlept after it a quarter of an hour or more, very ſoundly. At the place of execution, he made a ſhort, grave, and religious ſpeech; and, after ſolemnly declaring that he forgave all his enemies, ſubmitted to death with great firmneſs.

Campbell, (Archibald) firſt duke of Argyle, ſon to the preceding, was an active promoter of the revolution. He came over with the Prince of Orange; was admitted into the convention as Earl of Argyle, tho' his father's attainder was not reverſed; and in the claim of rights the ſentence againſt him was declared to be, what moſt certainly it was, a reproach upon the nation. The eſtabliſhment of the crown upon the Prince and Princeſs of Orange being carried by a great majority in the Scottiſh convention, the earl was ſent from the nobility with Sir James Montgomery and Sir John Dalrymple from the barons and boroughs, to offer the crown, in the name of the convention, to their Majeſties, and tendered them the coronation oath; for which, and many other eminent ſervices, he was admitted a member of the privy council, and, in 1690, made one of the Lords of the Treaſury. He was afterwards made a colonel of the Scots horſe guards; and, in 1694, one of the extraordinary Lords of Seſſion. He was likewiſe created Duke of Argyle, Marquis of Kintyre and Lorn, Earl of Campbell and Cowell, Viſcount of Lochow and Glengla, Lord Inverary, Mull, Morvern, and Terrey, by letters-patent, bearing date at Kenſington the 23d of June 1701. He ſent over a regiment to Flanders for king William's ſervice, the officers of which were chiefly of his own name and family, who bravely diſtinguiſhed themſelves through the whole courſe of the war. He married Elizabeth, daughter of Sir Lionel Talmaſh of Helmingham in the county of Suffolk, by Elizabeth ducheſs of Lauderdale his wife, daughter and heir of William Murray earl of Dyſart, by whom he left iſſue two ſons and a daughter; namely, John duke of Argyle, the ſubject of the next article; Archibald, who ſucceeded his brother as Duke of Argyle; and Lady Anne, married to James Stuart, ſecond earl of Bute, by whom ſhe had the preſent earl.

Campbell, (John) ſecond duke of Argyle, and alſo duke of Greenwich and baron of Chatham, ſon to the ſubject of the preceding article, was born on the 10th of October 1680; and, on the very day when his grandfather ſuffered at Edinburgh, fell out of a window three pair of ſtairs high without receiving any hurt. At the age of 15, he had made a conſiderable progreſs in claſſical learning. His father then perceived and encouraged his military diſpoſition, and introduced him to king William, who in the year 1694 gave him the command of a regiment. In this ſituation he remained till the death of his father in 1703; when becoming duke of Argyle, he was ſoon after ſworn of queen Anne's privy council, made captain of the Scotch horſe guards, and appointed one of the extraordinary lords of ſeſſion. In 1704, her Majeſty reviving the Scottiſh order of the thiſtle, his grace was inſtalled one of the knights of that order, and was ſoon after appointed high-commiſſioner to the Scotch parliament; where, being of great ſervice in promoting the intended union, he was on his return created a peer of England, by the titles of *baron of Chatham* and *earl of Greenwich*, and in 1710 was made knight of the garter. His grace firſt diſtinguiſhed himſelf in his military capacity at the battle of Oudenard; where he commanded as brigadier-general, with all the bravery of youth and the conduct of a veteran officer. He was preſent under the duke of Marlborough at the ſiege of Ghent, and took poſſeſſion of the town. He had alſo a conſiderable ſhare in the victory obtained over the French at the battle of Malplaquet, by diſlodging them from the wood of Sart, and gaining a poſt of great conſequence. In this ſharp engagement, ſeveral muſket-balls paſſed through the duke's clothes, hat, and peruke. Soon after this hot action, he was ſent to take the command in Spain; and after the reduction of Port Mahon, he returned to England. His grace having now a ſeat in the houſe of lords, he cenſured the meaſures of the miniſtry with ſuch freedom, that all his places were diſpoſed of to other noblemen: but at the acceſſion of George I. he recovered his influence. At the breaking out of the rebellion in 1715, he was made commander in chief of his majeſty's forces in North Britain; and was the principal means and cauſe of the total extinction, at that time, of the rebellion in Scotland, without much bloodſhed. In direct oppoſition to him, or that part of the army he commanded, at the head of all his Campbells, was placed Campbell earl of Braidalbin, of the ſame family and kindred, by ſome fatal error that ever miſguided and miſled that unhappy family of the Stuarts and all its adherents. The conſequence was, that both ſets of Campbells, from family affection, refuſed to ſtrike a ſtroke, and retired out of the battle. He arrived at London March 6th 1716, and was in high favour: but, to the ſurpriſe of people of all ranks, he was in a few months diveſted of all his employments: and from this period to the year 1718, he ſignalized himſelf in a civil capacity, by his uncorrupted patriotiſm and manly eloquence. In the beginning of the year 1719, he was again admitted into favour, appointed lord-ſteward of the houſhold, and in April following was created duke of Greenwich. He continued in the adminiſtration during all the remaining part of that reign; and, after his late majeſty's acceſſion, till April 1740; when he delivered a ſpeech with ſuch warmth, that the miniſtry being highly offended, he was again diſmiſſed from his employments. To theſe, however, on the change of the miniſtry, he was ſoon reſtored; but not approving of the meaſures of the new miniſtry more than thoſe of the old, he gave up all his poſts for the laſt time, and never after engaged in affairs of ſtate. He now enjoyed privacy and retirement; and died of a paralytic diſorder on the 4th of October 1743. To the memory of his grace a very noble monument was erected in Weſtminſter-Abbey, executed by the ingenious Roubilliac.

The duke of Argyle, though never firſt miniſter, was a very able ſtateſman and politician, moſt ſteadily fixed in thoſe principles he believed to be right, and not to be ſhaken or changed. His delicacy and honour were ſo great, that it hurt him to be even ſuſpected; witneſs that application ſaid to be made to him by one of the adherents of the Stuart family before the laſt rebellion in order to gain his intereſt, which was conſiderable both in Scotland and England. He immediately ſent the letter to the ſecretary of ſtate; and it vexed him much even to have an application made him, leſt any perſon ſhould think him capable of acting a double part. When he thought meaſures wrong or corrupt, he cared not who was the author, however great or powerful he might be; witneſs his boldly attacking the great duke of Marlborough in the houſe of lords, about his forage and army contracts in Flanders, in the very zenith of his power and popularity, though in all other reſpects he was the moſt able general of his time. The duke of Argyle, on all occaſions, ſpoke well, with a firm, manly, and noble eloquence; and ſeems to deſerve the character given of him by Pope:

> Argyle the ſtate's whole thunder born to weild,
> And ſhake alike the ſenate and the field.

In private life, the duke's conduct was highly exemplary. He was an affectionate huſband and an indulgent maſter. He ſeldom parted with his ſervants till age had rendered them incapable of their employments; and then he made proviſion for their ſubſiſtence. He was liberal to the poor, and particularly to perſons of merit in diſtreſs: but though he was ready to patronize deſerving perſons, he was extremely caurious not to deceive any by laviſh promiſes, or leading them to form vain expectations. He was a ſtrict œconomiſt, and paid his tradeſmen punctually every month; and though he maintained the dignity of his rank, he took care that no part of his income ſhould be waſted in empty pomp or unneceſſary expences. He was twice married; and left five daughters, but no male iſſue. The titles of duke and earl of Greenwich and baron of Chatham became extinct at his death; but in his other titles he was ſucceeded by his brother Archibald earl of Ila, the ſubject of the next article.

Campbell, (Archibald) third Duke of Argyle, brother, to the ſubject of the preceding article, was born at Hamhouſe, in England, in June 1682, and was educated at the Univerſity of Glaſgow. He afterwards applied himſelf to the ſtudy of the law at Utretcht; but upon his father's being created a Duke he betook himſelf to a military life, and ſerved ſome time under the duke of Marlborough. Upon quitting the army, in which he did not long remain, he applied to the acquiſition of that knowledge which would enable him to make a figure in the political world. In 1705, he was conſtituted treaſurer of Scotland, and made a conſiderable figure in Parliament, though he was not more than twenty-three years of age. In 1706, he was appointed one of the commiſſioners for treating of the Union; and the ſame year was created Lord Ornſay, Dunoon, and Arrois, Viſcount and Earl of Iſlay. In 1708, he was made an extraordinary Lord of Seſſion; and when the Union was effected, he was choſen one of the Sixteen Peers for Scotland, in the firſt Parliament of Great-Britain; and was conſtantly elected to every future Parliament till his death, except the fourth. In 1710, he was made Juſtice-General of Scotland. In 1711, he was called to the privy council; and upon the acceſſion of George I. he was nominated lord-regiſter of Scotland. When the rebellion broke out in 1715, he again betook himſelf to arms, in defence of the houſe of Hanover, and by his prudent conduct in the Weſt Highlands, he prevented General Gordon, at the head of three thouſand men, from penetrating into the country, and raiſing levies. He afterwards joined his brother at Stirling, and was wounded at the battle of Dumblain. In 1725, he was appointed keeper of the privy ſeal; and, from this time, he was entruſted with the management of Scottiſh affairs. In 1734, upon his reſigning the privy ſeal, he was made keeper of the great ſeal, which office he enjoyed till his death. Upon the deceaſe of his brother, he became duke of Argyle, hereditary juſtice general, lieutenant, ſheriff, and commiſſary of Argyleſhire and the Weſtern Iſles, hereditary great maſter of the houſhold, hereditary keeper of Dunſtaffnage, Carrick, and ſeveral other caſtles. He was alſo chancelor of the Univerſity of Aberdeen; and laboured to promote the intereſt of that, as well as of the other univerſities of Scotland. He particularly encouraged the ſchool of phyſic at Edinburgh, which has now acquired ſo high a reputation. Having the chief management of Scotch affairs, he was alſo extremely attentive to promote the trade, manufactures, and improvements of his country. It was by his advice that, after the rebellion in 1745, the Highlanders were employed in the royal army. He was a man of great endowments both natural and acquired, well verſed in the laws of his country, and poſſeſſed conſiderable parliamentary abilities. He was likewiſe eminent for his ſkill in human nature, had great talents for converſation, and had collected one of the moſt valuable private libraries in Great-Britain. He built himſelf a very magnificient ſeat at Inverary. The faculties of his mind continued ſound and vigorous till his death, which happened ſuddenly on the 15th of April 1761, in the 79th year of his age. He was married, but had no iſſue; and was ſucceeded in his titles and the eſtates of his family by John Campbell, fourth duke of Argyle, ſon of the honourable John Campbell of Mammore, who was the ſecond ſon of Archibald the ninth earl of Argyle.

The family of Argyle was heritable juſtice-general for Scotland till aboliſhed by the juriſdiction act. They are ſtill heritable maſters of the king's houſhould in Scotland, and keepers of Dunſtaffnage and Carrick.

Campbell, (John) an eminent hiſtorical, biographical, and political writer, was born at Edinburgh, March 8, 1707-8. His father, Robert Campbell of Glenlyon, Eſq; was captain of horſe in a regiment commanded by the then earl of Hyndford, and his mother Elizabeth, daughter of —— Smith, Eſq; of Windſor in Berkſhire, had the honour of claiming a deſcent from the poet Waller. Our author, their fourth ſon, was at the age of five years brought from Scotland in Windſor, where he received the firſt principles of his education; and at a proper age, he was placed out as a clerk to an attorney, being intended for the law. This profeſſion, however, he never followed; but by a cloſe application to the acquiſition of knowledge of various kinds, became qualified to appear with great advantage in the literary world. In 1736, before he had completed his 30th year, he gave to the public, in two volumes folio, "The Military Hiſtory of Prince Eugene and the Duke of Marlborough," enriched with maps, plans, and cuts. The reputation hence acquired, occaſioned him ſoon after to be ſolicited to take a part in the "Ancient Univerſal Hiſtory." Whilſt employed in this capital work Mr Campbell found leiſure to entertain the world with other productions. In 1739, he publiſhed the "Travels and Adventures of Edward Brown, Eſq;" 8vo. In the ſame year appeared his, "Memoirs of the Baſhaw Duke de Ripperda," 8vo, reprinted with improvements, 1740. Theſe memoirs were followed, in 1741, by the "Conciſe Hiſtory of Spaniſh America," 8vo. In 1742, he was the author of "A Letter to a Friend in the Country, on the Publication of Thurloe's State Papers;" giving an account of their diſcovery, importance and utility. The ſame year was diſtinguiſhed by the appearance of the 1ſt and 2d volumes of his "Lives of the Engliſh Admirals, and other eminent Britiſh Seamen." The two remaining volumes were completed in 1744; and the whole, not long after, was tranſlated into German. This was the firſt of Mr Campbell's works to which he prefixed his name; and it is a performance of great and acknowledged merit. In 1743, he publiſhed "Hermippus revived;" a ſecond edition of which, much improved and enlarged, came out in 1749, under the following title: "Hermippus Redivivus: or the Sage's Triumph over old Age and the Grave. Wherein a method is laid down for prolonging the life and vigour of man. Including a commentary upon an ancient Inſcription, in which this great ſecret is revealed; ſupported

ported by numerous authorities. The whole interſperſed with a great variety of remarkable and well-atteſted relations." This extraordinary tract had its origin in a foreign publication: but it was wrought up to perfection by the additional ingenuity and learning of Mr Campbell. In 1744, he gave to the public in two volumes folio, his "Voyages and Travels," on Dr Harris's plan, being a very diſtinguiſhed improvement of that collection which had appeared in 1705. The time and care employed by Mr Campbell in this important undertaking, did not prevent his engaging in another great work, the "Biographia Britannica," which began to be publiſhed in weekly numbers in 1745, and extended to ſeven volumes folio: but our author's articles were only in the firſt four volumes; of which Dr Kippis obſerves, they conſtitute the prime merit.

When the late Mr Dodſley formed the deſign of "The Preceptor," which appeared in 1748, Mr Campbell was to aſſiſt in the undertaking; and the parts written by him were the Introduction to Chronology, and the Diſcourſe on Trade and Commerce, both of which diſplayed an extenſive fund of knowledge upon theſe ſubjects. In 1750, he publiſhed the firſt ſeparate edition of his "Preſent State of Europe;" a work which had been originally begun in 1746, in the "Muſeum," a very valuable periodical performance printed for Dodſley. There is no production of our author's that hath met with a better reception. It has gone through ſix editions, and fully deſerved this encouragement. The next great undertaking which called for the exertion of our author's abilities and learning, was "The Modern Univerſal Hiſtory." This extenſive work was publiſhed, from time to time, in detached parts, till it amounted to 16 volumes folio; and a ſecond edition of it, 8vo, began to make its appearance in 1759. The parts of it written by Mr Campbell were the hiſtories of the Portugueſe, Dutch Spaniſh, French, Swediſh, Daniſh, and Oſtend Settlements in the Eaſt-Indies; and the Hiſtories of the Kingdoms of Spain, Portugal, Algarve, Navarre, and that of France, from Clovis to 1656. As our author had thus diſtinguiſhed himſelf in the literary world, the degree of LL.D. was very properly and honourably conferred upon him, June 18, 1754, by the univerſity of Glaſgow.

His principal and favourite work was, "A political ſurvey of Great-Britain," 2 vol, 4to, publiſhed a ſhort time before his death; in which the extent of his knowledge, and his patriotic ſpirit, are equally conſpicuous. Dr Campbell's reputation was not confined to his own country, but extended to the remoteſt parts of Europe. As a ſtriking inſtance of this, it may be mentioned, that in the ſpring of 1774, the empreſs of Ruſſia was pleaſed to honour him with the preſent of her picture, drawn in the robes worn in that country in the days of John Baſiliowitz, grand duke of Muſcovy, who was contemporary with queen Elizabeth. To manifeſt the doctor's ſenſe of her imperial majeſty's goodneſs, a ſett of the "Political Survey of Britain," bound in Morocco, highly ornamented, and accompanied with a letter deſcriptive of the triumphs and felicities of her reign, was forwarded to St Peterſburg, and conveyed into her hands by prince Orloff, who had reſided ſome months in Britain.

Dr Campbell in 1736 married Elizabeth, daughter of Benjamine Vobe, of Leominſter, in the county of Hereford, gentleman, with whom he lived nearly 40 years in the greateſt conjugal harmony and happineſs. So wholly did he dedicate his time to books, that he ſeldom went abroad: but to relieve himſelf as much as poſſible from the inconveniences incident to a ſedentary life, it was his cuſtom, when the weather would admit, to walk in his garden; or otherwiſe in ſome room of his houſe, by way of exerciſe. By this method, united with the ſtricteſt temperance in eating, and an equal abſtemiouſneſs in drinking, he enjoyed a good ſtate of health, though his conſtitution was delicate. His domeſtic manner of living did not preclude him from a very extenſive and honourable acquaintance. His houſe, eſpecially on a Sunday evening, was the reſort of the moſt diſtinguiſhed perſons of all ranks, an particularly of ſuch as had rendered themſelves eminent by their knowledge or love of literature. He received foreigners, who were fond of learning, with an affability and kindneſs which excited in them the higheſt reſpect and veneration; and his inſtructive and cheerful converſation made him the delight of his friends in general. He was during the latter part of his life, agent for the province of Georgia in North America; and died at the cloſe of the year 1775, in the 67th year of his age. The doctor's literary knowledge was by no means confined to the ſubjects on which he more particularly treated as an author; he was well acquainted with the mathematics, and had read much in medicine. It hath been with great reaſon believed, that if he had dedicated his ſtudies to the laſt ſcience, he would have made a very conſpicuous figure in the phyſical profeſſion. He was eminently verſed in the different parts of ſacred literature; and his acquaintance with the languages extended not only to the Hebrew, Greek, and Latin among the ancient, and to the French, Italian, Spaniſh, Portugueſe, and Dutch, among the modern; but likewiſe to the Oriental tongues. He was particularly fond of the Greek language. His attainment of ſuch a variety of knowledge was exceedingly aſſiſted by a memory ſurpriſingly retentive, and which indeed aſtoniſhed every perſon with whom he was converſant. In communicating his ideas, he had an uncommon readineſs and facility; and the ſtyle of his works, which had been formed upon the model of that of the celebrated biſhop Sprat, was perſpicuous, eaſy, flowing, and harmonious. To all theſe accompliſhments of the underſtanding, Dr Campbell joined the more important virtues of a moral and pious character. His diſpoſition was gentle and humane, and his manners kind and obliging. He was the tendereſt of huſbands, a moſt indulgent parent, a kind maſter, a firm and ſincere friend. To his great Creator he paid the conſtant and ardent tribute of devotion, duty, and reverence; and in his correſpondences he ſhowed that a ſenſe of piety was always neareſt his heart.

CAMPBELLTOWN, a parliament town of Argyle-ſhire in Scotland, ſeated on the lough of Kilkerran, on the eaſtern ſhore of Kintyre or Cantyre, of which it is the capital. It hath a good harbour; and is now a very conſiderable place, though within theſe 50 years only a petty fiſhing town. It has in fact been created by the fiſhery: for it was appointed the place of rendezvous for the buſſes; and above 260 have been ſeen in the harbour at once. The inhabitants are reckoned to be upwards of 8000 in number. W. Long. 5. 10. N. Lat. 54.

CAMPDEN, a ſmall town of Glouceſterſhire in England, containing about 200 houſes. It gives title of Viſcount, by courteſy, to Earl of Gainſborough his ſon. W. Long. 1. 50. N. Lat. 52.

CAMPEACHY, a town of Mexico in South America, ſeated on the eaſt coaſt of a bay of the ſame name, on the weſt of the province of Yucataro. It is defended by a good wall and ſtrong forts; but is neither ſo rich, nor carries on ſuch a trade, as formerly; it having been the port for the ſale of logwood, the place where it is cut being about 30 miles diſtant. It was taken by the Engliſh in 1596; by the bucaneers in 1678; and by the Flibuſters of St Domingo in 1685, who ſet it on fire and blew up the citadel. W. Long. 93. 7. N. Lat. 19. 20.

Campeachy-Wood, in botany. See Hæmatoxylum.

CAMPEN, a ſtrong town of Overyſſel in the United Provinces. It hath a citadel and a harbour; but the latter is almoſt choked up with ſand. It was taken by the Dutch in 1578, and by the French in 1672; but they abandoned it the following year. It is ſeated near the mouth of the river Yſſel and Zuider See. E. Long. 5. 35. N. Lat. 52. 38.

CAMPESTRE, in antiquity, a ſort of cover for the privities, worn by the Roman ſoldiers in the field exerciſes; being girt under the navel, and hanging down to the knees. The name is ſuppoſed to be formed from *campus*, the field or place where the Roman ſoldiers performed their exerciſes.

CAMPHORA, or Camphire, a ſolid concrete juice extracted from the wood of the laurus camphora. See Laurus, Chemistry, and Materia Medica.

Pure camphire is very white, pellucid, ſomewhat unctuous to the touch; of a bitteriſh aromatic taſte, yet accompanied with a ſenſe of coolneſs; of a very fragrant ſmell, ſomewhat like that of roſemary, but much ſtronger. It has been very long eſteemed one of the moſt efficacious diaphoretics; and has been celebrated in fevers, malignant and epidemical diſtempers. In deliria, alſo, where opiates could not procure ſleep, but rather aggravated the ſymptoms, this medicine has often been obſerved to procure it. All theſe effects, however, Dr Cullen attributes to its ſedative property, and denies that camphire has any other medicinal virtues than thoſe of an antiſpaſmodic and ſedative. He allows it to be very powerful, and capable of doing much good, or much harm. From experiments made on different brute creatures, camphire appears to be poiſonous to every one of them. In ſome it produced ſleep followed by death, without any other ſymptom. In others, before death, they were awakened into convulſions and rage. It ſeems, too, to act chiefly on the ſtomach; for an entire piece ſwallowed, produced the abovementioned effects with very little diminution of weight.

CAMPHUYSEN, (Dirk Theodore Raphael), an eminent painter, was born at Gorcum in 1586. He learned the art of painting from Diederic Govertze; and by a ſtudious application to it, he very ſoon not only equalled, but far ſurpaſſed his maſter. He had an uncommon genius, and ſtudied nature with care, judgement, and aſſiduity. His ſubjects were landſcapes, moſtly ſmall, with ruinous buildings, huts of peaſants, or views of villages on the banks of rivers, with boats and hoys, and generally he repreſented them by moonlight. His pencil is remarkably tender and ſoft, his colouring true nature and very tranſparent, and his expertneſs in perſpective is ſeen in the proportional diſtances of his objects, which are excellently contrived, and have a ſurpriſing degree of nature and truth. As he left off painting at an age when others are ſcarcely qualified to commence artiſts, few of his works are to be met with, and they bring conſiderable prices; as they cannot but give pleaſure to the eye of every obſerver. He painted his pictures with a thin body of colour, but they are handled with ſingular neatneſs and ſpirit. He practiſed in his profeſſion only till he was 18 years of age, and being then recommended as a tutor to the ſons of the lord of Nieuport, he undertook the employment, and diſcharged it with ſo much credit, that he was appointed ſecretary to that nobleman. He excelled in drawing with a pen; and the deſigns which he finiſhed in that manner are exceedingly valued.

CAMPIAN (Edmond), an Engliſh Jeſuit, was born at London, of indigent parents, in the year 1540; and educated at Chriſt's hoſpital, where he had the honour to ſpeak an oration before queen Mary on her acceſſion to the throne. He was admitted a ſcholar of St John's college in Oxford at its foundation, and took the degree of maſter of arts in 1564. About the ſame time he was ordained by a biſhop of the church of England, and became an eloquent Proteſtant preacher. In 1566, when queen Elizabeth was entertained by the univerſity of Oxford, he ſpoke an elegant oration before her majeſty, and was alſo reſpondent in the philoſophy act in St Mary's church. In 1568, he was junior proctor of the univerſity. In the following year, he went over to Ireland, where he wrote a hiſtory of that kingdom, and turned papiſt; but being found rather too aſſiduous in perſuading others to follow his example, he was committed to priſon. He ſoon however, found means to make his eſcape. He landed in England in 1571; and thence proceeded to Doway in Flanders, where he publicly recanted his former hereſy, and was created bachelor of divinity. He went ſoon after to Rome, where, in 1573, he was admitted of the ſociety of Jeſus, and was ſent by the general of that order to Vienna, where he wrote his tragedy called *Nectar et ambroſia*, which was acted before the emperor with great applauſe.

From Vienna he went to Prague in Bohemia, where he reſided in the Jeſuits college about ſix years, and then returned to Rome. From thence, in 1580, he was ſent by Pope Gregory XIII. with the celebrated Father Parſons, to convert the people of England. From Pitts we learn, that, ſome time before, ſeveral Engliſh prieſts, inſpired by the Holy Ghoſt, had undertaken to convert their countrymen; that 80 of theſe foreign miſſionaries, beſides ſeveral others, who by God's grace had been converted in England, were actually engaged in the pious work with great ſucceſs; that ſome of them had ſuffered impriſonment, chains, tortures, and ignominious death, with becoming conſtancy and reſolution: but ſeeing at laſt that the labour was abundant and the labourers few, they ſolicited the aſſiſtance of the

Jeſuits; requeſting, that though not early in the morning, they would at leaſt in the third, ſixth, or ninth hour, ſend labourers into the Lord's vineyard. In conſequence of this ſolicitation, the above two were ſent to England. They arrived in an evil hour for Campian, at Dover; and were next day joyfully received by their friends at London. He had not been long in England, before Walſingham the ſecretary of ſtate, being informed of his uncommon aſſiduity in the cauſe of the church of Rome, uſed every means in his power to have him apprehended, but for a long time without ſucceſs. However, he was at laſt taken by one Elliot, a noted *prieſt-taker*, who found him in the houſe of Edward Yates, Eſq; at Lyford in Berkſhire, and conducted him in triumph to London, with a paper on his hat, on which was written *Campian the Jeſuit*. He was impriſoned in the tower; where, Wood ſays, "he did undergo many examinations, abuſes, wrackings, tortures;" *exquiſitiſſimis cruciatibus tortus*, ſays Pitts. It is hoped, for the credit of the reformers, this torturing part of the ſtory is not true. The poor wretch, however, was condemned, on the ſtatute 25 Ed. III. for high treaſon; and butchered at Tyburn, with two or three of his fraternity. Howſoever criminal in the eye of the law, or of the Engliſh goſpel, might be the zeal of this Jeſuit for the ſalvation of the poor heretics of that kingdom, biographers of each perſuaſion unite in giving him a great and amiable character. "All writers (ſays the Oxford antiquary), whether Proteſtants or Popiſh, ſay, that he was a man of admirable parts; an elegant orator, a ſubtile philoſopher and diſputant, and an exact preacher whether in Engliſh or the Latin tongue, of a ſweet diſpoſition, and a well-poliſhed man." Fuller, in his church-hiſtory, ſays, "he was of a ſweet nature, conſtantly carrying about him the charms of a plauſible behaviour, of a fluent tongue, and good parts." His Hiſtory of Ireland, in two books, was written in 1570; and publiſhed, by Sir James Ware, from a manuſcript in the Cotton library, Dublin, 1633, folio. He wrote alſo *Chronologia univerſalis*, a very learned work; and various other tracts.

CAMPICURSIO, in the ancient military art, a march of armed men for ſeveral miles, from and back again to the camp, to inſtruct them in the military pace. This exerciſe was nearly akin to the *decurſio*, from which it only differed, in that the latter was performed by horſemen, the former alſo by foot.

CAMPIDOCTORES, or CAMPIDUCTORES, in the Roman army, were officers who inſtructed the ſoldiery in the diſcipline and exerciſes of war, and the art of handling their weapons to advantage. Theſe are alſo ſometimes called *campigeni*, and *armidoctores*.

CAMPIDUCTOR, in middle-age writers, ſignifies the leader or commander of an army, or party.

CAMPION, in botany, the Engliſh name of the LYCHNIS.

CAMPION, a town of the kingdom of Tanguth in Tartary. It was formerly remarkable for being a place through which the caravans paſſed in the road from Bukharia to China. E. Long. 104. 53. N. Lat. 40. 25.

CAMPISTRON, a celebrated French dramatic author, was born in 1656. Racine directed his poetical talents to the theatre, and aſſiſted him in his firſt pieces. He died in 1723.

CAMPITÆ, in church hiſtory, an appellation given to the donatiſts, on account of their aſſembling in the field, for want of churches. For a ſimilar reaſon, they were alſo denominated *Montenſes* and *Rupitani*.

CAMPLI, or CAMPOLI, a town of Italy, in the kingdom of Naples, and in the farther Abruzzo, ſituated in E. Long. 13. 55. N. Lat. 42. 38.

CAMPO MAJOR, a town of the province of Alentejo in Portugal. W. Long. 7. 24. N. Lat. 38. 50.

CAMPREDON, a town of Catalonia in Spain, ſeated at the foot of the Pyrenean mountains. The fortifications were demoliſhed by the French in 1691. W. Long. 1. 56. N. Lat. 42. 20.

CAMPS (Francis de), abbot of Notre Dame at Sigi, was born at Amiens in 1643; and diſtinguiſhed himſelf by his knowledge of medals, by writing an hiſtory of France, and ſeveral other works. He died at Paris in 1723.

CAMPVERE. See VEER.

CAMPUS, in antiquity, a field or vacant plain in a city, not built upon, left vacant on account of ſhows, combats, exerciſes, or other uſes of the citizens.

CAMPUS Maii, in ancient cuſtoms, an anniverſary aſſembly of the ancient Britons held on May-day, when they confederated together for the defence of the kingdom againſt all its enemies.

CAMPUS Martius, a large plain in the ſuburbs of ancient Rome, lying between the Quirinal and Capitoline mounts and the Tiber, thus called becauſe conſecrated to the god Mars, and ſet apart for military ſports and exerciſes to which the Roman youth were trained, as the uſe and handling of arms, and all manner of feats of activity. Here were the races run, either with chariots or ſingle horſes; here alſo ſtood the villa publica, or palace for the reception of ambaſſadors, who were not permitted to enter the city. Many of the public comitia were held in the ſame field, part of which was for that purpoſe cantoned out. The place was alſo nobly decorated with ſtatues, arches, columns, porticoes, and the like ſtructures.

CAMPUS Sceleratus, a place without the walls of ancient Rome, where the Veſtals who had violated their vows of virginity were buried alive.

CAMUL, a town of Aſia, on the eaſtern extremity of the kingdom of Cialus, on the frontiers of Tangut. E. Long. 98. 5. N. Lat. 37. 15.

CAMUS, a perſon with a low flat noſe, hollowed in the middle.

The Tartars are great admirers of camus beauties. Rubruquis obſerves, that the wife of the great Jenghiz Khan, a celebrated beauty, had only two holes for a noſe.

CAMUS (John Peter), a French prelate born in 1582. He was author of a number of pious romances (the taſte of his time), and other theological works, to the amount of 200 vols. His definition of politics is remarkable: *Ars non tam regendi, quam fallendi, homines*; "the art not ſo much of governing, as of deceiving mankind." He died in 1652.

CAN, in the ſea-language, as can-pump, a veſſel wherewith ſeamen pour water into the pump to make it go.

CAN-Buoy. See BOUY.

CAN-Hook, an inſtrument uſed to ſling a caſk by the ends of the ſtaves: it is formed by fixing a broad and flat

flat hook at each end of a ſhort rope ; and the tackle by which the caſk ſo ſlung may be hoiſted or lowered, is hooked to the middle of the rope.

CANA, (anc. geog.) a town on the confines of the Upper and Lower Galilee : memorable for the turning water into wine (John). The birth place of Simeon, called *Cananite* from this place, and of Nathaniel.

CANAAN, the fourth ſon of Ham. The irreverence of Ham towards his father Noah is recorded in Gen. ix. Upon that occaſion the patriarch curſed him in a branch of his poſterity: “ Curſed,” ſays he, “ be Canaan ; a ſervant of ſervants ſhall he be unto “ his brethren.” This curſe being pronounced, not againſt Ham the immediate tranſgreſſor, but againſt his ſon, who does not appear, from the words of Moſes, to have been any ways concerned in the crime, hath occaſioned ſeveral conjectures. Some have believed that Noah curſed Canaan, becauſe he could not well have curſed Ham himſelf, whom God had not long before bleſſed. Others think Moſes's chief intent in recording this prediction was to raiſe the ſpirits of the Iſraelites, then entering on a terrible war with the children of Canaan, by the aſſurance, that, in conſequence of the curſe, that people were deſtined by God to be ſubdued by them. For the opinion of thoſe who imagine all Ham's race were here accurſed, ſeems repugnant to the plain words of Scripture, which confines the malediction to Canaan and his poſterity ; and is alſo contrary to fact. Indeed, the prophecy of Noah, that Canaan “ ſhould be a ſervant of ſervants to his brethren,” ſeems to have been wholly completed in him. It was completed with regard to Shem, not only in that a conſiderable part of the ſeven nations of the Canaanites were made ſlaves to the Iſraelites, when they took poſſeſſion of their land, as part of the remainder of them were afterwards enſlaved by Solomon; but alſo by the ſubſequent expeditions of the Aſſyrians and Perſians, who were both deſcended from Shem; and under whom the Canaanites ſuffered ſubjection, as well as the Iſraelites ; not to mention the conqueſt of part of Canaan by the Elamites, or Perſians, under Chedorlaomer, prior to them all. With regard to Japhet, we find a completion of the prophecy, in the ſucceſſive conqueſts of the Greeks and Romans in Paleſtine and Phœnicia, where the Canaanites were ſettled ; but eſpecially in the total ſubverſion of the Carthaginian power by the Romans; beſides ſome invaſions of the northern nations, as the poſterity of Thogarma and Magog ; wherein many of them, probably, were carried away captive.

The poſterity of Canaan were very numerous. His eldeſt ſon was Sidon, who at leaſt founded and peopled the city of Sidon, and was the father of the Sidonians and Phœnicians. Canaan had beſides ten ſons, who were the fathers of ſo many people, dwelling in Paleſtine, and in part of Syria ; namely, the Hittites, the Jebuſites, the Amorites, the Girgaſites, the Hivites, the Arkites, the Sinites, the Arvadites, the Zemarites, and Hamathites.

Land of CANAAN, the country ſo named from Canaan the ſon of Ham. It lies between the Mediterranean ſea and the mountains of Arabia, and extends from Egypt to Phœnicia. It is bounded to the eaſt by the mountains of Arabia ; to the ſouth by the wilderneſs of Paran, Idumæa, and Egypt ; to the weſt by the Mediterranean, called in Hebrew the Great Sea ; to the north by the mountains of Libanus. Its length from the city of Dan (ſince called Cæſarea Philippi, or Paneadis, which ſtands at the foot of theſe mountains) to Beerſheba, is about 70 leagues ; and its breadth from the Mediterranean ſea to the eaſtern borders, is in ſome places 30. This country, which was firſt called Canaan, from Canaan the ſon of Ham, whoſe poſterity poſſeſſed it, was afterwards called Paleſtine, from the people which the Hebrews call Philiſtines, and the Greeks and Romans corruptly Paleſtines, who inhabited the ſea coaſts, and were firſt known to them. It likewiſe had the name of the *Land of Promiſe*, from the promiſe God made Abraham of giving it to him ; that of the *Land of Iſrael*, from the Iſraelites having made themſelves maſters of it ; that of *Judah*, from the tribe of Judah, which was the moſt conſiderable of the twelve : and laſtly, the happineſs it had of being ſanctified by the preſence, actions, miracles, and death of Jeſus Chriſt, has given it the name of the *Holy Land*, which it retains to this day.

The firſt inhabitants of this land therefore were the Canaanites, who were deſcended from Canaan, and the eleven ſons of that patriarch. Here they multiplied extremely ; trade and war were their firſt occupations ; theſe gave riſe to their riches, and the ſeveral colonies ſcattered by them over almoſt all the iſlands and maritime provinces of the Mediterranean. The meaſure of their idolatry and abominations was completed, when God delivered their country into the hands of the Iſraelites. In St Athanaſius's time, the Africans ſtill ſaid they were deſcended from the Canaanites ; and it is ſaid, that the Punic tongue was almoſt entirely the ſame with the Canaanitiſh and Hebrew language. The colonies which Cadmus carried into Thebes in Bœotia, and his brother Cilix into Cilicia, came from the ſtock of Canaan. The iſles of Sicily, Sardinia, Malta, Cyprus, Corfu, Majorca and Minorca, Gades and Ebuſus, are thought to have been peopled by the Canaanites. Bochart, in his large work entitled *Canaan*, has ſet all this matter in a good light.

Many of the old inhabitants of the north-weſt of the land of Canaan, however, particularly on the coaſt or territories of Tyre and Sidon, were not driven out by the children of Iſrael, whence this tract ſeems to have retained the name of Canaan a great while after thoſe other parts of the country, which were better inhabited by the Iſraelites, had loſt the ſaid name. The Greeks called this tract inhabited by the old Canaanites along the Mediterranean ſea, Phœnicia ; the more inland parts, as being inhabited partly by Canaanites, and partly by Syrians, Syrophœnicia : and hence the woman ſaid by St Matthew (xv. 22.) to be a woman of Canaan, whoſe daughter Jeſus cured, is ſaid by St Mark (vii. 26.) to be a Syrophœnician by nation, as ſhe was a Greek by religion and language.

CANADA, or the province of Quebec, an extenſive country of North America, bounded on the north-eaſt by the gulph of St Lawrence, and St John's river ; on the ſouth-weſt, by lands inhabited by the ſavage Indians, which are frequently included in this province ; on the ſouth, by the province of Nova-Scotia, the ſtates of New-England, and New-York ; and on the

Canada.

north-weſt, by other Indian nations. Under the name of *Canada*, the French comprehended a very large territory; taking into their claim part of New-Scotland, New-England, and New-York on the eaſt; and extending it on the weſt as far as the Pacific Ocean. That part, however, which was reduced by the Britiſh arms in the laſt war, lies between 61 and 81 degrees of weſt longitude, and between 45 and 52 of north latitude. The climate is not very different from that of the northern Britiſh colonies; but as it is much farther from the ſea, and more to the northward, than moſt of thoſe provinces, it has a much ſeverer winter, though the air is generally clear; and, like moſt of thoſe American tracts that do not lie too far to the northward, the ſummers are very hot, and exceeding pleaſant. The ſoil in general is very good, and in many parts extremely fertile; producing many different ſorts of grains, fruits, and vegetables. The meadow grounds, which are well watered, yield excellent graſs, and breed vaſt numbers of great and ſmall cattle. The uncultivated parts are a continued wood, compoſed of prodigiouſly large and lofty trees, of which there is ſuch a variety of ſpecies, that even of thoſe who have taken moſt pains to know them, there is not perhaps one that can tell half the number. Canada produces, among others, two ſorts of pines, the white and the red; four ſorts of firs; two ſorts of cedar and oak, the white and the red; the male and female maple; three ſorts of aſh-trees, the free, the mungrel, and the baſtard; three ſorts of walnut-trees, the hard, the ſoft, and the ſmooth; vaſt numbers of beech-trees and white wood; white and red elms, and poplars. The Indians hollow the red elms into canoes, ſome of which made out of one piece will contain 20 perſons; others are made of the bark; the different pieces of which they ſew together with the inner rind, and daub over the ſeams with pitch, or rather a bituminous matter reſembling pitch, to prevent their leaking; the ribs of theſe canoes are made of boughs of trees. In the hollow elms, the bears and wild cats take up their lodgings from November to April. The country produces alſo a vaſt variety of other vegetables, particularly tobacco, which thrives well. Near Quebec is a fine lead mine, and many excellent ones of iron have been diſcovered. It hath alſo been reported that ſilver is found in ſome of the mountains. The rivers are extremely numerous, and many of them very large and deep. The principal are, the Ouattauais, St John's, Seguinay, Deſpaires, and Trois Rivieres; but all theſe are ſwallowed up by the great river St Laurence. This river iſſues from the lake Ontario; and, taking its courſe north-eaſt, waſhes Montreal, where it receives the Ouattauais, and forms many fertile iſlands. It continues the ſame courſe, and meets the tide upwards of 400 miles from the ſea, where it is navigable for large veſſels; and below Quebec, 320 miles from the ſea, it becomes ſo broad and ſo deep, that ſhips of the line contributed in the laſt war to reduce that city. After receiving in its progreſs innumerable ſtreams, it at laſt falls into the ocean at cape Roſiers, where it is 90 miles broad, and where the cold is intenſe and the ſea boiſterous. This river is the only one upon which any ſettlements of note are as yet formed; but it is very probable, that, in time to come, Canada, and thoſe vaſt regions to the weſt, may be enabled of themſelves to carry on a conſiderable trade upon the great lakes of freſh water which theſe countries environ. Here are five lakes, the leaſt of which is of greater extent than the freſh-water lakes to be found in any other part of the world: theſe are the lake Ontario, which is no leſs than 200 leagues in circumference; Erie, or Oſwego, longer, but not ſo broad, is about the ſame extent. That of the Huron ſpreads greatly in width, and is about 300 leagues in circuit; as alſo is that of Machigan, though like lake Erie it is rather long, and comparatively narrow. But the lake Superior is larger than any of theſe, being no leſs than 500 leagues in circumference. All theſe are navigable by any veſſels, and they all communicate with each other; but the paſſage between Erie and Ontario is interrupted by a moſt ſtupendous fall or cataract, called the *falls of Niagara*[*]. The river St Lawrence, as already obſerved, is the outlet of theſe lakes, by which they diſcharge themſelves into the ocean. The French built forts at theſe ſeveral ſtraits, by which the lakes communicate with one another, and on that where the laſt of them communicates with the river. By theſe, while the country was in their poſſeſſion, they effectually ſecured to themſelves the trade of the lakes, and preſerved an influence over all the Indian nations that lie near them.

The moſt curious and intereſting part of the natural hiſtory of Canada is the animals there produced. Theſe are ſtags, elks, deer, bears, foxes, martins, wild cats, ferrets, weaſels, large ſquirrels of a greyiſh hue, hares and rabbits. The ſouthern parts, in particular, breed great numbers of wild bulls, divers ſorts of roe bucks, goats, wolves, &c. The marſhes, lakes, and pools, with which this country abounds, ſwarm with otters and beavers, of which the white are highly valued, as well as the right black kind. A vaſt variety of birds are alſo to be found in the woods; and the river St Lawrence abounds with ſuch quantities of fiſh, that it is affirmed by ſome writers, this would be a more profitable article that even the fur-trade.—There are in Canada a multitude of different Indian tribes; but theſe are obſerved to decreaſe in number where the Europeans are moſt numerous; owing chiefly to the immoderate uſe of ſpirituous liquors, of which they are exceſſively fond. Their manners and way of living we have already particularly deſcribed[†]. The principal towns are Quebec, Trois Rivieres, and Montreal. The commodities required by the Canadians from Europe are, wine, or rather rum; cloths, chiefly coarſe; linen; and wrought iron. The Indian trade requires rum, tobacco, a ſort of duffil blankets, guns, powder, balls, and flints, kettles, hatchets, toys, and trinkets of all kinds. While the country was in poſſeſſion of the French, the Indians ſupplied them with poultry; and the French had traders, who like the original inhabitants, traverſed the vaſt lakes and rivers in canoes, with incredible induſtry and patience, carrying their goods into the remoteſt parts of America, and among nations entirely unknown to us. Theſe again brought the furs, &c. home to them, as the Indians were thereby habituated to trade with them. For this purpoſe, people from all parts, even from the diſtance of 1000 miles, came to the French fair at Montreal, which began in June, and ſometimes laſted three months. On this occaſion many ſolemnities were obſerved, guards were

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[*] See *Niagara*.

[†] See *America*, N° 9.—80.

were placed, and the governor aſſiſted to preſerve order in ſo great and various a concourſe of ſavage nations. But ſometimes great diſorders and tumults happened; and the Indians frequently gave for a dram all that they were poſſed of. It is remarkable, that many of theſe nations actually paſſed by the Engliſh ſettlement of Albany in New-York, and travelled 200 miles further to Montreal, though they could have purchaſed the goods they wanted cheaper at the former.

Since Britain became poſſeſſed of Canada, their trade with that country has generally employed 34 ſhips and 400 ſeamen; their exports, at an average of three years, in ſkins, furs, ginſeng, ſnake-root, capillaire, and wheat, amount to 150,000*l*. Their imports from Great Britain are computed at nearly the ſame ſum. It will, however, be always impoſſible to overcome certain inconveniences ariſing from the violence of the winter. This is ſo exceſſive from December to April, that the broadeſt rivers are frozen over, and the ſnow lies commonly from four to ſix feet deep on the ground, even in thoſe parts of the country which lie three degrees ſouth of London, and in the temperate latitude of Paris. Another inconvenience ariſes from the falls in the river St Lawrence below Montreal, which prevent ſhips from penetrating to that emporium of inland commerce. The communication therefore with Canada, and the immenſe regions beyond it, will always be interrupted during the winter-ſeaſon, until roads are formed that can be travelled without danger from the Indians. For theſe ſavage people often commit hoſtilities without any previous notice; and frequently, without any provocation, they commit the moſt horrid ravages for a long time with impunity.

Canada was undoubtedly diſcovered by Sebaſtian Cabot, the famous Italian adventurer, who ſailed under a commiſſion from Henry VII. But though the Engliſh monarch did not think proper to make any uſe of this diſcovery, the French quickly attempted it; we have an account of their fiſhing for cod on the banks of Newfoundland, and along the ſea-coaſt of Canada, in the beginning of the 16th century. About the year 1506, one Denys, a Frenchman, drew a map of the gulph of St. Lawrence; and two years after, one Aubort, a ſhip maſter of Dieppe, carried over to France ſome of the natives of Canada. As the new country, however, did not promiſe the ſame amazing quantities of gold and ſilver produced by Mexico and Peru, the French for ſome years neglected the diſcovery. At laſt, in the year 1523, Francis I. a ſenſible and enterpriſing prince, ſent four ſhips, under the command of Verazani, a Florentine, to proſecute diſcoveries in that country. The particulars of this man's firſt expedition are not known. All we can learn is, that he returned to France, and next year he undertook a ſecond. As he approached the coaſt, he met with a violent ſtorm; however, he came ſo near as to perceive the natives on the ſhore, making friendly ſigns to him to land. This being found impracticable by reaſon of the ſurf upon the coaſt, one of the ſailors threw himſelf into the ſea; but, endeavouring to ſwim back to the ſhip, a ſurge thew him on ſhore without ſigns of life. He was, however, treated by the natives with ſuch care and humanity, that he recovered his ſtrength, and was allowed to ſwim back to the ſhip, which immediately returned to France. This is all we know of Verazani's ſecond expedition. He undertook a third, but was no more heard of, and it is thought that he and all his company periſhed before he could form any colony. In 1534, one Jaques Cartier of St Maloes ſet ſail under a commiſſion from the French king, and on the 10th of May arrived at Cape Bonaviſta in Newfoundland. He had with him two ſmall ſhips beſides the one in which he ſailed. He cruiſed along the coaſts of that iſland, on which he diſcovered inhabitants, probably the Eſkimaux. He landed in ſeveral places along the coaſt of the Gulf, and took poſſeſſion of the country in the king's name. On his return, he was again ſent out with a commiſſion, and a pretty large force: he returned in 1535, and paſſed the winter at St Croix; but the ſeaſon proved ſo ſevere, that he and his companions muſt have died of the ſcurvy, had they not, by the advice of the natives, made uſe of the decoction of the tops and bark of the white pines. As Cartier, however, could produce neither gold nor ſilver, all that he could ſay about the utility of the ſettlement was diſregarded; and in 1540, he was obliged to become pilot to one M. Roberval, who was by the French king appointed viceroy of Canada, and who ſailed from France with five veſſels. Arriving at the gulph of St Lawrence, they built a fort; and Cartier was left to command the garriſon in it, while Roberval returned to France for additional recruits to his new ſettlement. At laſt, having embarked in 1549, with a great number of adventurers, neither he nor any of his followers were heard of more.

This fatal accident ſo greatly diſcouraged the court of France, that, for 50 years, no meaſures were taken for ſupplying with neceſſaries the ſettlers that were left. At laſt, Henry IV. appointed the Marquis de la Roche lieutenant-general of Canada and the neighbouring countries. In 1598 he landed on the iſle of Sable, which he abſurdly thought to be a proper place for a ſettlement, though it was without any port, and without product except briars. Here he left about 40 malefactors, the refuſe of the French jails. After cruizing for ſome time on the coaſt of Nova Scotia, without being able to relieve theſe poor wretches, he returned to France, where he died of a broken heart. His colony muſt have periſhed, had not a French ſhip been wrecked on the iſland, and a few ſheep driven upon it at the ſame time. With the boards of the ſhip they erected huts; and while the ſheep laſted they lived on them, feeding afterwards on fiſh. Their clothes wearing out, they made coats of ſeal-ſkins; and in this miſerable condition they ſpent ſeven years, when Henry ordered them to be brought to France. The king had the curioſity to ſee them in their ſeal-ſkin dreſſes, and was ſo moved with their appearance, that he forgave them all their offences, and gave each of them 50 crowns to begin the world anew.

In 1600, one Chauvin, a commander in the French navy, attended by a merchant of St Malo, called *Pontgrave*, made a voyage to Canada, from whence he returned with a very profitable quantity of furs. Next year he repeated the voyage with the ſame good fortune, but died while he was preparing for a third. The many ſpecimens of profit to be made by the Canadian trade, at laſt induced the public to think favourably of it. An armament was equipped, and the command of it given to Pontgrave, with powers to extend his diſcoveries

veries up the river St Lawrence. He ſailed in 1603, having in his company Samuel Champlain, who had been a captain in the navy, and was a man of parts and ſpirit. It was not, however, till the year 1608, that the colony was fully eſtabliſhed. This was accompliſhed by founding the city of Quebec, which from that time commenced the capital of all the ſettlements in Canada. The colony, however, for many years continued in a low way, and was often in danger of being totally exterminated by the Indians. As the particulars of theſe wars, however, could neither be entertaining, nor indeed intelligible, to many of our readers, we chooſe to omit them, and in general obſerve, that the French not only concluded a permanent peace with the Indians, but ſo much ingratiated themſelves with them, that they could with the greateſt eaſe prevail upon them at any time to murder and ſcalp the Engliſh in their ſettlements. Theſe practices had a conſiderable ſhare in bringing about the war with France, when the whole country was conquered by the Britiſh in 1761. The moſt remarkable tranſaction in this conqueſt was the ſiege of QUEBEC; for a particular account of which, ſee that article. And for the tranſactions here during the late American war, ſee AMERICA (United States of), nº 195, 200—207.

CANAL *of* COMMUNICATION, an artificial cut in the ground, ſupplied with water from rivers, ſprings, &c. in order to make a navigable communication betwixt one place and another.

The particular operations neceſſary for making artificial navigations depend upon a number of circumſtances. The ſituation of the ground; the vicinity or connection with rivers; the eaſe or difficulty with which a proper quantity of water can be obtained; theſe and many other circumſtances neceſſarily produce great variety in the ſtructure of artificial navigations, and augment or diminiſh the labour and expence of executing them. When the ground is naturally level, and unconnected with rivers, the execution is eaſy, and the navigation is not liable to be diſturbed by floods; but, when the ground riſes and falls, and cannot be reduced to a level, artificial methods of raiſing and lowering veſſels muſt be employed; which likewiſe vary according to circumſtances.

A kind of temporary ſluices are ſometimes employed for raiſing boats over falls or ſhoals in rivers by a very ſimple operation. Two poſts or pillars of maſon-work, with grooves, are fixed, one on each bank of the river, at ſome diſtance below the ſhoal. The boat having paſſed theſe poſts, planks are let down acroſs the river by pullies into the grooves, by which the water is dammed up to a proper height for allowing the boat to paſs up the river over the ſhoal.

The Dutch and Flemings at this day ſometimes, when obſtructed by caſcades, form an inclined plane or rolling-bridge upon dry land, alongſt which their veſſels are drawn from the river below the caſcade into the river above it. This, it is ſaid, was the only method employed by the ancients, and is ſtill uſed by the Chineſe, who are ſaid to be entirely ignorant of the nature and utility of locks. Theſe rolling-bridges conſiſt of a number of cylindrical rollers which turn eaſily on pivots, and a mill is commonly built near by, ſo that the ſame machinery may ſerve the double purpoſe of working the mill and drawing up veſſels.

A LOCK is a baſon placed lengthwiſe in a river or canal, lined with walls of maſonry on each ſide, and terminated by two gates, placed where there is a caſcade or natural fall of the country; and ſo conſtructed, that the baſon being filled with water by an upper ſluice to the level of the waters above, a veſſel may aſcend thro' the upper gate; or the water in the lock being reduced to the level of the water at the bottom of the caſcade, the veſſel may deſcend through the lower gate; for when the waters are brought to a level on either ſide, the gate on that ſide may be eaſily opened. But as the lower gate is ſtrained in proportion to the depth of water it ſupports, when the perpendicular height of the water exceeds 12 or 15 feet, more locks than one become neceſſary. Thus, if the fall be 17 feet, two locks are required, each having 8½ feet fall; and if the fall be 26 feet, three locks are neceſſary, each having 8 feet 8 inches fall. The ſide-walls of a lock ought to be very ſtrong. Where the natural foundation is bad, they ſhould be founded on piles and platforms of wood: they ſhould likewiſe ſlope outwards, in order to reſiſt the preſſure of the earth from behind.

Plate CXIV. fig. 1. A perſpective view of part of a canal: the veſſel L, within the lock AC.—Fig. 2. Section of an open lock; the veſſel L about to enter.—Fig. 3. Section of a lock full of water; the veſſel L raiſed to a level with the water in the ſuperior canal.—Fig. 4. Ground ſection of a lock. L, a veſſel in the inferior canal. C, the under gate. A, the upper gate. G H, a ſubterraneous paſſage for letting water from the ſuperior canal run into the lock. KF, a ſubterraneous paſſage for water from the lock to the inferior canal.

X and Y (fig. 1.) are the two flood-gates, each of which conſiſts of two leaves, reſting upon one another, ſo as to form an obtuſe angle, in order the better to reſiſt the preſſure of the water. The firſt (X) prevents the water of the ſuperior canal from falling into the lock; and the ſecond (Y) dams up and ſuſtains the water in the lock. Theſe flood-gates ought to be very ſtrong, and to turn freely upon their hinges. In order to make them open and ſhut with eaſe, each leaf is furniſhed with a long lever A *b*, A *b*; C *b*, C *b*. They ſhould be made very tight and cloſe, that as little water as poſſible may be loſt.

By the ſubterraneous paſſage G H (fig. 2, 3, & 4) which deſcends obliquely, by opening the ſluice G, the water is let down from the ſuperior canal D into the lock, where it is ſtopt and retained by the gate C when ſhut, till the water on the lock comes to be on a level with the water in the ſuperior canal D; as repreſented, fig. 3. When, on the other hand, the water contained by the lock is to be let out, the paſſage G H muſt be ſhut by letting down the ſluice G, the gate A muſt be alſo ſhut, and the paſſage K F opened by raiſing the ſluice K: a free paſſage being thus given to the water, it deſcends through K F, into the inferior canal, until the water in the lock is on a level with the water in the inferior canal B; as repreſented, fig. 2.

Now, let be required to raiſe the veſſel L (fig. 2) from the inferior canal B to the ſuperior one D; if the lock happens to be full of water, the ſluice G muſt be ſhut, and alſo the gate A, and the ſluice K opened,

ſo

Canal.

ſo that the water in the lock may run out till it is on a level with the water in the inferior canal B. When the water in the lock comes to be on a level with the water at B, the leaves of the gate C are opened by the levers C *b*, which is eaſily performed, the water on each ſide of the gate being in equilibrio; the veſſel then ſails into the lock. After this the gate C and the ſluice K are ſhut, and the ſluice G opened, in order to fill the lock, till the water in the lock, and conſequently the veſſel, be upon a level with the water in the ſuperior canal D; as is repreſented in fig. 3. The gate A is then opened, and the veſſel paſſes into the canal D.

Again, let it be required to make a veſſel deſcend from the canal D into the inferior canal B. If the lock is empty, as in fig. 2. the gate C and ſluice K muſt be ſhut, and the upper ſluice G opened, ſo that the water in the lock may riſe to a level with the water in the upper canal D. Then open the gate A, and let the veſſel paſs thro' into the lock. Shut the gate A and the ſluice G; then open the ſluice K, till the water in the lock be on a level with the water in the inferior canal; then the gate C is opened, and the veſſel paſſes along into the canal B, as was required.

It is almoſt needleſs to ſpend time in enumerating the many advantages which neceſſarily reſult from artificial navigations. Their utility is now ſo apparent, that moſt nations in Europe give the higheſt encouragement to undertakings of this kind wherever they are practicable. The advantages of navigable canals did not eſcape the obſervation of the ancients. From the moſt early accounts of ſociety we read of attempts to cut through large iſthmuſes, in order to make a communication by water, either betwixt different nations, or diſtant parts of the ſame nation, where land-carriage was long and expenſive. Herodotus relates, that the Cnidians, a people of Caria in Aſia Minor, deſigned to cut the iſthmus which joins that peninſula to the continent; but were ſuperſtitious enough to give up the undertaking, becauſe they were interdicted by an oracle. Several kings of Egypt attempted to join the Red-Sea to the Mediterranean Cleopatra was exceedingly fond of this project. Soliman II. emperor of the Turks, employed 50,000 men in this great work. This canal was completed under the caliphate of Omar, but afterwards allowed to fall into diſrepair; ſo that it is now difficult to diſcover any traces of it. Both the Greeks and Romans intended to make a canal acroſs the Iſthmus of Corinth, which joins the Morea and Achaia, in order to make a navigable paſſage by the Ionian ſea into the Archipelago. Demetrius, Julius Cæſar, Caligula, and Nero, made ſeveral unſucceſsful efforts to open this paſſage. But, as the ancients were entirely ignorant of the uſe of water-locks, their whole attention was employed in making level cuts, which is probably the principal reaſon why they ſo often failed in their attempts. Charlemagne formed a deſign of joining the Rhine and the Danube, in order to make a communication between the ocean and the Black Sea, by a canal from the river Almutz which diſcharges itſelf into the Danube, to the Reditz, which falls into the Maine, and this laſt falls into the Rhine near Mayence: for this purpoſe he employed a prodigious number of workmen; but he met with ſo many obſtacles from different quarters, that he was obliged to give up the attempt.

The French at preſent have many fine canals: that of Briare was begun under Henry IV. and finiſhed under the direction of cardinal Richlieu in the reign of Louis XIII. This canal makes a communication betwixt the Loire and the Seine by the river Loing. It extends 11 French great leagues from Briare to Montargis. It enters the Loire a little above Briare, and terminates in the Loing at Cepoi. There are 42 locks on this canal.

The canal of Orleans, for making another communication between the Seine and the Loire, was begun in 1675, and finiſhed by Philip of Orleans, regent of France, during the minority of Louis XV. and is furniſhed with 20 locks. It goes by the name of the *canal of Orleans*; but it begins at the village of Kombleux, which is a ſhort French league from the town of Orleans.

But the greateſt and moſt uſeful work of this kind is the junction of the ocean with the Mediterranean by the canal of Languedoc. It was propoſed in the reigns of Francis I. and Henry IV. and was undertaken and finiſhed under Louis XIV. It begins with a large reſervoir 4000 paces in circumference, and 24 feet deep, which receives many ſprings from the mountain Noire. This canal is about 64 leagues in length, is ſupplied by a number of rivulets, and is furniſhed with 104 locks, of about eight feet riſe each. In ſome places it paſſes over bridges of vaſt height; and in others it cuts thro' ſolid rocks for 1000 paces. At one end it joins the river Garonne near Thoulouſe, and terminates at the other in the lake Tau, which extends to the port of Cette. It was planned by Francis Riquet in 1666, and finiſhed before his death, which happened in 1680.

In the Dutch, Auſtrian, and French Netherlands, there is a very great number of canals; that from Bruges to Oſtend carries veſſels of 200 tons.

The Chineſe have alſo a great number of canals; that which runs from Canton to Pekin extends about 825 miles in length, and was executed about 800 years ago.

It would be an endleſs taſk to deſcribe the numberleſs canals in Holland, Ruſſia, Germany, &c. We ſhall therefore confine ourſelves to thoſe that are either already finiſhed, or at preſent executing, in Great-Britain.

As the promoting of commerce is the principal intention of making canals, it is natural to expect that their frequency in any nation ſhould bear ſome proportion to the trade carried on in it, providing the ſituation of the country will admit of them. The preſent ſtate of England and Scotland confirms this obſervation. Though the Romans made a canal between the Nyne, a little below Peterborough, and the Witham, three miles below Lincoln, which is now almoſt entirely filled up, yet it is not long ſince canals were revived in England. They are now however become very numerous, particularly in the counties of York, Lincoln, and Cheſhire. Moſt of the counties betwixt the mouth of the Thames and the Briſtol channel are connected together either by natural or artificial navigations; thoſe upon the Thames and Iſis reaching within about

20 miles of thoſe upon the Severn. The duke of Bridgewater's canal in Cheſhire runs 27 miles on a perfect level; but at Barton it is carried by a very high aqueduct bridge over the Irwell, a navigable river; ſo that it is common for veſſels to be paſſing at the ſame time both under and above the bridge. It is likewiſe cut ſome miles into the hills, where the Duke's coal-mines are wrought.

A navigable canal betwixt the Forth and Clyde in Scotland, and which divides the kingdom in two parts, was firſt thought of by Charles II. for tranſports and ſmall ſhips of war; the expence of which was to have been L. 500,000, a ſum far beyond the abilities of his reign. It was again projected in the year 1722, and a ſurvey made; but nothing more done till 1761, when the then Lord Napier, at his own expence, cauſed make a ſurvey, plan, and eſtimate on a ſmall ſcale. In 1764, the truſtees for fiſheries, &c. in Scotland cauſed make another ſurvey, plan, and eſtimate of a canal five feet deep, which was to coſt L. 79,000. In 1766, a ſubſcription was obtained by a number of the moſt reſpectable merchants in Glaſgow, for making a canal four feet deep and twenty-four feet in breadth; but when the bill was nearly obtained in Parliament, it was given up on account of the ſmallneſs of the ſcale, and a new ſubſcription ſet on foot for a canal ſeven feet deep, eſtimated at L. 150,000. This obtained the ſanction of Parliament; and the work was begun in 1768 by Mr Smeaton the engineer. The extreme length of the canal from the Forth to the Clyde is 35 miles, beginning at the mouth of the Carron, and ending at Dalmure Burnfoot on the Clyde, ſix miles below Glaſgow, riſing and falling 160 feet by means of 39 locks, 20 on the eaſt ſide of the ſummit, and 19 on the weſt, as the tide does not ebb ſo low in Clyde as in the Forth by nine feet. Veſſels drawing eight feet water, and not exceeding nineteen feet beam and ſeventy-three feet in length, paſs with eaſe, the canal having afterwards been deepened to upwards of eight feet. The whole enterpriſe diſplays the art of man in a high degree. The carrying the canal through moſs, quickſand, gravel, and rocks, up precipices and over valleys, was attended with inconceivable difficulties. There are eighteen draw-bridges and fifteen aqueduct bridges of note, beſides ſmall ones and tunnels. In the firſt three miles there are only ſix locks; but in the fourth mile there are no leſs than ten locks, and a very fine aqueduct bridge over the great road to the weſt of Falkirk. In the next ſix miles there are only four locks, which carry you to the ſummit. The canal then runs eighteen miles on a level, and terminates about a mile from Glaſgow. In this courſe, for a conſiderable way the ground is banked about twenty feet high, and the water is ſixteen feet deep, and two miles of it is made through a deep moſs. At Kirkintulloch, the canal is carried over the water of Logie on an aqueduct arch of ninety feet broad. This arch was thrown over in three ſtretches, having only a centre of thirty feet, which was ſhifted on ſmall rollers from one ſtretch to another; a thing new, and never attempted before with an arch of this ſize; yet the joinings are as fairly equal as any other part, and admired as a very fine piece of maſonry. On each ſide there is a very conſiderable banking over the valley. The work was carried on till it came within ſix miles of its junction with the Clyde; when the ſubſcription and a ſubſequent loan being exhauſted, the work was ſtopt in 1775. The city of Glaſgow, however, by means of a collateral branch, opened a communication with the Forth, which has produced a revenue of about L. 6000 annually; and, in order to finiſh the remaining ſix miles, the government in 1784 gave L. 50,000 out of the forfeited eſtates, the dividends ariſing from this ſum to be applied to making and repairing roads in the Highlands of Scotland. Accordingly the work has been reſumed; and by contract, under a high penalty, muſt be entirely completed in November 1789. The aqueduct bridge over the Kilven (now finiſhed, and ſuppoſed the greateſt of the kind in the world) conſiſts of four arches, and carries the canal over a valley 65 feet high and 420 in length, exhibiting a very ſingular effort of human ingenuity and labour. To ſupply the canal with water was of itſelf a very great work. There is one reſervoir of 50 acres 24 feet deep, and another of 70 acres 22 feet deep, into which many rivers and ſprings terminate, which it is thought will afford ſufficient ſupply of water at all times. This whole undertaking when finiſhed will coſt about L. 200,000. It is the greateſt of the kind in Britain, and without doubt will be of great national utility; though it is to be regretted that it had not been executed on a ſtill larger ſcale, the locks being too ſhort for tranſporting large maſts.

Canal, in anatomy, a duct or paſſage through which any of the juices flow.

CANANOR, a large maritime town of Aſia, on the coaſt of Malabar, in a kingdom of the ſame name, with a very large and ſafe harbour. It formerly belonged to the Portugueſe, and had a ſtrong fort to guard it; but in 1683, the Dutch, together with the natives, drove them away; and after they became maſters of the town, enlarged the fortifications. They have but a very ſmall trade; but there is a town at the bottom of the bay independent of the Dutch, whoſe prince can bring 20,000 men into the field. The Dutch fort is large, and the governor's lodgings are at a good diſtance from the gate; ſo that, when there was a ſkirmiſh between the factory and the natives, he knew nothing of it till it was over. E. Long. 78. 10. N. Lat. 12. 0.

Cananor, a ſmall kingdom of Aſia, on the coaſt of Malabar, whoſe king can raiſe a conſiderable army. The natives are generally Mahometans; and the country produces pepper, cardamoms, ginger, mirobolans, and tamarinds, in which they drive a conſiderable trade.

CANARA, a kingdom of Aſia, on the coaſt of Malabar. The inhabitants are Gentoos, or Pagans; and there is a pagod, or temple, called *Ramtrut*, which is viſited every year by a great number of pilgrims. Here the cuſtom of burning the wives with their huſbands had its beginning, and is practiſed to this day. The country is generally governed by a woman, who keeps her court at a town called *Baydor*, two days journey from the ſea. She may marry whom ſhe pleaſes; and is not obliged to burn with her huſband, like her female ſubjects. They are ſo good obſervers of their laws, that a robbery or murder is ſcarce ever heard of among them. The Canarans have forts built of earth along the coaſt, which are garriſoned with 200 or 300 ſoldiers, to guard againſt the robberies of their neighbours.

Plate CXIV.

Fig: 1.
Perspective VIEW of part of a CANAL with Locks.

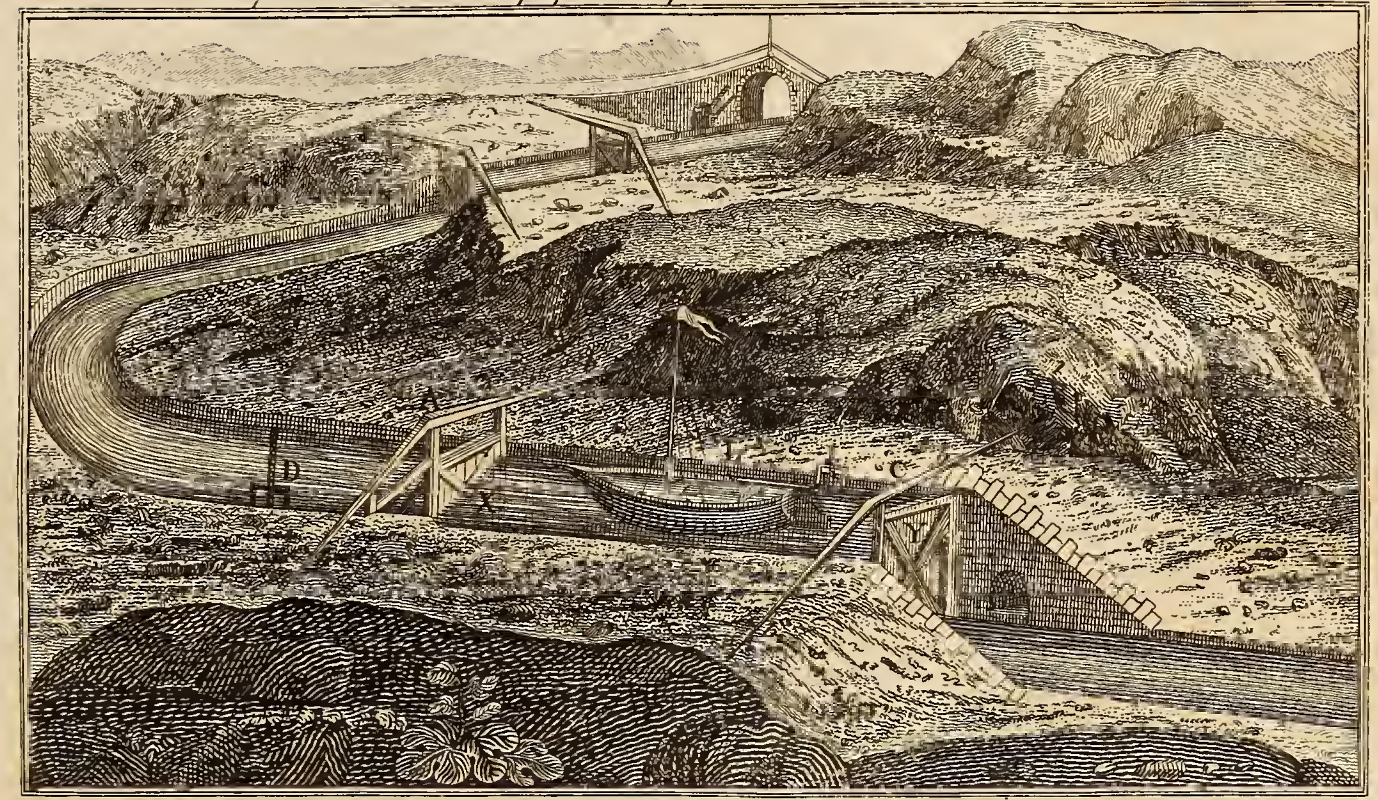


Fig. 2.
Section of a LOCK.

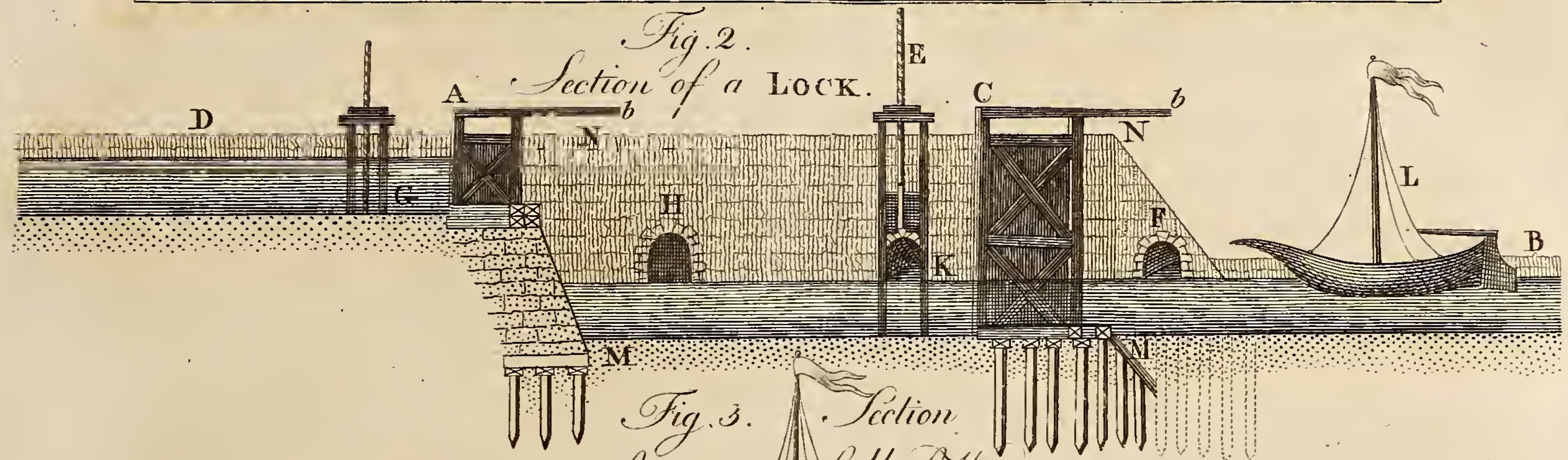


Fig. 3. Section of a LOCK full of Water.

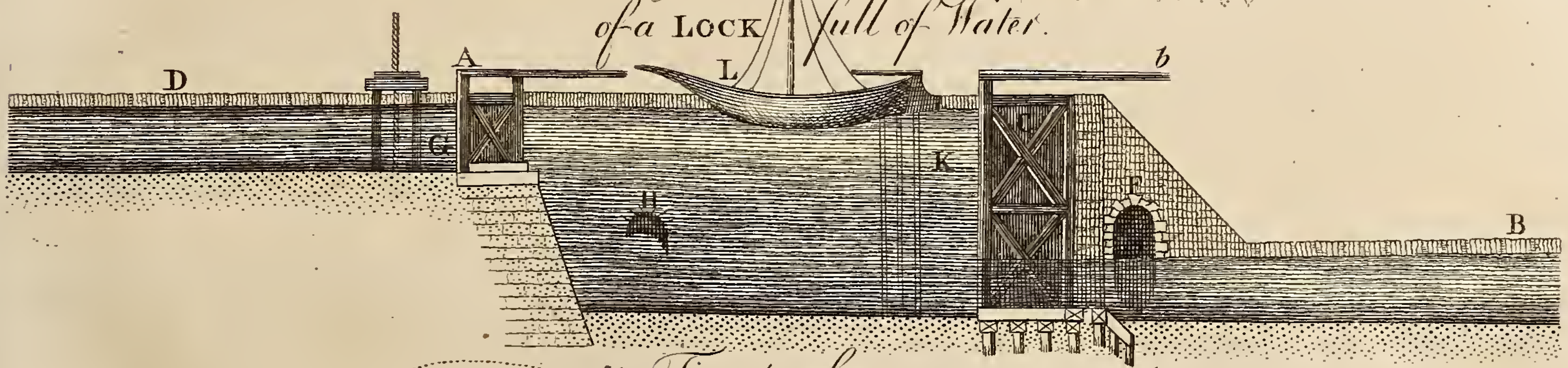
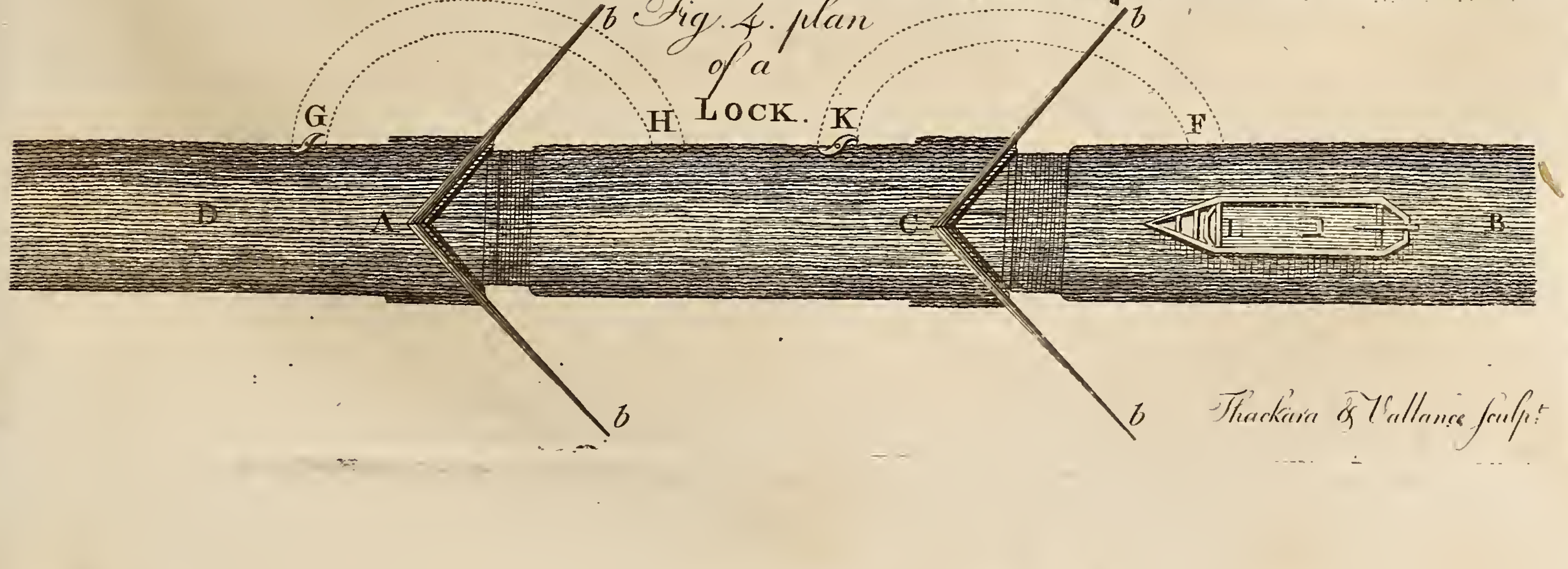


Fig. 4. plan of a LOCK.



Thackara & Vallance sculpt.

bours. The lower grounds yield every year two crops of corn or rice; and the higher produce pepper, betel nuts, ſanders wood, iron and ſteel. The Portugueſe clergy here live very looſely, and make no ſcruple of procuring women for ſtrangers.

CANARIA, (anc. geog.) one of the Fortunate Iſlands, a proof that theſe were what are now called the *Canaries*. Canaria had its name from its abounding with dogs of an enormous ſize, two of which were brought to Juba king of Mauritania. See the following article.

CANARIA, or the GRAND CANARY, an iſland in the Atlantic Ocean, about 180 miles from the coaſt of Africa. It is about 100 miles in circumference, and 33 in diameter. It is a fruitful iſland, and famous for the wine that bears its name. It alſo abounds with apples, melons, oranges, citrons, pomegranates, figs, olives, peaches, and plantains. The fir and palm trees are the moſt common. The towns are, Canary the capital, Gualdera, and Geria.

CANARY, or CIVIDAD DE PALMAS, is the capital of the iſland of Canaria, with an indifferent caſtle, and a biſhop's ſee. It has alſo a court of inquiſition, and the ſupreme council of the reſt of the Canary-iſlands; as alſo four convents, two for men and two for women. The town is about three miles in compaſs, and contains 12,000 inhabitants. The houſes are only one ſtory high, and flat at the top; but they are well built. The cathedral is a handſome ſtructure. W. Long. 15. 20. N. Lat. 28. 4.

CANARY-Iſlands, are ſituated in the Atlantic ocean, over againſt the empire of Morocco in Africa. They were formerly called the *Fortunate Iſlands*, on account of the temperate healthy air, and excellent fruits. The land is very fruitful, for both wheat and barley produce 130 for one. The cattle thrive well, and the woods are full of all ſorts of game. The Canary ſinging birds are well known all over Europe and America. There are here ſugar-canes in great abundance; but the Spaniards firſt planted vines here, from whence we have the wine called *Canary* or *Sack*.

Theſe iſlands were not entirely unknown to the ancients; but they were a long while forgot, till John de Betencourt diſcovered them in 1402. It is ſaid they were firſt inhabited by the Phœnicians, or Carthaginians, but on no certain foundation; nor could the inhabitants themſelves tell from whence they were derived; on the contrary, they did not know there was any other country in the world. Their language, manners, and cuſtoms, had no reſemblance to thoſe of their neighbours. However, they were like the people on the coaſt of Barbary in complexion. They had no iron. After the diſcovery, the Spaniards ſoon got poſſeſſion of them all, under whoſe dominions they are to this day, except Madeira, which belongs to the Portugueſe. The inhabitants are chiefly Spaniards; though there are ſome of the firſt people remaining, whom they call *Guanches*, who are ſomewhat civilized by their intercourſe with the Spaniards. They are a hardy, active, bold people, and live on the mountains. Their chief food is goat's milk. Their complexion is tawny, and their noſes flat. The Spaniſh veſſels, when they ſail for the Weſt-Indies, always rendezvous at theſe iſlands going and coming. Their number is 12. 1. Alegranza; 2. Canaria; 3. Ferro, 4. Fuerteventura; 5. Gomera; 6. Gratioſa; 7. Lancerotta; 8. Madeira; 9. Palma; 10. Rocca; 11. Salvages; 12. Teneriff. Weſt longitude from 12. to 21. north latitude from 27. 30. to 29. 30.

CANARY-bird. See FRINGILLA. Theſe birds are much admired for their ſinging, and take their name from the place from whence they originally came, *viz.* the Canary-iſlands; but of late years there is a ſort of birds brought from Germany, and eſpecially from Tirol, and therefore called *German birds*, which are much better than the others: though both are ſuppoſed to have originally come from the ſame place. The cocks never grow fat, and by ſome country people cannot be diſtinguiſhed from common green birds; though the Canary-birds are much luſtier, have a longer tail, and differ much in the heaving of the paſſages of the throat when they ſing. Theſe birds being ſo much eſteemed for their ſong, are ſometimes ſold at a high price, according to the goodneſs and excellency of their notes; ſo that it will always be adviſable to hear one ſing before he is bought. In order to know whether he is in good health, take him out of the ſtore-cage, and put him in a clean cage by himſelf; if he ſtand up boldly, without crouching or ſhrinking in his feathers, look with a briſk eye, and is not ſubject to clap his head under his wing, it is a ſign that he is in good health; but the greateſt matter is to obſerve his dunging: if he bolts his tail like a nightingale after he has dunged, it is a ſign he is not in good health, or at leaſt that he will ſoon be ſick: but if his dung be very thin like water, or of a ſlimy white, without any blackneſs in it, it is a ſign of approaching death. When in perfect health, his dung lies round and hard, with a fine white on the outſide, dark within, and dries quickly; though a ſeed-bird ſeldom dungs ſo hard, unleſs he is very young.

Canary-birds are ſubject to many diſeaſes, particularly impoſthumes, which affect the head, cauſe them to fall ſuddenly from the perch, and die in a ſhort time, if not ſpeedily cured. The moſt approved medicine is an ointment made of freſh butter and capon's greaſe melted together. With this the top of the bird's head is to be anointed for two or three days, and it will diſſolve the impoſthume: but if the medicine has been too long delayed, then, after three or four times anointing, ſee whether the place of his head be ſoft; and if ſo, open it gently, and let out the matter, which will be like the yolk of an egg; when this is done, anoint the place, and the bird will be cured. At the ſame time he muſt have figs with his other food, and in his water a ſlice or two of liquorice, with white ſugar-candy.

Canary-birds are diſtinguiſhed by different names at different times and ages: ſuch as are about three years old are called *runts*; and thoſe above two are named *eriffs*: thoſe of the firſt year under the care of the old ones, are termed *branchers*; thoſe that are new flown, and cannot feed themſelves, *puſhers*; and thoſe brought up by hand, *neſtlings*.

The Canary-birds may be bred with us; and, if treated with proper care, they will become as vigorous and healthful as in the country from whence they have their name. The cages in which theſe birds are kept are to be made either of walnut-tree or oak, with bars of wire; becauſe theſe, being woods of ſtrength, do not require to be uſed in large pieces.

The common ſhape of cages, which is cylindric, is very improper for theſe birds; for this allows little room to walk, and without that the birds uſually become melancholy. The moſt proper of all ſhapes is the high and long, but narrow.

If theſe birds eat too much, they grow over-fat, loſe their ſhape, and their ſinging is ſpoiled: or at leaſt they become ſo idle, that they will ſcarce ever ſing. In this caſe their victual is to be given them in a much ſmaller quantity, and they will by this means be recovered by degrees to all their beauty, and will ſing as at firſt.

At the time that they are about to build their neſts, there muſt be put into their cages ſome hay, dried thoroughly in the ſun: with this muſt be fixed ſome moſs dried in the ſame manner, and ſome ſtag's hair; and great care is to be taken of breeding the young, in the article of food. As ſoon as the young birds are eight days old, or ſomewhat more, and are able to eat and pick up food of themſelves, they are to be taken out of the cage in which they were hatched, and each put ſeparately into another cage, and hung up in a room where it may never have an opportunity of hearing the voice of any other bird. After they have been kept thus about eight days, they are to be excited to ſing by a bird-pipe; but this is not to be blowed too much, or in too ſhrill a manner, leſt they ſing themſelves to death.

For the firſt fifteen days the cages are to be covered with a black cloth, and for the fifteen days following with a green one. Five leſſons in a day from the pipe are ſufficient for theſe young creatures; and they muſt not be diſturbed with ſeveral ſounds at the ſame time, leſt they confound and puzzle them: two leſſons ſhould be given them early in the morning, one about the middle of the day, and two more at night.

The genius and temper of the ſeveral birds of this kind are very different. The males are almoſt always melancholy, and will not ſing unleſs they are excited to it by hearing others continually ſinging about them. The male bird of this kind will often kill the female put to him for breeding; and when there are ſeveral females together with the males, they will often do the ſame to one another from jealouſy. It is therefore not eaſy to manage the article of their breeding well in this particular, unleſs in this manner: let two female birds be put into one cage, and when they have lived together ſome time, they will have contracted a ſort of love for one another, which will not eaſily be diſſolved. Put a male bird into the cage with theſe two, and every thing will go well; their friendſhip will keep them from quarrelling about his favours, and from danger of his miſchievous diſpoſition; for if he attacks one of them, in order to kill her, the other will immediately take her part; and after a few of theſe battles, the male will find that they are together an overmatch for him at fighting, and will then diſtribute his favours to them, and there will not fail of being a young breed or two, which are to be taken away from their parents, and educated as before directed. Some males watch the time of the females laying, and devour the eggs as faſt as ſhe depoſits them: and others take the young ones in their beak as ſoon as hatched, and cruſh them to death againſt the ſides of the cage, or ſome other way deſtroy them. When a male has been known once to have been guilty of this, he is to be ſhut up in a ſmall cage, in the middle of the large one in which the female is breeding her young, and thus he will often comfort her with ſinging all day long, while ſhe ſits upon the eggs or takes care of the young ones; and when the time of taking away, to put them into ſeparate cages, is come, the male is to be let out, and he will always after this live in friendſhip with the female.

If the male become ſick during the time of the female's ſitting or bringing up her young, he muſt be removed immediately, and only brought to the ſide of her cage at certain times, that ſhe may ſee him, till he is perfectly cured; and then he is to be ſhut up again in his cage in the middle.

Canary-birds are various in their notes, ſome having a ſweet ſong, others a lowiſh note, others a long ſong, which is beſt, as having the greateſt variety of notes: but they ſing chiefly either the titlark or nightingale notes. See *Song of Birds*.

CANCALLE, a town of France, in Upper Brittany by the ſea-ſide, where there is a road. Here the Britiſh landed in 1758, in their way to St Maloes, where they burnt a great number of ſhips in the harbour, and then retired without loſs. This town was in their power; but they acted like generous enemies, and did no hurt to this nor any other on the coaſt. W. Long. 0 13. N. Lat. 48. 41.

CANCELIER, in falconry, is when a light brown hawk, in her ſtooping, turns two or three times upon the wing, to recover herſelf before ſhe ſeizes.

CANCELLI, a term uſed to denote lattice windows, of thoſe made of croſs bars diſpoſed latticewiſe; it is alſo uſed for rails or balluſters incloſing the communion-table, a court of juſtice, or the like, and for the network in the inſide of hollow bones.

CANCELLING, in the civil law, an act whereby a perſon conſents that ſome former deed be rendered null and void. This is otherwiſe called *reſciſion*. The word comes from the Latin *cancellare* to encompaſs or pale a thing round. In the proper ſenſe of the word, *to cancel*, is to deface an obligation, by paſſing the pen from top to bottom, or acroſs it; which makes a kind of chequer lattice, which the Latins call *cancelli*.

CANCER, in zoology, a genus of inſects belonging to the order of inſecta aptera. The generic characters are theſe: they have eight legs, (ſeldom ten or ſix); beſides the two large claws which anſwer the purpoſe of hands. They have two eyes at a conſiderable diſtance from each other, and for the moſt part ſupported by a kind of pedunculi or footſtalks; the eyes are likewiſe elongated and moveable; they have two clawed palpi, and the tail is jointed. This genus includes the lobſter, ſhrimp, &c. There are no leſs than 87 ſpecies of cancer, diſtinguiſhed principally by the length of their tails and the margins of their breaſts. The following are the moſt remarkable.

Common lobſter.

1. The gammarus, or common lobſter, with a ſmooth thorax, ſhort ſerrated ſnout; very long antenæ; and between them two ſhorter ones, bifid; claws and fangs large, the greater tuberculated, the leſſer ſerrated on the inner edge; four pair of legs; ſix joints in the tail; tail-fins rounded. It inhabits all the rocky ſhores of America, but chiefly where there is a depth of water. In Llyn in Wales, a certain ſmall lobſter,

ſter, nothing different except in ſize, burrows in the ſand. They are brought in vaſt quantities from the Orkney iſles, and many parts of the eaſtern coaſt of Scotland, to the London markets. Sixty or ſeventy thouſand are annually brought from the neighbourhood of Montroſe alone.—The lobſter was well known to the ancients, and is well deſcribed by Ariſtotle under the name of αϛακος. It is found as far as the Helleſpont; and is now called at Conſtantinople *liczuda* and *licpuda*.

Lobſters fear thunder, and are apt to caſt their claws on a great clap; it is ſaid that they will do the ſame on the firing of a great gun; and that, when men of war meet a lobſter boat, a jocular threat is uſed, that, if the maſter does not ſell them good lobſters, they will *ſalute him*.

The habitation of this ſpecies is in the cleareſt water, at the foot of rocks that impend over the ſea. This has given opportunity of examining more cloſely into the natural hiſtory of the animal, than of many others who live in an element that prohibits moſt of the human reſearches, and limits the enquiries of the moſt inquiſitive. Some lobſters are taken by hand; but the greater quantity in pots, a ſort of trap formed of twigs, and baited with garbage; they are formed like a wire mouſe-trap, ſo that when the lobſter gets in, there is no return. Theſe are faſtened to a cord ſunk in the ſea, and their place marked by a buoy.—They begin to breed in the ſpring, and continue breeding moſt part of the ſummer. They propagate *more humano*, and are extremely prolific. Dr Baſter ſays he counted 12,444 eggs under the tail, beſides thoſe that remained in the body unprotruded. They depoſit thoſe eggs in the ſand, where they are ſoon hatched.

Lobſters change their cruſt annually. Previous to their putting off their old one, they appear ſick, languid and reſtleſs. They totally acquire a new coat in a few days; but during the time that they remain defenceleſs, they ſeek ſome very lonely place, for fear of being devoured by ſuch of their brethren as are not in the ſame ſituation. It is alſo remarkable, that lobſters and crabs will renew their claws, if by accident they are torn off; and it is certain they will grow again in a few weeks, though they never attain to the ſize of the firſt. They are very voracious animals, and feed on ſea-weeds, garbage, and all ſorts of dead bodies. The pincers of one of the lobſters large claws are furniſhed with knobs, and thoſe of the other are always ſerrated. With the former it keeps firm hold of the ſtalks of ſubmarine plants, and with the latter it cuts and minces its food very dexterouſly. The knobbed or *numb* claw, as the fiſhermen call it, is ſometimes on the right and ſometimes on the left ſide indifferently. It is more dangerous to be ſeized by them with the cutting claw than the other; but in either caſe, the quickeſt way to get diſengaged from the creature is to pull off its claw. The female or *hen* lobſter does not caſt her ſhell the ſame year that ſhe depoſits her ova, or, in the common phraſe, is in *berry*. When the ova firſt appear under her tail, they are ſmall and extremely black: but they become in ſucceſſion almoſt as large as ripe elder berries before they are depoſited, and turn of a dark brown colour, eſpecially towards the end of the time of her depoſiting them. They continue full, and depoſiting the ova in conſtant ſucceſſion, as long as any of that black ſubſtance can be found in their body, which, when boiled, turns of a beautiful red colour, and is called their *coral*. Hen-lobſters are found in berry at all times of the year, but chiefly in winter. It is a common miſtake, that a berried hen is always in perfection for the table. When her berries appear large and browniſh, ſhe will always be found exhauſted, watery and poor. Though the ova be caſt at all times of the year, they ſeem only to come to life during the warm ſummer months of July and Auguſt. Great numbers of them may then be found, under the appearance of tadpoles, ſwimming about the little pools left by the tides among the rocks, and many alſo under their proper form from half an inch to four inches in length. In caſting their ſhells, it is hard to conceive how the lobſter is able to draw the fiſh of their large claws out, leaving the ſhell entire and attached to the ſhell of their body, in which ſtate they are conſtantly found. The fiſhermen ſay, the lobſter pines before caſting, till the fiſh of its large claw is no thicker than the quill of a gooſe, which enables it to draw its parts through the joints and narrow paſſage near the trunk. The new ſhell is quite membranaceous at firſt, but hardens by degrees. Lobſters only grow in ſize while their ſhells are in their ſoft ſtate. They are choſen for the table, by their being heavy in proportion to their ſize; and by the hardneſs of their ſhells on their ſides, which, when in perfection, will not yield to moderate preſſure. Barnacles and other ſmall fiſh adhering to them are reckoned certain ſigns of ſuperior goodneſs. Cock-lobſters are in general better than the hens in winter; they are diſtinguiſhed by the narrowneſs of their tails, and by their having a ſtrong ſpine upon the centre of each of the tranſverſe proceſſes beneath the tail, which ſupport the four middle plates of their tails. The fiſh of a lobſter's claw is more tender, delicate, and eaſy of digeſtion, than that of the tail. In ſummer, the lobſters are found near the ſhore, and thence to about ſix fathoms water; in winter, they are ſeldom taken in leſs than 12 or 15 fathoms. Like other inſects, they are much more active and alert in warm weather than in cold. In the water, they can run nimbly upon their legs or ſmall claws; and, if alarmed, can ſpring, tail foremoſt, to a ſurpriſing diſtance, as ſwift as a bird can fly. The fiſhermen can ſee them paſs about 30 feet; and, by the ſwiftneſs of their motion, ſuppoſe they may go much further. Athenæus remarks this circumſtance, and ſays, that "the incurvated lobſters will ſpring with the activity of dolphins." Their eyes are raiſed upon moveable baſes, which enables them to ſee readily every way. When frightened, they will ſpring from a conſiderable diſtance to their hold in the rock, and, what is not leſs ſurpriſing than true, will throw themſelves into their hold in that manner through an entrance barely ſufficient for their bodies to paſs.

2. The ſtrigoſus, or plated lobſter, with a pyramidal ſpiny ſnout; thorax elegantly plated, each plate marked near its junction with ſhort ſtriæ; claws much longer than the body, thick, echinated, and tuberculated; the upper fang trifid; only three legs ſpiny on their ſides; tail broad. The largeſt of this ſpecies is about ſix inches long. It inhabits the coaſts of Angleſea, under ſtones and fuci. It is very active; and, if taken, flaps its tail againſt the body with much violence and noiſe. Plate CXV.

3. The aſtacus, or craw-fiſh, with a projecting ſnout

ſlightly ſerrated on the ſides; a ſmooth thorax: back ſmooth, with two ſmall ſpines on each ſide, claws large, beſet with ſmall tubercles; two firſt pair of legs clawed, the two next ſubulated; tail conſiſting of five joints; the caudal fins rounded. It inhabits many of the rivers in England, lodged in holes which they form in the clayey banks. Cardan ſays, that this ſpecies indicates the goodneſs of water; for in the beſt water they are boiled into the reddeſt colour.

Craw-fiſh, prawn, ſhrimp, &c.

4. The ſerratus, or prawn, with a long ſerrated ſnout bending upwards; three pair of very long filiform feelers; claws ſmall, furniſhed with two fangs; ſmooth thorax; five joints to the tail; middle caudal fin ſubulated, two outmoſt flat and rounded. It is frequent in ſeveral ſhores among looſe ſtones; ſometimes found at ſea, and taken on the ſurface over 30 fathoms depth of water; cinerous when freſh, of a fine red when boiled.

5. The crangon, or ſhrimp, with long ſlender feelers, and between them two projecting laminæ; claws with a ſingle, hooked, moveable fang; three pair of legs; ſeven joints in the tail; the middle caudal fin ſubulated, the four others rounded and fringed, a ſpine on the exterior ſide of each of the outmoſt. It inhabits the ſhores of Britain in vaſt quantities, and is the moſt delicious of the genus.

6. The ſquilla, with a ſnout like a prawn, but deeper and thinner; the feelers longer in proportion to the bulk; the ſub-caudal fins rather larger; is, at full growth, not above half the bulk of the former.—It inhabits the coaſts of Kent; and is ſold in London under the name of the *white ſhrimp*, as it aſſumes that colour when boiled.

7. The atomos, or atom-lobſter, with a ſlender body; filiform antennæ; three pair of legs near the head; behind which are two pair of oval veſiculæ; beyond are three pair of legs, and a ſlender tail between the laſt pair. It is very minute, and the help of the microſcope is often neceſſary for its inſpection.

8. The pulex, or flea lobſter, with five pair of legs, and two claws imperfect; with 12 joints of the body. It is very common in fountains and rivulets; ſwims very ſwiftly in an incurvated poſture on its back; embraces and protects its young between the legs; does not leap.

9. The locuſt, or locuſt-lobſter, with four antennæ; two pair of imperfect claws; the firſt joint ovated; body conſiſts of 14 joints, in which it differs from the former. It abounds in ſummer, on the ſhore, beneath ſtones and algæ; leaps about with vaſt agility.

Hermit-crab.

10. The diogenes, ſoldier-crab, or hermit crab, with rough claws; the left claw is the longeſt (this being the only difference between the *diogenes* and *bernardus*); the legs are ſubulated, and ſerrated along the upper ridge; the tail naked and tender, and furniſhed with a hook by which it ſecures itſelf in its lodging. This ſpecies is paraſitic; and inhabits the empty cavities of turbinated ſhells, changing its habitation according to its increaſe of growth from the ſmall *nerite* to the large *whelk*. Nature denies it the ſtrong covering behind, which it hath given to others of this claſs; and therefore directs it to take refuge in the deſerted caſes of other animals. They crawl very faſt with the ſhell on their back; and at the approach of danger draw themſelves within the ſhell, and, thruſting out the larger claw, will pinch very hard whatever moleſts them. Ariſtotle deſcribes it very exactly under the name of *καρκινιον*. By the moderns it is called the *ſoldier*, from the idea of its dwelling in a tent; or the *hermit*, from retiring into a cell.

It is very diverting to obſerve this animal when wanting to change its ſhell. The little ſoldier is ſeen buſily parading the ſhore along that line of pebbles and ſhells which is formed by the extremeſt wave; ſtill, however, dragging its old incommodious habitation at its tail, unwilling to part with one ſhell, even though a troubleſome appendage, till it can find another more convenient. It is ſeen ſtopping at one ſhell, turning it, and paſſing it by; going on to another, contemplating that a while, and then ſlipping its tail from its old habitation to try on the new; this alſo is found to be inconvenient, and it quickly returns to its old ſhell again. In this manner it frequently changes, till at laſt it finds one light, roomy, and commodious; to this it adheres, though the ſhell be ſometimes ſo large as to hide the body of the animal, claws and all. Yet it is not till after many trials, and many combats alſo, that the ſoldier is thus completely equipped; for there is often a conteſt between two of them for ſome well-looking favourite ſhell for which they are rivals. They both endeavour to take poſſeſſion; they ſtrike with their claws, they bite each other, till the weakeſt is obliged to yield by giving up the object of diſpute. It is then that the victor immediately takes poſſeſſion, and parades it in his new conqueſt three or four times back and forward upon the ſtrand before his envious antagoniſt. When this animal is taken, it ſends forth a feeble cry, endeavouring to ſeize the enemy with its nippers; which if it faſtens upon, it will ſooner die than quit the graſp.

The hermit-crabs frequent moſtly thoſe parts of the ſea-ſhores which are covered with ſhrubs and trees, producing various wild fruits on which they ſubſiſt; though they will alſo feed on the fragments of fiſh and other animal ſubſtances caſt on ſhore. When roaſted in the ſhell, they are eſteemed delicate. The hermit-crab, hung in the air, diſſolves into a kind of oil, which ſpeedily cures the rheumatiſm, if rubbed upon the part.

11. The vocans, or ſand-crab, is but of a ſmall ſize; its colour light brown, or duſky white. It has eight legs and two claws, one of which is double the ſize of the other: theſe claws ſerve both to defend and to feed themſelves with. The head has two ſquare holes, which are receptacles for its eyes; out of which it thruſts them, and draws them in again at pleaſure. Their abode is only on the ſandy ſhores of Ilathera, and many others of the Bahama iſlands. They run very faſt, and retreat from danger into little holes they make in the ſand.

12. The grapſus, or red mottled crab, hath a round body, the legs longer and larger than in other kinds; the claws red; except which, the whole is mottled in a beautiful manner with red and white. Theſe crabs inhabit the rocks hanging over the ſea; they are the nimbleſt of all others, and run with ſurpriſing agility along the upright ſide of a rock, and even under the rocks that hang horizontally below the water. This they are often neceſſitated to do for eſcaping the aſſaults of rapacious birds that purſue them. Theſe crabs

never

never go to land; but frequent moſtly thoſe parts of the promontories and iſlands of rocks in and near the ſea, where, by the continual and violent agitation of the waves againſt the rocks, they are always wet, continually receiving the ſpray of the ſea, which often waſhes them into it; but they inſtantly return to the rock again, not being able to live under water, and yet requiring more of that element than any of the cruſtaceous kinds that are not fiſh.

13. The granulatus, or rough-ſhelled crab: theſe crabs are pretty large, and are commonly taken from the bottom of the ſea in ſhallow water; the legs are ſmall in proportion to the body; the two claws are remarkably large and flat. The whole ſhell is covered over with innumerable little tubercles like ſhagreen: the colour is brown, variouſly ſtained with purple.

14. The cancer erythropus, or red-claw crab, is of a ſmall ſize, and brown colour; it hath two claws of unequal bigneſs, red at the ends; and eight legs, which ſeem of leſs uſe to them than in other crabs; for when on the ground, they crawl with ſlow pace, dragging their bodies along; but they are moſtly ſeen graſping with their claws, and hanging to ſome ſea plant, or other marine ſubſtance.

The pea-crab.

15. The piſum, or pea-crab, with rounded and ſmooth thorax, entire and blunt; with a tail of the ſize of the body, which commonly is the bulk of a pea. It inhabits the muſcle, and has unjuſtly acquired the repute of being poiſonous. The ſwelling after eating of muſcles is wholly conſtitutional; for one that is affected by it, hundreds remain uninjured. Crabs either of this kind, or allied to them, the ancients believed to have been the conſentaneous inmates of the PINNÆ, and others bivalves; which, being too ſtupid to perceive the approach of their prey, were warned of it by their vigilant friend. Oppian tells the fable prettily.

In clouded deeps below, the *pinna* hides,
And through the ſilent paths obſcurely glides;
A ſtupid wretch, and void of thoughtful care,
He forms no bait, nor lays the tempting ſnare;
But the dull ſluggard boaſts a *crab* his friend,
Whoſe buſy eyes the coming prey attend.
One room contains them, and the partners dwell
Beneath the convex of one ſloping ſhell;
Deep in the watery vaſt the comrades rove,
And mutual intereſt binds their conſtant love;
That wiſer friend the lucky juncture tells,
When in the circuit of his gaping ſhells
Fiſh wand'ring enter; then the bearded guide
Warns the dull mate, and pricks his tender ſide;
He knows the hint, nor at the treatment grieves,
But hugs th' advantage, and the pain forgives;
His cloſing ſhells the *pinna* ſudden joins,
And 'twixt the preſſing ſides his prey confines:
Thus fed by mutual aid, the friendly pair
Divide their gains, and all the plunder ſhare.

16. The mænas, or common crab, with three notches on the front; five ſerrated teeth on each ſide; claws ovated; next joint toothed; hind feet ſubulated; dirty green colour; red when boiled. It inhabits all the ſhores; and lurks under the algæ, or burrows under the ſand. Is ſold, and eaten by the poor of Britain.

17. The pagurus, or black clawed crab, with a crenated thorax; ſmooth body; quinquedentated front; ſmooth claws and black tips; hind feet ſubulated. It inhabits the rocky coaſts; is the moſt delicious meat of any; caſts its ſhell between Chriſtmas and Eaſter. The tips of the claws of this ſpecies are uſed in medicine; intended to abſorb acidities in the ſtomach and bowels.

18. The velutinus, or velvet crab, with the thorax quinquedentated; body covered with ſhort, brown, velvet-like pile; claws covered with minute tubercles; ſmall ſpines round the top of the ſecond joint; hind legs broadly ovated.—This is among the ſpecies taken notice of by Ariſtotle on account of the broad feet, which, he ſays, aſſiſt them in ſwimming; as web-feet do the water-fowl. It inhabits the weſtern coaſt of Angleſea.

19. The horridus, or horrid-crab, with a projecting bifurcated ſnout, the end diverging; body heart-ſhaped; with the claws and legs covered with long and very ſharp ſpines.—It is a large ſpecies, and inhabits the rocks on the eaſtern coaſts of Scotland. It is common to Norway and Scotland, as many of the marine animals and birds are.

20. The ruricola, land-crab, or violet-crab, with a ſmooth entire thorax, and the two laſt joints of the feet armed with ſpines. It inhabits the Bahamia iſlands, as well as moſt lands between the tropics; and feeds upon vegetables.

Theſe animals live not only in a kind of orderly ſociety in their retreats in the mountains, but regularly once a year march down to the ſea-ſide in a body of ſome millions at a time. As they multiply in great numbers, they chooſe the month of April or May to begin their expedition; and then ſally out by thouſands from the ſtumps of hollow trees, from the clefts of rocks, and from the holes which they dig for themſelves under the ſurface of the earth. At that time the whole ground is covered with this band of adventurers; there is no ſetting down one's foot without treading upon them. The ſea is their place of deſtination, and to that they direct their march with right-lined preciſion. No geometrician could ſend them to their deſtined ſtation by a ſhorter courſe; they neither turn to the right nor left, whatever obſtacles intervene; and even if they meet with a houſe, they will attempt to ſcale the walls to keep the unbroken tenor of their way. But though this be the general order of their route, they, upon other occaſions, are obliged to conform to the face of the country; and if it is interſected with rivers, they are then ſeen to wind along the courſe of the ſtream. The proceſſion ſets forward from the mountains with the regularity of an army under the guidance of an experienced commander. They are commonly divided into three battalions; of which the firſt conſiſts of the ſtrongeſt and boldeſt males, that, like pioneers, march forward to clear the route and face the greateſt dangers. Theſe are often obliged to halt for want of rain, and to go into the moſt convenient encampment till the weather changes. The main body of the army is compoſed of females, which never leave the mountains till the rain is ſet in for ſome time, and then deſcend in regular battalia, being formed into columns of 50 paces broad, and three miles deep, and ſo cloſe that they almoſt cover the ground. Three or four days after this, the rear-guard follows, a ſtraggling undiſciplined tribe, conſiſting of males and females, but neither ſo robuſt nor ſo vigorous as the former. The night is their chief time of proceeding; but if it rains by day, they do not fail to profit by the occaſion; and they continue to move forward in their ſlow uniform manner. When the ſun ſhines and is hot upon the ſurface of the ground, they then make an univerſal halt, and wait till the cool of the evening. When they are terrified, they march back in a confuſed diſorderly manner, holding up their nippers, with which they ſometimes tear off a piece of the ſkin, and then leave the weapon where they inflicted the wound. They even try to intimidate their enemies; for they often clatter their nippers together, as if it were to threaten thoſe that come to diſturb them. But tho' they thus ſtrive to be formidable to man, they are much more ſo to each other; for they are poſſeſſed of one moſt unſocial property, which is, that if any of them by accident is maimed in ſuch a manner as to be incapable of proceeding, the reſt fall upon and devour it on the ſpot, and then purſue their journey.

When, after a fatiguing march, and eſcaping a thouſand dangers, (for they are ſometimes three months in getting to the ſhore), they have arrived at their deſtined port, they prepare to caſt their ſpawn. The peas are as yet within their bodies, and not excluded as is uſual in animals of this kind, under the tail; for the creature waits for the benefit of ſea-water to help the delivery. For this purpoſe the crab has no ſooner reached the ſhore, than it eagerly goes to the edge of the water, and lets the waves waſh over its body two or three times. This ſeems only a preparation for bringing their ſpawn to maturity; for, without farther delay, they withdrew to ſeek a lodging upon land: in the mean time the ſpawn grows larger, is excluded out of the body, and ſticks to the barbs under the flap, or more properly the tail. This bunch is ſeen as big as an hen's egg, and exactly reſembling the roes of herrings. In this ſtate of pregnancy they once more ſeek the ſhore for the laſt time; and ſhaking off their ſpawn into the water, leave accident to bring it to maturity. At this time whole ſhoals of hungry fiſh are at the ſhore in expectation of this annual ſupply; the ſea to a great diſtance ſeems black with them; and about two-thirds of the crabs eggs are immediately devoured by theſe rapacious invaders. The eggs that eſcape are hatched under the ſand; and, ſoon after, millions at a time of theſe little crabs are ſeen quitting the ſhore, and ſlowly travelling up to the mountains. The old ones, however, are not ſo active to return; they have become ſo feeble and lean, that they can hardly creep along, and the fleſh at that time changes its colour. The moſt of them, therefore, are obliged to continue in the flat parts of the country till they recover, making holes in the earth, which they cover at the mouth with leaves and dirt, ſo that no air may enter. There they throw off their old ſhells, which they leave, as it were, quite whole; the place where they opened on the belly being unſeen. At that time they are quite naked, and almoſt without motion for ſix days together, when they become ſo fat as to be delicious food. They have then under their ſtomachs four large white ſtones, which gradually decreaſe in proportion as the ſhell hardens, and, when they come to perfection, are not to be found. It is at that time that the animal is ſeen ſlowly making its way back; and all this is moſt commonly performed in the ſpace of ſix weeks.

This animal, when poſſeſſed of its retreats in the mountains, is impregnable: for, only ſubſiſting upon vegetables, it ſeldom ventures out; and its habitation being in the moſt inacceſſible places, it remains for a great part of the ſeaſon in perfect ſecurity. It is only when impelled by the deſire of bringing forth its young, and when compelled to deſcend into the flat country, that it is taken. At that time the natives wait for its deſcent in eager expectation, and deſtroy thouſands; but, diſregarding their bodies, they only ſeek for that ſmall ſpawn which lies on each ſide of the ſtomach within the ſhell, of about the thickneſs of a man's thumb. They are much more valuable upon their return after they have caſt their ſhell; for, being covered with a ſkin reſembling ſoft parchment, almoſt every part except the ſtomach may be eaten. They are taken in the holes by feeling for them with an inſtrument; they are ſought after by night, when on their journey, by flambeaux. The inſtant the animal perceives itſelf attacked, it throws itſelf on its back, and with its claws pinches moſt terribly whatever it happens to faſten on. But the dextrous crab-catcher takes them by the hinder legs in ſuch a manner that the nippers cannot touch him, and thus he throws them into his bag. Sometimes they are alſo caught when they take refuge in the bottoms of holes in rocks by the ſea-ſide, by clapping a ſtick at the mouth of the hole, which prevents their getting out, and then ſoon after, the tide coming, enters the hole, and the animal is found, upon its retiring, drowned in its retreat.

Theſe crabs are of various ſizes, the largeſt about ſix inches wide; they walk ſide-ways like the ſea-crab, and are ſhaped like them: ſome are black, ſome yellow, ſome red, and others variegated with red, white, and yellow mixed. Some of theſe are poiſonous; and ſeveral people have died of eating of the crabs, particularly of the black kind. The light-coloured are reckoned beſt; and when full in fleſh, are very well taſted. In ſome of the ſugar iſlands they are eat without danger; and are no ſmall help to the negro ſlaves, who, on many of theſe iſlands, would fare very hard without them.

Cancer, in medicine, a roundiſh, unequal, hard, and livid tumour, generally ſeated in the glandulous parts of the body, ſuppoſed to be ſo called, becauſe it appears at length with turgid veins ſhooting out from it, ſo as to reſemble, as it is thought, the figure of a crab-fiſh; or, others ſay, becauſe like that fiſh, where it has once got, it is ſcarce poſſible to drive it away. See, (the *Index* ſubjoined to) Medicine.

Cancer, in aſtronomy, one of the twelve ſigns, repreſented on the globe in the form of a crab, and thus marked (♋) in books. It is the fourth conſtellation in the ſtarry zodiac, and that from which one quadrant of the ecliptic takes its denomination. The reaſon generally aſſigned for its name as well as figure, is a ſuppoſed reſemblance which the ſun's motion in this ſign bears to the crab-fiſh. As the latter walks backwards, ſo the former, in this part of his courſe, begins to go backwards, or recede from us; though the diſpoſi-

diſpoſition of ſtars in this ſign is by others ſuppoſed to have given the firſt hint to the repreſentation of a crab.

Tropic of Cancer, in aſtronomy, a leſſer circle of the ſphere parallel to the equator, and paſſing through the beginning of the ſign Cancer.

CANCHERIZANTE, or Cancherizato, in the Italian muſic, a term ſignifying a piece of muſic that begins at the end, being the retrograde motion from the end of a ſong, &c. to the beginning.

CANCROMA, or Boat-Bill, in ornithology, a genus of birds belonging to the order of *Grallæ*; the characters of which are: The bill is broad, with a keel along the middle; the noſtrils are ſmall, and lodged in a furrow; the tongue is ſmall; and the toes are divided. There are two ſpecies:

1. The Cochlearia, or Creſted Boat-bill, is of the ſize of a fowl; the length 22 inches. The bill is four inches long, and of a ſingular form, not unlike a boat with the keel uppermoſt, or, as ſome think, like the bowls of two ſpoons, placed with the hollow parts together; the upper mandible has a prominent ridge at the top, and on each ſide of this a long channel, at the bottom of which the noſtrils are placed; theſe are oval, and ſituated obliquely; the general colour of the bill is duſky, or in ſome ſpecimens dark brown; the ſkin between the under jaw capable of diſtenſion: from the hind head ſprings a long black creſt, the feathers which compoſe it narrow, and end in a point; the middle ones are ſix inches in length, the others leſſen by degrees, the outer ones being not more than one inch: between the bill and the eye the ſkin is bare and duſky; the plumage on the forehead white; the reſt of the bird of a pale bluiſh aſh-colour; acroſs the lower part of the neck behind is a tranſverſe band of browniſh black, which paſſes forwards on each ſide towards the breaſt, ending in a point, but does not encompaſs it: the fore part of the neck, and under parts, are bluiſh white, except the belly and thighs, which are rufous: the feathers which hang over the breaſt are looſe, like thoſe of the heron: the tail is three inches and a half long, and the wings when cloſed, reach nearly to the end of it: the leg is three inches in length; and the thigh, from its inſertion to the knee, four; the middle toe two inches and a half; the bare part above the knee one inch and a half: the colour of the bare parts yellowiſh brown; claws black: the toes are connected at the baſe by a membrane, which, as in the umbre is the deepeſt in the outer one.—It inhabits Cayenne, Guiana, and Braſil, and chiefly frequents ſuch parts as are near the water: in ſuch places it perches on the trees, which hang over the ſtreams, and, like the king's fiſher, drops down on the fiſh which ſwim beneath. It has been thought to live on crabs likewiſe, whence the Linnæan name.

2. The Concrophaga, or Brown Boat-bill, a diſtinct ſpecies, according to Linnæus, but which Mr Lathan conſiders as only a variety, is of the ſize of the former; the head and creſt the ſame; the upper parts, inſtead of aſh-colour, are of a pale rufous brown; the tail rufous aſh; and the under parts wholly of a cream colour; the bill and legs of a yellow brown. Its place and manners the ſame with thoſe of the preceding.

CANDAHAR, a province of Perſia, bounded on the north by the province of Balk; on the eaſt, by that of Cabul; on the ſouth, by Buchor and Sableſtan; and on the weſt, by Sigeſtan. There have been bloody wars between the Indians and Perſians on account of this province; but in 1650 it fell to the Perſians. The inhabitants are known by the name of *Aghuans*, or *Affghans*, who have often endeavoured to throw off the yoke. But in 1737, they were ſeverely puniſhed for ſuch an attempt. See Persia.

Candahar, the capital of the above province, is ſeated on a mountain; and being a place of great trade, has a conſiderable fortreſs. The caravans that travel from Perſia and the parts about the Caſpian ſea to the Eaſt Indies, chooſe to paſs through Candahar, becauſe there is no danger of being robbed on this road, and proviſions are very reaſonable. The religion is Mahometaniſm, but there are many Banians and Guebres. E. Long. 67. 5. N. Lat. 33. 0.

CANDAULES, the laſt king of Lydia, of the family of the Heraclides. See Lydia.

CANDELARES, (from *candela* a candle), the name of an order in the former editions of Linnæus's Fragments of a natural method, conſiſting of theſe three genera, *rhizophora*, *nyſſa*, and *minuſops*. They are removed, in the latter editions, into the order Holoraceæ; which ſee.

CANDIA, the modern name of the iſland of Crete (ſee Crete). The word is a variation of *Khunda*, which was originally the Arabian name of the metropolis only, but in time came to be applied to the whole iſland.

Candia came into the poſſeſſion of the Venetians by purchaſe in the year 1194, as related under the article Crete: and ſoon began to flouriſh under the laws of that wiſe republic. The inhabitants, living under the protection of a moderate government, and being encouraged by their maſters, engaged in commerce and agriculture. The Venetian commandants readily afforded to thoſe travellers who viſited the iſland, that aſſiſtance which is neceſſary to enable them to extend and improve uſeful knowledge. Belon, the the naturaliſt, is laviſh in praiſe of their good offices, and deſcribes, in an intereſting manner, the flouriſhing ſtate of that part of the iſland which he viſited.

The ſeat of government was eſtabliſhed at Candia. The magiſtrates and officers, who compoſed the council, reſided there. The proviſor-general was preſident. He poſſeſſed the chief authority; and his power extended over the whole principality. It continued in the poſſeſſion of the Venetians for five centuries and an half. Cornaro held the chief command at the time when it was threatened with a ſtorm on the ſide of Conſtantinople. The Turks, for the ſpace of a year, had been employed in preparing a vaſt armament. They deceived the Venetian, by aſſuring him that it was intended againſt Malta. In the year 1645, in the midſt of a ſolemn peace, they appeared unexpectedly before Crete with a fleet of 400 ſail, having on board 60,000 land forces, under the command of four pachas. The emperor Ibrahim, under whom this expedition was udertaken, had no fair pretext to offer in juſtification of his enterprize. He made uſe of all that perfidy which characterizes the people of the eaſt, to impoſe on the Venetian ſenate. He loaded their ambaſſador with preſents, directed his fleet to bear for Cape Matapan, as if they had been going beyond the Archi-

Archipelago; and cauſed the governors of Tina and Cerigna to be ſolemnly aſſured, that the republic had nothing to fear for her poſſeſſions. At the very inſtant when he was making thoſe aſſurances, his naval armament entered the gulf of Canea; and, paſſing between that city and St Theodore, anchored at the mouth of Platania.

The Venetians, not expecting this ſudden attack, had made no preparations to repel it. The Turks landed without oppoſition. The iſle of St Theodore is but a league and an half from Canea. It is only three quarters of a league in compaſs. The Venetians had erected two forts there; one of which, ſtanding on the ſummit of the higheſt eminence, on the coaſt of that little iſle, was called Turluru; the other, on a lower ſituation, was named St Theodore. It was an important object to the Muſſulmans to make themſelves maſters of that rock, which might annoy their ſhips. They immediately attacked it with ardour. The firſt of thoſe fortreſſes, being deſtitute of ſoldiers and cannon, was taken without ſtriking a blow. The garriſon of the other conſiſted of no more than 60 men. They made a gallant defence, and ſtood out till the laſt extremity; and when the Turks at laſt prevailed, their number was diminiſhed to ten, whom the captain-pacha cruelly cauſed to be beheaded.

Being now maſters of that important poſt, as well as of Lazaret, an elevated rock, ſtanding about half a league from Canea, the Turks inveſted the city by ſea and land. General Cornaro was ſtruck, as with a thunder-clap, when he learned the deſcent of the enemy. In the whole iſland there were no more than a body of 3500 infantry, and a ſmall number of cavalry. The beſieged city was defended only by 1000 regular troops, and a few citizens, who were able to bear arms. He made haſte to give the republic notice of his diſtreſs; and poſted himſelf off the road, that he might the more readily ſuccour the beſieged city. He threw a body of 250 men into the town, before the lines of the enemy were completed. He afterwards made ſeveral attempts to ſtrengthen the beſieged with other reinforcements; but in vain. The Turks had advanced in bodies cloſe to the town, had carried a half-moon battery, which covered the gate of Retimo; and were battering the walls night and day with their numerous artillery. The beſieged defended themſelves with reſolute valour, and the ſmalleſt advantage which the beſiegers gained coſt them dear. General Cornaro made an attempt to arm the Greeks, particularly the Spachiots, who boaſted loudly of their valour. He formed a battalion of theſe. But the æra of their valour was long paſt. When they beheld the enemy, and heard the thunder of the cannon, they took to flight; not one of them would ſtand fire.

While the ſenate of Venice were deliberating on the means to be uſed for relieving Canca, and endeavouring to equip a fleet, the Mahometan generals were ſacrificing the lives of their ſoldiers to bring their enterpriſe to a glorious termination. In different engagements they had already loſt 20,000 warriors; but, deſcending into the ditches, they had undermined the walls, and blown up the moſt impregnable forts with exploſions of powder. They ſprung one of thoſe mines beneath the baſtion of St Demetri. It overturned a conſiderable part of the wall, which cruſhed all the defenders of the baſtion. That inſtant the beſiegers ſprung up with their ſabres in their hands, and taking advantage of the general conſternation of the beſieged on that quarter, made themſelves maſters of the poſt. The beſieged, recovering from their terror, attacked them with unequalled intrepidity. About 400 men aſſailed 2000 Turks already firmly poſted on the wall, and preſſed upon them with ſuch obſtinate and dauntleſs valour, that they killed a great number, and drove the reſt down into the ditch. In this extremity, every perſon in the city was in arms. The Greek monks took up muſkets; and the women, forgetting the delicacy of their ſex, appeared on the walls among the defenders, either ſupplying the men with ammunition and arms, or fighting themſelves; and ſeveral of thoſe daring heroines loſt their lives.

For 50 days the city held out againſt all the forces of the Turks. If, even at the end of that time, the Venetians had ſent a naval armament to its relief, the kingdom of Candia might have been ſaved. Doubtleſs, they were not ignorant of this well known fact. The north wind blows ſtraight into the harbour of Canea. When it blows a little briſkly, the ſea rages. It is then impoſſible for any ſquadron of ſhips, however numerous, to form in line of battle in the harbour, and to meet an enemy. If the Venetians had ſet out from Cerigo with a fair wind, they might have reached Canea in five hours, and might have entered the harbour with full ſails, without being expoſed to one cannon-ſhot; while none of the Turkiſh ſhips would have dared to appear before them; or if they had ventured, muſt have been driven back on the ſhore, and daſhed in pieces among the rocks. But, inſtead of thus taking advantage of the natural circumſtances of the place, they ſent a few galleys, which, not daring to double Cape Spada, coaſted along the ſouthern ſhore of the iſland, and failed of accompliſhing the deſign of their expedition.

At laſt, the Caneans, deſpairing of relief from Venice, ſeeing three breaches made in their walls, thro' which the infidels might eaſily advance upon them, exhauſted with fatigue, and covered with wounds, and reduced to the number of 500 men, who were obliged to ſcatter themſelves round the walls, which were half a league in extent, and undermined in all quarters, demanded a parley, and offered to capitulate. They obtained very honourable conditions; and after a glorious defence of two months, which coſt the Turks 20,000 men, marched out of the city with the honours of war. Thoſe citizens, who did not chuſe to continue in the city, were permitted to remove; and the Ottomans, contrary to their uſual practice, faithfully obſerved their ſtipulations.

The Venetians, after the loſs of Canea, retired to Retimo. The captain-pacha laid ſiege to the citadel of the Sude, ſituated in the entrance of the bay, on an high rock, of about a quarter of a league in circumference. He raiſed earthen-batteries, and made an ineffectual attempt to level its ramparts. At laſt, deſpairing of taking it by aſſault, he left ſome forces to block it up from all communication, and advanced towards Retimo. That city, being unwalled, was defended by a citadel, ſtanding on an eminence which overlooks the harbour. General Cornaro had retired thither. At the approach of the enemy, he advanced

Candia.

from the city, and waited for them in the open field. In the action, inattentive to his own ſafety, he encouraged the ſoldiers, by fighting in the ranks. A glorious death was the reward of his valour: but his fall determined the fate of Retimo.

The Turks having landed additional forces on the iſland, they introduced the plague, which was almoſt a conſtant attendant on their armies. This dreadful peſt rapidly advanced, and, like a devouring fire, waſting all before it, deſtroyed moſt part of the inhabitants. The reſt, fleeing in terror before its ravages, eſcaped into the Venetian territories, and the iſland was left almoſt deſolate.

The ſiege of the capital commenced in 1646, and was protracted much longer than that of Troy. Till the year 1648, the Turks ſcarcely gained any advantages before that city. They were often routed by the Venetians, and ſometimes compelled to retire to Retimo. At that period Ibrahim was ſolemnly depoſed, and his eldeſt ſon, at the age of nine years, was raiſed to the throne, under the name of Mahomet IV. Not ſatisfied with confining the ſultan to the horrors and obſcurity of a dungeon, the partizans of his ſon ſtrangled him on the 19th of Auguſt, in the ſame year. That young prince, who mounted the throne by the death of his father, was afterwards expelled from it, and condemned to paſs the remainder of his life in confinement.

In the year 1649, Uſſein Pacha, who blockaded Candia, receiving no ſupplies from the Porte, was compelled to raiſe the ſiege, and retreat to Canea. The Venetians were then on the ſea with a ſtrong ſquadron. They attacked the Turkiſh fleet in the bay of Smyrna, burnt 12 of their ſhips and 2 gallies, and killed 6000 of their men. Some time after, the Mahometans having found means to land an army on Candia, renewed the ſiege of the city with greater vigour, and made themſelves maſters of an advanced fort that was very troubleſome to the beſieged; which obliged them to blow it up.

From the year 1650 till 1658, the Venetians, continuing maſters of the ſea, intercepted the Ottomans every year in the ſtraits of the Dardanelles, and fought them in four naval engagements; in which they defeated their numerous fleets, ſunk a number of their caravels, took others, and extended the terror of their arms even to the the walls of Conſtantinople. That capital became a ſcene of tumult and diſorder. The Grand Signior alarmed, and trembling for his ſafety, left the city with precipitation.

Such glorious ſucceſs revived the hopes of the Venetians, and depreſſed the courage of the Turks. They converted the ſiege of Candia into a blockade, and ſuffered conſiderable loſſes. The Sultan, in order to exclude the Venetian fleet from the Dardanelles, and to open to his own navy a free and ſafe paſſage, cauſed two fortreſſes to be built at the entrance of the ſtraits. He gave orders to the Pacha of Canea to appear again before the walls of Candia, and to make every poſſible effort to gain the city. In the mean time, the republic of Venice, to improve the advantages which they had gained, made ſeveral attempts on Canea. In 1660, that city was about to ſurrender to their arms, when the Pacha of Rhodes, haſtening to its relief, reinforced the defenders with a body of 2000 men. He happily doubled the extremity of Cape Melec, though within ſight of the Venetian fleet, which was becalmed off Cape Spada, and could not advance one fathom to oppoſe an enemy, conſiderably weaker than themſelves.

Kiopruli, ſon and ſucceſſor to the viſir of that name, who had long been the ſupport of the Ottoman empire, knowing that the murmurs of the people againſt the long continuance of the ſiege of Candia were riſing to an height, and fearing a general revolt, which would be fatal to himſelf and his maſter, ſet out from Byzantium, about the end of the year 1666, at the head of a formidable army. Having eſcaped the Venetian fleet, which was lying off Canea with a view to intercept him, he landed at *Palio Caſtro*, and formed his lines around Candia. Under his command were four Pachas, and the flower of the Ottoman forces. Thoſe troops, being encouraged by the preſence and the promiſes of their chiefs, and ſupported by a great quantity of artillery, performed prodigies of valour. All the exterior forts were deſtroyed. Nothing now remained to the beſieged but the bare line of the walls, unprotected by fortreſſes; and theſe being battered by an inceſſant diſcharge of artillery, ſoon gave way on all quarters. Still, however, what poſterity may perhaps regard as incredible, the Candians held out three years againſt all the forces of the Ottoman empire. At laſt they were going to capitulate, when the hope of aſſiſtance from France reanimated their valour and rendered them invincible. The expected ſuccours arrived on the 26th of June 1669. They were conducted by the duke of Noailles. Under his command were a great number of French noblemen, who came to make trial of their ſkill in arms againſt the Turks.

Next day after their arrival, the ardour of the French prompted them to make a general ſally. The duke of Beaufort, admiral of France, aſſumed the command of the forlorn hope. He was the firſt to advance againſt the Muſſulmans, and was followed by a numerous body of infantry and cavalry. They advanced furiouſly upon the enemy, attacked them within their trenches, forced the trenches, and would have compelled them to abandon their lines and artillery, had not an unforeſeen accident damped their courage. In the midſt of the engagement a magazine of powder was ſet on fire; the foremoſt of the combatants loſt their lives; the French ranks were broken; ſeveral of their leaders, among whom was the duke of Beaufort, diſappeared for ever; the ſoldiers fled in diſorder; and the duke of Noailles, with difficulty, effected a retreat within the walls of Candia. The French accuſed the Italians of having betrayed them; and on that pretext prepared to ſet off ſooner than the time agreed upon. No intreaties of the commandant could prevail with them to delay their departure; ſo they reimbarked. Their departure determined the fate of the city. There were now no more than five hundred men to defend it. Moroſini capitulated with Kiopruli, to whom he ſurrendered the kingdom of Crete, excepting only the Sude, Grabuſa, and Spina-Longua. The grand viſir made his entrance into Candia on the 4th of October 1670; and ſtayed eight months in that city, inſpecting the reparation of its walls and fortreſſes.

The three fortreſſes left in the hands of the Venetians by the treaty of capitulation remained long after in their poſſeſſion. At laſt they were all taken, one after another. In ſhort, after a war of thirty years continuance, in the courſe of which more than two hundred thouſand men fell in the iſland, and it was deluged with ſtreams of Chriſtian and Mahometan blood, Candia was entirely ſubdued by the Turks, in whoſe hands it ſtill continues.

Of the climate of Candia travellers ſpeak with rapture. The heat is never exceſſive; and in the plains violent cold is never felt. In the warmeſt days of ſummer the atmoſphere is cooled by breezes from the ſea. Winter properly begins here with December and ends with January; and during that ſhort period ſnow never falls on the lower grounds, and the ſurface of the water is rarely frozen over. Moſt frequently the weather is as fine then as it is in Britain at the beginning of June. Theſe two months have received the name of *winter*, becauſe in them there is a copious fall of rain, the ſky is obſcured with clouds, and the north winds blow violently; but the rains are favourable to agriculture, the winds chaſe the clouds towards the ſummits of the mountains, where a repoſitory is formed for thoſe waters which are to fertilize the fields; and the inhabitants of the plain ſuffer no inconvenience from theſe tranſient blaſts. In the month of February, the ground is overſpread with flowers and riſing crops. The reſt of the year is almoſt one continued fine day. The inhabitants of Crete never experience any of thoſe mortifying returns of piercing cold, which are ſo frequently felt in Britain and even more ſouthern countries; and which, ſucceeding ſuddenly after the cheriſhing heats of ſpring, nip the bloſſoming flowers, wither the open buds, deſtroy half the fruits of the year, and are fatal to delicate conſtitutions. The ſky is always unclouded and ſerene; the winds are mild and refreſhing breezes. The radiant ſun proceeds in ſmiling majeſty along the azure vault, and ripens the fruits on the lofty mountains, the riſing hills, and the plains. The nights are no leſs beautiful; their coolneſs is delicious. The atmoſphere not being overloaded with vapours, the ſky unfolds to the obſerver's view a countleſs profuſion of ſtars; thoſe numerous ſtars ſparkle with the moſt vivid rays, and ſtrew the azure vault in which they appear fixed, with gold, with diamonds, and with rubies. Nothing can be more magnificent than this ſight, and the Cretans enjoy it for ſix months in the year.

To the charms of the climate other advantages are joined which augment their value: There are ſcarce any moraſſes in the iſland; the waters never ſtand here in a ſtate of ſtagnation; they flow in numberleſs ſtreams from the tops of the mountains, and form here and there large fountains or ſmall rivers that empty themſelves into the ſea; the elevated ſituation of their ſprings cauſe them to daſh down with ſuch rapidity, that they never loſe themſelves in pools or lakes, conſequently inſects cannot depoſit their eggs upon them, as they would be immediately hurried down into the ſea; and Crete is not infeſted like Egypt with thoſe clouds of inſects which ſwarm in the houſes, and whoſe ſting is inſufferably painful; nor is the atmoſphere here loaded with thoſe noxious vapours which riſe from marſhy grounds.

The mountains and hills are overſpread with various kinds of thyme, ſavoury, wild thyme, and with a multitude of odoriferous and balſamic plants; the rivulets which flow down the vallies are overhung with myrtles and laurel roſes; clumps of orange, citron, and almond trees, are plentifully ſcattered over the fields; the gardens are adorned with tufts of Arabian jaſmine. In ſpring, they are beſtrewed with beds of violets, ſome extenſive plains are arrayed in ſaffron; the cavities of the rocks are fringed with ſweet ſmelling dittany. In a word, from the hills, the vales, and the plains, on all hands, there ariſe clouds of exquiſite perfumes, which embalm the air, and render it a luxury to breathe it.

As to the inhabitants, the Mahometan men are generally from five feet and an half to ſix feet tall. They bear a ſtrong reſemblance to ancient ſtatues; and it muſt have been after ſuch models that the ancient artiſts wrought. The women alſo are generally beautiful. Their dreſs does not reſtrain the growth of any part of their bodies, and their ſhape therefore aſſumes thoſe admirable proportions with which the hand of the Creator has graced his faireſt workmanſhip on the earth. They are not all handſome or charming; but ſome of them are beautiful, particularly the Turkiſh ladies. In general, the Cretan women have a riſing throat, a neck gracefully rounded, black eyes ſparkling with animation, a ſmall mouth, a fine noſe, and cheeks delicately coloured with the freſh vermilion of health. But the oval of their form is different from that of Europeans, and the character of their beauty is peculiar to their own nation.

The quadrupeds belonging to the iſland are not of a ferocious temper. There are no lions, tigers, bears, wolves, foxes, nor indeed any dangerous animal here. Wild goats are the only inhabitants of the foreſts that overſpread the lofty mountains; and theſe have nothing to fear but the ball of the hunter; hares inhabit the hills and the plain; ſheep graze in ſecurity on the thyme and the heath; they are folded every night, and the ſhepherd ſleeps ſoundly without being diſturbed with the fear that wild animals may invade and ravage his folds.

The Cretans are very happy in not being expoſed to the troubleſome bite of noxious inſects, the poiſon of ſerpents, and the rapacity of the wild beaſts of the deſart. The ancients believed that the iſland enjoyed theſe ſingular advantages, on account of its having been the birth-place of Jupiter. "The Cretans (ſay Ælian) celebrate in their ſongs the beneficence of Jupiter, and the favour which he conferred on their iſland, which was the place of his birth and education, by freeing it from every noxious animal, and even rendering it unfit for nouriſhing thoſe noxious animals that are introduced into it from foreign countries."

Dittany holds the firſt rank among the medicinal plants which are produced in Crete. The praiſes beſtowed on the virtues of this plant by the ancients are altogether extravagant; yet we perhaps treat the medicinal virtues of this plant with too much contempt. Its leaf is very balſamic, and its flower diffuſes around it a delicious odour. At preſent the inhabitants of the iſland apply it with ſucceſs on various occaſions. The leaf, when dried and taken in an infuſion with a little ſugar, makes a very pleaſant drink, of a finer flavour than tea. It is there an immediate cure for a weak ſtomach, and enables it to recover its tone after a bad digeſtion.

Diſeaſes are very rare in a country whoſe atmoſphere is exceedingly pure; and in Candia, epidemical diſeaſes are unknown. Fevers prevail here in ſummer, but are not dangerous; and the plague would be wholly unknown, had not the Turks deſtroyed the lazarets that were eſtabliſhed by the Venetians, for ſtrangers to do quarantine in. Since the period when theſe were demoliſhed, it is occaſionally introduced by ſhips from Smyrna and Conſtantinople. As no precautions are taken againſt it, it gains ground, and ſpreads over the iſland from one province to another; and as the colds and heats are never intemperate, it ſometimes continues its ravages for ſix months at a time.

This fine country is infeſted with a diſeaſe ſomewhat leſs dangerous than the plague, but whoſe ſymptoms are ſomewhat more hideous; that diſeaſe is the leproſy. In ancient times, Syria was the focus in which it raged with moſt fury: and from Syria it was carried into ſeveral of the iſlands of the Archipelago. It is infectious, and is inſtantaneouſly communicated by contact. The victims who are attacked by it, are driven from ſociety, and confined to little ruinous houſes on the highway. They are ſtrictly forbidden to leave theſe miſerable dwellings, or hold intercourſe with any perſon. Thoſe poor wretches have generally beſide their huts a ſmall garden producing pulſe, and feeding poultry; and with that ſupport, and what they obtain from paſſengers, they find means to drag out a painful life in circumſtances of ſhocking bodily diſtreſs. Their bloated ſkin is covered with a ſcaly cruſt, ſpeckled with red and white ſpots, which afflict them with intolerable itchings. A hoarſe and tremulous voice iſſues from the bottom of their breaſts. Their words are ſcarce articulated; becauſe their diſtemper inwardly preys upon the organs of ſpeech. Theſe frightful ſpectres gradually loſe the uſe of their limbs. They continue to breathe till ſuch time as the whole maſs of their blood is corrupted, and their bodies entirely in a ſtate of putrefaction. The rich are not attacked by this diſtemper: it confines itſelf to the poor, chiefly to the Greeks. But thoſe Greeks obſerve ſtrictly their four lents; and eat nothing during that time but ſalt fiſh, botorgo, ſalted and ſmoked pickled olives, and cheeſe. They drink plentifully of the hot and muddy wines of the iſland. The natural tendency of ſuch a regimen muſt be, to fire the blood, to thicken the fluid part of it, and thus at length to bring on a leproſy.

Candia is at preſent governed by three Pachas, who reſide reſpectively at Candia, Canea, and Retimo. The firſt, who is always a Pacha of three tails, may be conſidered as viceroy of the iſland. He enjoys more extenſive powers than the others. To him the inſpection of the forts and arſenals is entruſted. He nominates to ſuch military employments as fall vacant, as well as to the governments of the Sude, Grabuſa, Spina Longua, and Gira-petra. The governors of theſe forts are denominated Beys. Each of them has a conſtable and three general officers under him: one of whom is commander of the artillery; another of the cavalry; and the third of the janiſſaries.

The council of the pacha conſiſts of a kyaia, who is the channel through which all orders are iſſued, and all favours beſtowed; an aga of the janiſſaries, colonel-general of the troops, who has the chief care of the regulation of the police; two topigi bachi; a defterdar, who is treaſurer-general for the imperial revenues; a keeper of the imperial treaſury; and the chief officers of the army. This government is entirely military, and the power of the pacha ſeraſquier is abſolute. The juſtice of his ſentences is never called into queſtion; they are inſtantly carried into execution.

The people of the law are the mufti, who is the religious head, and the cadi. The firſt interprets thoſe laws which regard the diviſion of the patrimony among the children of a family, ſucceſſions, and marriages;—in a word, all that are contained in the Koran; and he alſo decides on every thing that relates to the ceremonies of the Muſſulman religion. The cadi cannot pronounce ſentence on affairs connected with theſe laws, without firſt taking the opinion of the mufti in writing, which is named *Faitſa*. It is his buſineſs to receive the declarations, complaints, and donations of private perſons; and to decide on ſuch differences as ariſe among them. The pacha is obliged to conſult thoſe judges when he puts a Turk legally to death; but the pacha, who is dignified with three tails, ſets himſelf above all laws, condemns to death, and ſees his ſentence executed, of his own proper authority. All the moſques have their Itam, a kind of curate, whoſe duty is to perform the ſervice. There are ſchoolmaſters in the different quarters of the city. Theſe perſons are much reſpected in Turkey, and are honoured with the title of Effendi.

The garriſon of Candia conſiſts of forty-ſix companies, compoſing a military force of about ten thouſand men. All theſe forces do not reſide conſtantly in the city, but they may be muſtered in a very ſhort time. They are all regularly paid every three months excepting the janiſſaries, none of whom but the officers receive pay. The different gradations of this military body do not depend on the pacha. The council of each company, conſiſting of veterans, and of officers in actual ſervice, has the power of naming to them. A perſon can occupy the ſame poſt for no longer than two years; but the poſt of *Sorbagi*, or captain, which is purchaſed at Conſtantinople, is held for life. The *ouſta*, or cook, is alſo continued in his employment as long as the company to which he belongs is ſatisfied with him. Each company has its almoner, denominated *imam*.

The garriſons of Canea and Retimo, formed on a ſimilar plan, are much leſs numerous. The firſt conſiſts of about three thouſand men, the other of five hundred; but as all the male children of the Turks are enrolled among the janiſſaries as ſoon as born, the number of theſe troops might be greatly augmented in time of war; but, to ſay the truth, they are far from formidable. Moſt of them have never ſeen fire, nor are they ever exerciſed in military evolutions.

The pachas of Canea and Retimo are no leſs abſolute, within the bounds of their reſpective provinces, than the pacha of Candia. They enjoy the ſame privileges with him, and their council conſiſts of the ſame officers. Theſe governors chief object is to get rich as ſpeedily as poſſible; and in order to accompliſh that end, they practiſe all the arts and cruelties of oppreſſion, to ſqueeze money from the Greeks. In truth, thoſe poor wretches run to meet the chains with which they are loaded. Envy which always preys upon them, continually prompts them to take up arms. If ſome one among them happen to enjoy a decent ſortune, the reſt aſſiduouſly ſeek ſome pretence for accuſing him before the pacha, who takes advantage of theſe diſſentions to ſeize the property of both the parties. It is by no means aſtoniſhing, that under ſo barbarous a government, the number of the Greeks is daily diminiſhed.

There are ſcarcely in the iſland, ſixty-five thouſand of whom pay the carach.	150,000 Greeks
The Turks have not poſſeſſed the iſland for more than one hundred and twenty years; yet, as they are not expoſed to the ſame oppreſſion, they have multiplied in it, and raiſed themſelves upon the ruin of the ancient inhabitants. Their number amounts to	200,000 Turks.
The Jews, of whom there are not many in the Iſland, amount only to	200
Total is	350,200 ſouls.

This fertile country is in want of nothing but induſtrious huſbandmen, ſecure of enjoying the fruit of their labours. It might maintain four times its preſent number of inhabitants.

Antiquity has celebrated the iſland of Crete as containing an hundred populous cities: and the induſtry of geographers has preſerved their names and ſituations. Many of theſe cities contained no fewer than thirty thouſand inhabitants;—and by reckoning them, on an average, at ſix thouſand each, we ſhall in all probability be rather within than beyond the truth.

This calculation gives for an hundred cities	600,000
By allowing the ſame number as inhabitants of the towns, villages, and all the reſt of the iſland,	600,000
the whole number of the inhabitants of ancient Crete will amount to	1,200,000

This number cannot be exaggerated. When Candia was in the hands of the Venetians, it was reckoned to contain nine hundred fourſcore and ſixteen villages.

It appears, therefore, that when the iſland of Crete enjoyed the bleſſing of liberty, it maintained to the number of eight hundred and forty-nine thouſand eight hundred more inhabitants than it does at preſent. But ſince thoſe happier times, ſhe has been deprived of her laws by the tyranny of the Romans; has groaned under the deſtructive ſway of the monarchs of the lower empire; has been expoſed for a period of an hundred and twenty years to the ravages of the Arabians; has next paſſed under the dominion of the Venetians; and has at laſt been ſubjected to the deſpotiſm of the Turks, who have produced a dreadful depopulation in all the countries which have been ſubdued by their arms.

The Turks allow the Greeks the free exerciſe of their religion, but forbid them to repair their churches or monaſteries; and accordingly they cannot obtain permiſſion to repair their places of worſhip, or religious houſes, but by the powerful influence of gold. From this article the pachas derive very conſiderable ſums. They have twelve biſhops as formerly, the firſt of whom aſſumes the title of archbiſhop of Gortynia. He reſides at Candia; in which city the metropolitan church of the iſland ſtands. He is appointed by the patriarch of Conſtantinople; and has the right of nominating to all other biſhoprics of the iſland; the names of which are, Gortynia, Cnoſſou, Mirabella, Hyera, Gira-petra, Arcadia, Cherroneſe, Lambis, Milopotamo, Retimo, Canea, Ciſamo. Theſe biſhoprics are nearly the ſame as under the reign of the Greek emperors. The patriarch wears a triple tiara, writes his ſignature in red ink, and anſwers for all the debts of the clergy. To enable him to fulfil his engagements, he lays impoſitions on the reſt of the biſhops, and particularly on the monaſteries, from which he draws very handſome contributions. He is conſidered as the head of the Greeks, whom he protects, as far as his ſlender credit goes. The orders of government are directed to him on important occaſions; and he is the only one of all the Greeks in the iſland who enjoys the privilege of entering the city on horſeback.

CANDIA, is the capital of the above iſland, ſituated on its northern coaſt, in E. Long. 25. 0. N. Lat. 35. 30. It ſtands on the ſame ſituation which was formerly occupied by Heraclea, and is the ſeat of government under the Turks. Its walls, which are more than a league in compaſs, are in good repair, and defended by deep ditches, but not protected by any exterior fort. Towards the ſea it has no attacks to fear; becauſe the ſhallowneſs of the harbour renders it inacceſſible to ſhips of war.

The Porte generally commits the government of this iſland to a Pacha of three tails. The principal officers, and ſeveral bodies of the Ottoman ſoldiery, are ſtationed here. This city, when under the Venetians, was opulent, commercial, and populous; but it has now loſt much of its former ſtrength and grandeur. The harbour, naturally a fine baſon, in which ſhips are ſecurely ſheltered from every ſtorm, is every day becoming narrower and ſhallower. At preſent it admits only boats and ſmall ſhips after they have diſcharged a part of their freight. Thoſe veſſels, which the Turks freight at Candia, are obliged to go almoſt empty to the ports of Standie, whether their cargoes are conveyed to them in barks. Such inconveniences are highly unfavourable to commerce; and as government never thinks of removing them, the trade of Candia is therefore conſiderably decayed.

Candia, which was embelliſhed by the Venetians with regular ſtreets, handſome houſes, a fine ſquare, and a magnificent ciſtern, contains at preſent but a ſmall number of inhabitants, notwithſtanding the vaſt extent of the area incloſed within its walls. Several diviſions of the city are void of inhabitants. That in which the market-place ſtands is the only one which diſcovers any ſtir of buſineſs, or ſhow of affluence. The Mahometans have converted moſt of the Chriſtian temples into moſques; yet they have left two churches to the Greeks, one to the Armenians, and a ſynagogue to the Jews. The Capuchins poſſeſs a ſmall convent, with a chapel in which the vice-conſul of France hears maſs. At preſent he is the only Frenchman who attends it, as the French merchants have taken up their reſidence at Canea.

Weſt of the city of Candia is an extenſive range of hills, which are a continuation of mount Ida, and of which the extremity forms the promontory of Dion. On the way to Dion, we find Palio Caſtro, on the ſhore; a name which the modern Greeks give indifferently to all remains of ancient cities. Its ſituation correſponds to that of the ancient Panormus, which ſtood north-weſt from Heraclea.

The river which runs weſt of Candia was anciently known by the name of Triton; near the ſource of which Minerva ſprung from the brain of Jove. Loaxus is a little farther diſtant. About a league eaſt of that city, the river Ceratus flows through a delightful vale. According to Strabo, in one part of its courſe it runs near by Gnoſſus. A little beyond that, is another river ſuppoſed to be Therenus, on the banks of which, fable relates that Jupiter conſummated his marriage with Juno. For the ſpace of more than half a league round the walls of Candia there is not a ſingle tree to be ſeen. The Turks cut them all down in the time of the ſiege, and laid waſte the gardens and orchards. Beyond that extent, the country is plentifully covered with corn and fruit trees. The neighbouring hills are overſpread with vineyards, which produce the malmſey of mount Ida,—worthy of preference at the table of the moſt exquiſite connoiſſeur in wines. That ſpecies of wine, though little known, has a fine flavour, a very pleaſant reliſh, and is highly eſteemed in the iſland.

CANDIAC, (John Lewis) a premature genius, born at Candiac in the dioceſe of Niſmes in France, in 1719. In the cradle he diſtinguiſhed his letters: at 13 months, he knew them perfectly: at three years of age, he read Latin, either printed or in manuſcript: at four, he tranſlated from that tongue: at ſix, he read Greek and Hebrew; was maſter of the principles of arithmetic, hiſtory, geography, heraldry, and the ſcience of medals; and had read the beſt authors on almoſt every branch of literature. He died of a complication of diſorders, at Paris, in 1726.

CANDIDATE, a perſon who aſpires to ſome public office.

In the Roman commonwealth, they were obliged to wear a white gown during the two years of their ſoliciting a place. This garment, according to Plutarch, they wore without any other clothes, that the people might not ſuſpect they concealed money for purchaſing votes, and alſo that they might more eaſily ſhow to the people the ſcars of thoſe wounds they had received in fighting for the defence of the commonwealth. The candidates uſually declared their pretenſions a year before the time of election, which they ſpent in making intereſt and gaining friends. Various arts of popularity were practiſed for this purpoſe, and frequent circuits made round the city, and viſits and compliments to all ſorts of perſons, the proceſs of which was called *ambitus*. See AMBITUS.

CANDIDATI MILITES, an order of ſoldiers, among the Romans, who ſerved as the emperor's body-guards to defend him in battle. They were the talleſt and ſtrongeſt of the whole troops, and moſt proper to inſpire terror. They were called *candidati*, becauſe clothed in white, either that they might be more conſpicuous, or becauſe they were conſidered in the way of preferment.

CANDISH, a conſiderable province of Aſia, in the dominions of the Great Mogal, bounded by Chytor and Malva on the north, Orixa on the eaſt, Decan on the ſouth, and Guzarat on the weſt. It is populous and rich; and abounds in cotton, rice, and indigo. Brampore is the capital town.

CANDLE, a ſmall taper of tallow, wax, or ſpermaceti; the wick of which is commonly of ſeveral threads of cotton, ſpun and twiſted together.

A tallow-candle, to be good, muſt be half ſheep's and half bullock's tallow; for hog's tallow makes the candle gutter, and always gives an offenſive ſmell, with a thick black ſmoke. The wick ought to be pure, ſufficiently dry, and properly twiſted; otherwiſe the candle will emit an inconſtant vibratory flame, which is both prejudicial to the eyes and inſufficient for the diſtinct illumination of objects.

There are two ſorts of tallow-candles; the one dipped, the other moulded: the former are the common candles; the others are the invention of the ſieur le Brege at Paris.

As to the method of making candles in general: After the tallow has been weighed, and mixed in the due proportions, it is cut into very ſmall pieces, that it may melt the ſooner; for the tallow in lumps, as it comes from the butchers, would be in danger of burning or turning black, if it were left too long over the fire. Being perfectly melted and ſkimmed, they pour a certain quantity of water into it, proportionable to the quantity of tallow. This ſerves to precipitate to the bottom of the veſſel the impurities of the tallow which may have eſcaped the ſkimmer. No water, however, muſt be thrown into the tallow deſigned for the three firſt dips; becauſe the wick, being ſtill quite dry, would imbibe the water, which makes the candles crackle in burning, and renders them of bad uſe. The tallow, thus melted, is poured into a tub, through a coarſe ſieve of horſe-hair, to purify it ſtill more, and may be uſed after having ſtood three hours. It will continue fit for uſe 24 hours in ſummer and 15 in winter. The wicks are made of ſpun cotton, which the tallow-chandlers buy in ſkains, and which they wind up into bottoms or clues. Whence they are cut out, with an inſtrument contrived on purpoſe, into pieces of the length of the candle required; then put on the ſticks or broaches, or elſe placed in the moulds, as the candles are intended to be either dipped or moulded.

Wax-candles are made of a cotton or flaxen wick, ſlightly twiſted, and covered with white or yellow wax. Of theſe, there are ſeveral kinds: ſome of a conical figure, uſed to illuminate churches, and in proceſſions, funeral ceremonies, &c. (ſee TAPER); others of a cylindrical form, uſed on ordinary occaſions. The firſt are either made with a ladle or the hand. 1. To make wax-candles with the ladle. The wicks being prepared, a dozen of them are tied by the neck, at equal diſtances, round an iron circle, ſuſpended over a large baſon of copper tinned, and full of melted wax: a large ladle full of this wax is poured gently on the tops of the wicks one after another, and this operation continued till the candle arrive at its deſtined bigneſs; with this precaution, that the three firſt ladles be poured on at the top of the wick, the fourth at the height of $\frac{3}{4}$, the fifth at $\frac{1}{2}$, and the ſixth at $\frac{1}{4}$, in order to give the candle its pyramidal form. Then the candles are taken down, kept warm,

and

and rolled and ſmoothed upon a walnut-tree table, with a long ſquare inſtrument of box, ſmooth at the bottom. 2. As to the manner of making wax-candles by the hand, they begin to ſoften the wax, by working it ſeveral times in hot water, contained in a narrow but deep caldron. A piece of the wax is then taken out, and diſpoſed by little and little around the wick, which is hung on a hook in the wall, by the extremity oppoſite to the neck; ſo that they begin with the big end, diminiſhing ſtill as they deſcend towards the neck. In other reſpects the method is nearly the ſame as in the former caſe. However, it muſt be obſerved, that, in the former caſe, water is always uſed to moiſten the ſeveral inſtruments, to prevent the wax from ſticking; and in the latter, oil of olives, or lard, for the hands, &c. The cylindrical wax-candles are either made as the former, with a ladle, or drawn. Wax-candles drawn, are ſo called, becauſe actually drawn in the manner of wire, by means of two large rollers of wood, turned by a handle, which, turning backwards and forwards ſeveral times, paſs the wick through melted wax contained in a braſs baſon, and at the ſame time through the holes of an inſtrument like that uſed for drawing wire faſtened at one ſide of the baſon.

If any chandlers in Britain mix with their wares any thing deceitfully, &c. the candles ſhall be forfeited. Stat. 23 Eliz. and a tax or duty is granted on candles, by 8 and 9 Anne, cap. 6. made for ſale, of one penny a pound, beſides the duty upon tallow, by 8 Anne, cap. 9. And by 24 Geo. III. cap. 11. an additional duty of an halfpenny a pound: and by the ſame an additional duty of an halfpenny a pound is laid upon all candles imported (except thoſe of wax and ſpermaceti, for which ſee *Wax-Candles*), ſubject alſo to the two additional 5 per cents. impoſed by 19 and 22 Geo. III. beſides the duty of 2¼d. formerly impoſed by 2 W. ſeſſ. 2. cap. 4. 8 Anne, cap. 9. and 9 Anne, cap. 6. And every maker of candles, other than wax candles, for ſale, ſhall annually take out a licence at L. 1. The maker of candles ſhall, in four weeks within the bills, and elſewhere in ſix weeks, after entry, clear off the duties on pain of double duty: nor ſell any after default in payment on pain of double value; 8 Anne, cap. 9. The makers of candles are not to uſe melting houſes, without making a true entry, on pain of L. 100, and to give notice of making candles to the exciſe officer for the duties: and of the number, &c. or ſhall forfeit L. 50, ſtat. 11. Geo. I. cap. 30. See alſo 23 Geo. II. cap. 21. and 26 Geo. II. cap. 32. No maker of candles for ſale ſhall begin to make candles, without notice firſt given to the officer, unleſs from September 29th to March 25th yearly, between ſeven in the morning and five in the evening, and from March 25th to September 29th, between five in the morning and ſeven in the evening, on pain of L. 10, 10 Anne, cap. 26. The penalty of obſtructing the officer is L. 20, and of removing of candles before they are ſurveyed L. 20, 8 Anne, cap. 9. The penalty of privately making candles is the forfeiture of the ſame and utenſils, and L. 100, 5 Geo. III. cap. 43. And the penalty of mingling weighed with unweighed candles, of removing them before they are weighed, or of concealing them, is the forfeiture of L. 100, 11 Geo. cap. 30. Candles, for which the duty hath been paid, may be exported, and the duty drawn back; but no draw-back ſhall be allowed on the exportation of any foreign candles imported. 8. Ann. cap. 9. 23 Geo. II. cap. 21.

The Roman candles were at firſt little ſtrings dipt in pitch, or ſurrounded with wax; though afterwards they made them of the papyrus, covered likewiſe with wax; and ſometimes alſo of ruſhes, by ſtripping off the outer rind, and only retaining the pith.—For religious offices, wax candles were uſed; for vulgar uſes, thoſe of tallow. Lord Bacon propoſes candles of divers compoſitions and ingredients, as alſo of different ſorts of wicks; with experiments of the degrees of duration, and light of each. Good houſewives bury their candles in flour or bran, which it is ſaid increaſes their laſting almoſt half.

Experiments to determine the real and comparative value of burning Candles *of different ſorts and ſizes.*

	Numb. of candles in one pound.	Weight of one candle.		The time one candle laſted		The time that one pound will laſt.		The expence in 12 hours when candles are at 6d. per dozen, which alſo ſhows the proportion of the expence at any price per dozen.
		Oz.	Dr.	Hr.	Min	Hr.	Min	Farthings and 100th parts.
Small wick	18⅓	0	14	3	15	59	26	4.85
Large wick.	19	0	13½	2	40	50	34	5.70
	16½	0	15½	2	40	44	2	6.54
	12	1	5⅓	3	27	41	24	6.96
*	10¾	1	8	3	36	38	24	7.50
*	7¾	2	1	4	9	32	12	8.94
*	8	2	0	4	15	34	0	8.47
	5¾	2	13	5	19	30	15	9.53
	Mould candles.							Mould-candle at 7s. per doz.
	5⅞	2	12	7	20	42	39	7.87
	4	4	0	9	3	36	20	9.28

N. B. The time that one candle laſted was taken from an average of ſeveral trials in each ſize.

It is obſerveable, in optics, that the flame of two candles joined, give a much ſtronger light than both of them ſeparate. The obſervation was ſuggeſted by Dr Franklin. Probably the union of the two flames produces a greater degree of heat, whereby the vapour is attenuated, and the particles of which light conſiſts more copiouſly emitted.

Lighting a Candle *by a ſmall ſpark of electricity.* This method, which is an invention of Dr Ingenhouſz, is recorded in the Phil. Tranſ. vol. 68. It is done by a ſmall phial, having eight or ten inches of metallic coating, or even leſs, charged with electricity, which may be done at any time of the night by a perſon who has an electric machine in his room. "When I have occaſion to light a candle," ſays he, "I charge a ſmall coated phial, whoſe knob is bent outwards, ſo as to hang a little over the body of the phial; then I wrap ſome looſe cotton over the extremity of a long braſs pin or wire, ſo as to ſtick moderately faſt to its ſubſtance. I next roll this extremity of the pin wrapped up with cotton in ſome fine powder of reſin, (which I always keep in readineſs upon the table for this purpoſe, either in a wide-mouthed phial or in a looſe paper); this being done, I apply the extremity of the pin or wire to the external coating of the charged phial, and bring as quickly as poſſible the other extremity wrapped round with cotton to the knob: the powder of reſin takes fire, and communicates its flame to the cotton, and both together burn long enough to light a candle. As I do not want more than half a minute to light my candle in this way, I find it a readier method than kindling it by a flint and ſteel, or calling a ſervant. I have found, that powder of white or yellow reſin lights eaſier than that of brown. The *farina lycopodii* may be uſed for the ſame purpoſe: but it is not ſo good as the powder of reſin, becauſe it does not take fire quite ſo readily, requiring a ſtronger ſpark not to miſs; beſides, it is ſoon burnt away. By dipping the cotton in oil of turpentine, the ſame effect may be as readily obtained, if you take a jar ſomewhat greater in ſize. This oil will inflame ſo much the readier if you ſtrew a few fine particles of braſs upon it. The pin duſt is the beſt for this purpoſe; but as this oil is ſcattered about by the exploſion, and when kindled fills the room with much more ſmoke than the powder of reſin, I prefer the laſt."

CANDLE-Bombs, a name given to ſmall glaſs bubbles, having a neck about an inch long, with a very ſlender bore, by means of which a ſmall quantity of water is introduced into them, and the orifice afterwards cloſed up. This ſtalk being put through the wick of a burning candle, the vicinity of the flame ſoon rarifies the water into ſteam, by the elaſticity of which the glaſs is broken with a loud crack.

CANDLE is alſo a term of medicine, and is reckoned among the inſtruments of ſurgery. Thus the *candela fumalis*, or the *candela pro ſuffitu odorata*, is a maſs of an oblong form, conſiſting of odoriferous powders, mixed up with a third or more of the charcoal of willow or lime tree, and reduced to a proper conſiſtence with a mucilage of gum tragacanth, labdanum, or turpentine. It is intended to excite a grateful ſmell without any flame, to correct the air, to fortify the brain, and to excite the ſpirits.

Medicated CANDLE, the ſame with BOUGIE.

CANDLE. Sale or auction by inch of candle, is when a ſmall piece of candle, being lighted, the byſtanders are allowed to bid for the merchandize that is ſelling; but the moment the candle is out, the commodity is adjudged to the laſt bidder.

There is alſo an excommunication by inch of candle; when the ſinner is allowed to come to repentance while a candle continues burning; but after it is conſumed, he remains excommunicated to all intents and purpoſes.

Ruſh-CANDLES, uſed in different parts of England, are made of the pith of a ſort of ruſhes, peeled or ſtripped of the ſkin, except on one ſide, and dipped in melted greaſe.

CANDLE-Wood, ſlips of pine about the thickneſs of a finger, uſed in ſome places to burn inſtead of candles, giving a very good light. The French inhabitants of Tortuga uſe ſlips of yellow ſantal-wood for the ſame purpoſe, and under the ſame denomination, which yields a clear flame though of a green colour.

CANDLEBERRY TREE, in botany, the Engliſh name of the MYRICA.

CANDLEMAS, a feaſt of the church held on the ſecond day of February, in honour of the purification of the Virgin Mary. It is borrowed from the practice of the ancient Chriſtians, who on that day uſed abundance of lights both in their churches and proceſſions, in memory, as is ſuppoſed, of our Saviour's being on that day declared by Simeon "to be a light to lighten the Gentiles." In imitation of this cuſtom, the Roman-catholics on this day conſecrate all the tapers and candles which they uſe in their churches during the whole year. At Rome, the Pope performs that ceremony himſelf; and diſtributes wax-candles to the cardinals and others, who carry them in proceſſion through the great hall of the Pope's palace. This ceremony was prohibited in England by an order of council in 1548.

CANDLEMAS, in England, is made one of the four terms of the year for paying and receiving rents or borrowed money, &c.—In the courts of law, Candlemas term begins 15th January, and ends 3d February.

CANDLESTICK, an inſtrument to hold a candle, made in different forms, and of all ſorts of matter.

The golden candleſtick was one of the ſacred utenſils made by Moſes to be placed in the Jewiſh tabernacle. It was made of hammered gold, a talent in weight. It conſiſted of ſeven branches ſupported by a baſe or foot. Theſe branches were adorned at equal diſtances with ſix flowers like lilies, and with as many bowls and knobs placed alternately. Upon the ſtock and ſix branches of the candleſtick were the golden lamps, which were immoveable, wherein were put oil and cotton.

Theſe ſeven lamps were lighted every evening, and extinguiſhed every morning. The lamps had their tongs or ſnuffers to draw the cotton in or out, and diſhes underneath them to receive the ſparks or droppings of the oil. This candleſtick was placed in the antichamber of the ſanctuary on the ſouth ſide, and ſerved to illuminate the altar of perfume and the tabernacle of the ſhew-bread. When Solomon had built the temple of the Lord, he placed in it ten golden candleſticks of the ſame form as that deſcribed by Moſes, five on the north and five on the ſouth ſide of the holy place: But after the Babyloniſh captivity, the golden candleſtick was again placed in the temple, as it had been before in the tabernacle by Moſes. This ſacred utenſil, upon the deſtruction of the temple by the Romans, was lodged in the temple of peace built by Veſpaſian; and the repreſentation of it is ſtill to be ſeen on the triumphal arch at the foot of mount Palatine, on which Veſpaſian's triumph is delineated.

CANDY, a large kingdom of Aſia, in the iſland of Ceylon. It contains about a quarter of the iſland; and as it is encompaſſed with high mountains, and covered with thick foreſts, through which the roads and paths are narrow and difficult, the king has them guarded to prevent his ſubjects from going into other countries. It is full of hills, from whence rivulets proceed which are full of fiſh; but as they run among the rocks, they are not fit for boats: however, the inhabitants are very dexterous in turning them to water their land, which is fruitful in rice, pulſe, and hemp. The king is abſolute, and his ſubjects are idolaters. The capital town is of the ſame name.

CANDY, a town of Aſia, and capital of a kingdom of the ſame name, in the iſland of Ceylon. It has been often burnt by the Portugueſe, when they were maſters of theſe coaſts. The houſes are very poor, low, and badly furniſhed. E. Long. 79. 12. N. Lat. 7. 35.

CANDY, or *Sugar-Candy*, a preparation of ſugar made by melting and cryſtallizing it ſix or ſeven times over, to render it hard or tranſparent. It is of three kinds, white, yellow, and red. The white comes from the loaf-ſugar, the yellow from the caſſonado, and the red from the muſcavado.

CANDYING, the act of preſerving ſimples in ſubſtance, by boiling them in ſugar. The performance of this originally belonged to the apothecaries, but is now become a part of the buſineſs of the confectioner.

CANE, in botany. See ARUNDO and CALAMUS.

CANE, denotes alſo a walking ſtick. It is cuſtomary to adorn it with a head of gold, ſilvet, agate, &c. Some are without knots, and very ſmooth and even; others are full of knots about two inches diſtance from one another. Theſe laſt have very little elaſticity, and will not bend ſo well as the others.

Canes of Bengal are the moſt beautiful which the Europeans bring into Europe. Some of them are ſo fine, that people work them into bowls or veſſels, which being varniſhed over in the inſide, with black or yellow lacca, will hold liquors as well as glaſs or China ware does; and the Indians uſe them for that purpoſe.

CANE is alſo the name of a long meaſure, which differs according to the ſeveral countries where it is uſed. At Naples the cane is equal to 7 feet 3½ inches Engliſh meaſure: the cane of Thoulouſe and the Upper Languedoc, is equal to the varre of Arragon, and contains five feet 8½ inches; at Montpellier, Provence, Dauphine, and the Lower Languedoc, to ſix Engliſh feet 5⅓ inches.

CANEA, a conſiderable town of the iſland of Candia, where a baſhaw reſides. It was built by the Venetians, and occupies part of the ſite of the ancient CYDONIA. It is but about two miles in compaſs; encircled on the land ſide with a ſingle wall, extremely thick; and defended by a broad and deep ditch, cut through a bed of rock, which extends all around the wall. By cutting it ſtill deeper, they might cauſe the ſea to flow round its ramparts; on which they have raiſed high platforms, that their great guns might command a wider extent of the adjacent plain. The city has only one gate, the gate of Retimo, protected by an half-moon battery, which is the only exterior fort. The ſide which faces the ſea is the beſt fortified. On the left of the harbour are four batteries, riſing one above another, and planted with a number of large cannons of caſt metal, marked with the arms of Venice. The firſt of theſe batteries ſtands cloſe on the brink of the ſea. The right ſide of the harbour is defended only by a ſtrong wall, extending along a chain of pointed rocks which it is dangerous for ſhips to approach. At the extremity of this wall, there is an old caſtle, falling into ruins. Beneath that caſtle, the Venetians had immenſe arſenals, vaulted with ſtone. Each of theſe vaults was of ſufficient length, breadth, and height, to ſerve as a work-ſhop for building a ſhip of the line. The ground is ſloping, and the outermoſt part of theſe capacious arſenals is on a level with the ſea; ſo that it was very eaſy to launch the ſhips built there into the water. The Turks are ſuffering that magnificent work to fall into ruins.

The city of Canea is laid out on a fine plan. The ſtreets are large and ſtraight; and the ſquares adorned with fountains. There are no remarkable buildings in it. Moſt of the houſes are flat-roofed, and have only one ſtory. Thoſe contiguous to the harbour are adorned with galleries, from which yon enjoy a delightful proſpect. From the windows you diſcover the large bay formed between Cape Spada and Cape Melec, and all the ſhips that are entering in or paſſing out. The harbour, at preſent, receives ſhips of 200 tons burden; and it might be enlarged ſo as to admit the largeſt frigates. Its mouth is expoſed to the violence of the north winds, which ſometimes ſwell the billows above the ramparts. But, as it is narrow, and the bottom is good, ſhips that are well moored run no danger. At the time when Tournefort viſited Crete, Canea did not contain more than five or ſix thouſand inhabitants. But, at preſent, when the gates of Gira-Petra, Candia, and Retimo are choaked up, the merchants have retired to Canea; and it is reckoned to contain 16,000 ſouls. The environs of the town are admirable; being adorned with foreſts of olive-trees mixed with fields, vineyards, gardens, and brooks bordered with myrtle-trees and laural-roſes. The chief revenue of this town conſiſts in oil-olive. E. Long. 24. 15. N. Lat. 35. 28.

CANELLA, in botany: A genus of the monogynia order belonging to the dodecandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx is three lobed; the petals are five; the antheræ 16, growing to an urceolated or bladder-ſhaped nectarium; and the fruit is a trilocular berry, with two ſeeds. There is but one ſpecies, the alba; which grows uſually about 20 feet high, and eight or ten inches in thickneſs, in the thick woods of moſt of the Bahama iſlands. The leaves are narrow at the ſtalk, growing wider at their ends, which are broad and rounding, having a middle rib only; they are very ſmooth, and of a light ſhining green. In May and June the flowers, which are pentapetalous, come forth in cluſters at the ends of the branches: they are red, and very fragrant, and are ſucceeded by round berries, of the ſize of large peas, green, and when ripe (which is in February) purple, containing two ſhining black ſeeds, flat on one ſide, otherwiſe not unlike in ſhape to a kidney bean: theſe ſeeds in the berry are enveloped in a ſlimy mucilage. The whole plant is very aromatic, the bark particularly, being more uſed in diſtilling, and in greater eſteem, in the more northern parts of the world than in Britain.

Pl. CXVI

The bark is the canella alba of the ſhops. It is brought to us rolled up into long quills, thicker than cinnamon, and both outwardly and inwardly of a whitiſh colour, lightly inclining to yellow. Infuſions of it in water are of a yellowiſh colour, and ſmell of the canella; but they are rather bitter than aromatic. Tinctures in rectified ſpirit have the warmth of the bark, but little of its ſmell. Proof-ſpirit diſſolves the aromatic as well as the bitter matter of the canella, and is therefore the beſt menſtruum.

The canella is the interior bark freed from an outward thin rough one, and dried in the ſhade The ſhops diſtinguiſh two ſorts of canella, differing from each other in the length and thickneſs of the quills : they are both the bark of the ſame tree ; the thicker being taken from the trunk, and the thinner from the branches. This bark is a warm pungent aromatic, though not of the moſt agreeable kind : nor are any of the preparations of it very grateful.

Canella alba is often employed where a warm ſtimulant to the ſtomach is neceſſary, and as a corrigent of other articles. It is now, however, little uſed in compoſition by the London college ; the only official formula which it enters being the pulvis aloeticus : but with the Edinburgh college it is an ingredient in the tinctura amara, vinum amarum, vinum rhei, &c. It is uſeful as covering the taſte of ſome other articles.—This bark has been confounded with that called Winter's bark, which belongs to a very different tree. See Wintera.

CANELLE, or Cane-Land, a large country in the iſland of Ceylon, called formerly the *kingdom of Cota*. It contains a great number of cantons, the principal of which are occupied by the Dutch. The chief riches of this country conſiſts in cinnamon, of which there are large foreſts. There are five towns on the coaſt, ſome forts, and a great number of harbours. The reſt of the country is inhabited by the natives ; and there are ſeveral rich mines, from whence they get rubies, ſapphires, topazes, cats-eyes, and ſeveral other precious ſtones.

CANEPHORÆ, in Grecian antiquity, virgins who, when they became marriageable, preſented certain baſkets full of little curioſities to Diana, in order to get leave to depart out of her train, and change their ſtate of life.

CANEPHORIA, in Grecian antiquity, a ceremony which made part of a feaſt, celebrated by the Athenian virgins on the eve of their marriage-day. At Athens the canephoria conſiſted in this ; that the maid, conducted by her father and mother, went to the temple of Minerva, carrying with her a baſket full of preſents to engage the goddeſs to make the marriage-ſtate happy; or, as the ſcholiaſt of Theocritus has it, the baſket was intended as a kind of honourable amends made to that goddeſs, the protectrix of virginity, for abandoning her party ; or as a ceremony to appeaſe her wrath. Suidas calls it a feſtival in honour of Diana.

Canephoria, is alſo the name of a feſtival in honour of Bacchus, celebrated particularly by the Athenians, on which the young maids carried golden baſkets full of fruit, which baſkets were covered, to conceal the myſtery from the uninitiated.

CANES, in Egypt and other eaſtern countries, a poor ſort of buildings for the reception of ſtrangers and travellers. People are accommodated in theſe with a room at a ſmall price, but with no other neceſſaries ; ſo that, excepting the room, there are no greater accommodations in theſe houſes than in the deſarts, only that there is a market near.

Canes Venatici, in aſtronomy, the grey-hounds, two new conſtellations, firſt eſtabliſhed by Hevelius, between the tail of the Great Bear and Bootes's arms, above the Coma Berenices. The firſt is called *aſterion*, being that next the Bear's tail ; the other *chara*. They comprehended 23 ſtars, of which Tycho only obſerved two. The longitudes and latitudes of each are given by Hevelius. In the Britiſh Catalogue they are 25.

CANETO, a ſtrong town of Italy in the duchy of Mantua, ſeated on the river Oglio, which was taken by the Imperialiſts in 1701, by the French in 1702, afterwards by the Imperialiſts, and then by the French in 1705. E. Long. 10. 45. N. Lat. 40. 55.

CANGA, in the Chineſe affairs, a wooden clog borne on the neck, by way of puniſhment for divers offences. The canga is compoſed of two pieces of wood notched, to receive the criminal's neck ; the load lies on his ſhoulders, and is more or leſs heavy according to the quality of his offence. Some cangas weigh 200lb ; the generality from 50 to 60. The Mandarins condemn to the puniſhment of the canga. Sentence of death is ſometimes changed for this kind of puniſhment.

CANGE, (Charles du Freſne ſieur du), one of the moſt learned writers of his time, was born at Amiens in 1601, and ſtudied at the Jeſuits college in that city. Afterwards he applied himſelf to the ſtudy of the law at Orleans, and gained great reputation by his works ; among which are, 1. The hiſtory of the empire of Conſtantinople under the French emperors. 2. John Cinnamus's ſix books of the hiſtory of the affairs of John and Manuel Comnenus in Greek and Latin, with hiſtorical and philological notes. 3. *Gloſſarium ad Scriptores mediæ & infimæ Latinitatis.*

CANGI, Ceangi, or *Cangani*, anciently a people of Britain, concerning whoſe ſituation antiquaries have been much perplexed. They are all the ſame people. Cambden diſcovered ſome traces of them in many different and diſtant places, as in Somerſetſhire, Wales, Derbyſhire, and Cheſhire ; and he might have found as plain veſtiges of them in Devonſhire, Dorſetſhire, Eſſex, Wiltſhire, &c. Mr Horſley and others are no leſs perplexed and undetermined in their opinions on this ſubject. But Mr Baxter ſeems to have diſcovered the true cauſe of all this perplexity, by obſerving that the Cangi or Ceangi were not a diſtinct nation ſeated in one particular place, but ſuch of the youth of many different nations as were employed in paſturage, in feeding the flocks and herds of their reſpective tribes. Almoſt all the ancient nations of Britain had their ceangi, their paſtoritia pubes, the keepers of their flocks and herds, who ranged about the country in great numbers, as they were invited by the ſeaſon and plenty of paſture for their cattle. This is the reaſon that veſtiges of their name are to be found in ſo many different parts of Britain ; but chiefly in thoſe parts which are moſt fit for paſturage. Theſe ceangi of the different Britiſh nations, naturally brave, and rendered ſtill more hardy by their way of life, were conſtantly armed for the protection of their flocks from wild beaſts ; and theſe arms they occaſionally employed in the defence of their country and their liberty.

CANGIAGIO, or Cambiasi, (Ludovico) one of the moſt eminent of the Genoeſe painters, was born in 1527. His works at Genoa are very numerous ; and he was employed by the king of Spain to adorn part of the Eſcurial. It is remarked of him, that he was not only a moſt expeditious and rapid painter, but alſo that he worked equally well with both hands ;

and by that unuſual power he executed more deſigns, and finiſhed more grand works with his own pencil, in a much ſhorter time, than moſt other artiſts could do with ſeveral aſſiſtants. He died in 1585.

In the royal collection at Paris, there is a Sleeping Cupid, as large as life, and likewiſe Judith with her attendant; which are painted by Cangiagio, and are an honour to that maſter. And in the Pembroke collection at Wilton, is a picture, reputed the work of Cangiagio, repreſenting Chriſt bearing his Croſs.

CANICULA, is a name proper to one of the ſtars of the conſtellation *canis major*, called alſo ſimply the *dog-ſtar*; by the Greeks σειριος, *ſirius**. Canicula is the tenth in order in the Britannic catalogue; in Tycho's and Ptolemy's it is the ſecond. It is ſituated in the mouth of the conſtellation; and is of the firſt magnitude, being the largeſt and brighteſt of all the ſtars in the heavens. From the riſing of this ſtar not coſmically, or with the ſun, but heliacally, that is, its emerſion from the ſun's rays, which now happens about the 15th day of Auguſt, the ancients reckoned their *dies caniculares*, or dog-days. The Egyptians and Ethiopians began their year at the riſing of the canicula, reckoning to its riſe again the next year, which is called the *annus canarius*, or canicular year. This year conſiſted ordinarily of 365 days, and every fourth year of 366, by which it was accommodated to the civil year. The reaſon of their choice of the canicula before the other ſtars to compute their time by, was not only the ſuperior brightneſs of that ſtar, but becauſe its heliacal riſing was in Egypt a time of ſingular note, as falling on the greateſt augmentation of the Nile, the reputed father of Egypt. Epheſtion adds, that from the aſpect and colour of canicula, the Egyptians drew prognoſtics concerning the riſe of the Nile; and, according to Florus, predicted the future ſtate of the year; ſo that the firſt riſing of this ſtar was annually obſerved with great attention.

* See *Sirius*

CANICULUM, or CANICULUS, in the Byzantine antiquities, a golden ſtandiſh or ink-veſſel, decorated with precious ſtones, wherein was kept the ſacred *encauſtum*, or red ink, wherewith the emperors ſigned their decrees, letters, &c. The word is by ſome derived from *canis*, or *caniculus*; alluding to the figure of a dog which it repreſented, or rather becauſe it was ſupported by the figures of dogs. The caniculum was under the care of a particular officer of ſtate.

CANINA, the north part of the ancient Epirus, a province of Greece, which now belongs to the Turks, and lies off the entrance of the gulph of Venice. The principal town is of the ſame name, and is ſeated on ſea-coaſt, at the foot of the mountains of Chimera. E. Long. 19. 25. N. Lat. 40. 55.

CANINANA, in zoology, the name of a ſpecies of ſerpent found in America, and eſteemed one of the leſs poiſonous kinds. It grows to about two feet long; and is green on the back, and yellow on the belly. It feeds on eggs and ſmall birds; the natives cut off the head and tail, and eat the body as a delicate diſh.

CANINE, whatever partakes of, or has any relation to, the nature of a dog.

CANINE Appetite, amounts to much the ſame with BULIMY.

CANINE Madneſs. See (the *Index* ſubjoined to) MEDICINE.

CANINE Teeth, are two ſharp edged teeth in each jaw; one on each ſide, placed between the inciſores and molares.

CANINI, (John Angelo and Marc Anthony) brothers and Romans, celebrated for their love of antiquities. John excelled in deſigns for engraving on ſtones, particularly heads; Marc engraved them. They were encouraged by Colbert to publiſh a ſucceſſion of heads of the heroes and great men of antiquity, deſigned from medals, antique ſtones, and other ancient remains; but John died at Rome ſoon after the work was begun: Marc Anthony, however, procured aſſiſtance, finiſhed and publiſhed it in Italian in 1669. The cuts of this edition were engraved by Canini, Picard, and Valet; and a curious explanation is given, which diſcovers the ſkill of the Caninis in hiſtory and mythology. The French edition of Amſterdam, 1731, is ſpurious.

CANIS, or DOG, in zoology, a genus of quadrupeds, belonging to the order of feræ. The characters of the dog are theſe: he has ſix fore-teeth in the upper jaw, thoſe in the ſides being longer than the intermediate ones, which are lobated; in the under jaw there are likewiſe ſix fore-teeth, thoſe on the ſides being lobated. He has ſix grinders in the upper, and ſeven in the lower jaw. The teeth called *dog-teeth* are four, one on each ſide, both in the lower and upper jaw; they are ſharp-pointed, bent a little inward, and ſtand at a diſtance from any of the reſt.

There are 14 ſpecies of this genus, *viz.*

Domeſtic Dog.

See Plates CXVII, CXVIII, CXIX, and CXX.

I. The FAMILIARIS, or Domeſtic Dog, is diſtinguiſhed from the other ſpecies by having his tail bent to the left ſide; which mark is ſo ſingular, that perhaps the tail of no other quadruped is bent in this manner. Of this ſpecies there are a great number of varieties. Linnæus enumerates 11, and Buffon gives figures of no leſs than 27. The maſtiff is about the ſize of a wolf, with the ſides of the lips hanging down, and a full robuſt body. The large Daniſh dog differs only from the former in being fuller in the body, and generally of a larger ſize. The grey-hound is likewiſe the ſame with the maſtiff; but its make is more ſlender and delicate. Indeed the difference betwixt theſe three dogs, although perfectly diſtinguiſhable at firſt ſight, is not greater than that betwixt a Dutchman, a Frenchman, and an Italian. The ſhepherd's dog, the wolf-dog, and what is commonly called the *Siberian dog*, to which may be joined the Lapland dog, the Canada dog, and, in general, all thoſe which have ſtraight ears and a pointed ſnout, are all one kind, differing only in thickneſs, the roughneſs or ſmoothneſs of their ſkin, the length of their legs and tails. The hound or beagle, the terrier, the braque or harrier, and the ſpaniel, may be conſidered as the ſame kind: they have the ſame form and the ſame inſtincts; and differ only in the length of their legs, and ſize of their ears, which in each of them are long, ſoft, and pendulous. The bull-dog, the ſmall Daniſh dog, the Turkiſh dog, and the Iceland dog, may likewiſe be conſidered as the ſame kind, all the varieties in their appearance taking their riſe merely from climate. For inſtance, the Turkiſh dog, which has no hair, is nothing elſe but the ſmall Daniſh dog tranſported to a warm climate, which makes the hair fall off. A dog of any kind loſes its hair in very warm climates. But this is not the only change which ariſes from difference of climate. In ſome countries, the voice is changed; in others, dogs become altogether ſilent. In ſome climates they loſe the faculty of barking, and howl like wolves, or yelp like foxes. Warm climates even change their form and inſtincts: they turn ill-ſhaped, and their ears become ſtraight and pointed. It is only in temperate climes that dogs preſerve their natural courage, ardour, and ſagacity.

Dr Caius has left, among ſeveral other tracts relating to natural hiſtory, one written expreſsly on the ſpecies of Britiſh dogs; beſides a deſcription of the variety of dogs then exiſting in that country, he has added a ſyſtematic table of them, which we ſhall here inſert, and explain by a brief account of each kind.

Synopsis of British Dogs.

I. The moſt generous kinds.	Dogs of chace.	Hounds.	Terrier
			Harrier
			Blood-hound
			Gaze-hound
			Grey-hound
			Leviner, or Lyemmer
			Tumbler
	Fowlers.		Spaniel
			Setter
			Water-ſpaniel, or finder
	Lap Dogs.		Spaniel gentle, or comforter
II. Farm Dogs.			Shepherd's dog
			Maſtiff, or ban dog.
III. Mongrels.			Wappe
			Turnſpit
			Dancer

1. a. The firſt variety is the *terrarius* or terrier, which takes its name from its ſubterraneous employ; being a ſmall kind of hound uſed to force the fox or other beaſts of prey out of their holes; and in former times, rabbits out of their burrows into nets.

b. The *leverarius*, or harrier, is a ſpecies well known at preſent: it derives its name from its uſe, that of hunting the hare; but under this head may be placed the fox-hound, which is only a ſtronger and fleeter variety, applied to a different chace.

c. The *ſanguinarius*, blood-hound, or *ſleut-hounde* of the Scots, was a dog of great uſe, as already noticed under the article *Blood-Hound*.

The next ſubdiviſion of this ſpecies of dogs comprehends thoſe that hunt by the eye; and whoſe ſucceſs depends either upon the quickneſs of their ſight, their ſwiftneſs, or their ſubtilty.

d. The *agaſæus*, or gaze-hound, was the firſt: it chaced indifferently the fox, hare, or buck. It would ſelect from the herd the fatteſt and faireſt deer; purſue it by the eye; and, if loſt for a time, recover it again by its ſingular diſtinguiſhing faculty; nay, ſhould the beaſt rejoin the herd, this dog would fix unerringly on the ſame. This ſpecies is now loſt, or at leaſt unknown to us,

e. The next kind is the *leporarius*, or gre-hound. Dr Caius informs us, that it takes its name *quod præcipui gradus ſit inter canes*, "the firſt in rank among dogs:" that it was formerly eſteemed ſo, appears from the foreſt-laws of king Canute, who enacted that no one under the degree of a gentleman ſhould preſume to keep a grey-hound; and ſtill more ſtrongly from an old Welſh ſaying which ſignifies, that "you may know a gentleman by his hawk, his horſe, and his grey-hound."

The variety called the *Highland grey-hound*, and now become very ſcarce, is of very great ſize, ſtrong, deep-cheſted, and covered with long rough hair. This kind was much eſteemed in former days, and uſed in great numbers by the powerful chieftains in their magnificent hunting-matches. It had as ſagacious noſtrils as the blood-hound, and was as fierce.

f. The third ſpecies is the *levinarius*, or lorarius; the leviner or lyemmer: the firſt name is derived from the lightneſs of the kind; the other from the old word *lyemme*, a thong; this ſpecies being uſed to be led in a thong, and ſlipped at the game. Our author ſays that this dog was a kind that hunted both by ſcent and ſight; and in the form of its body obſerved a medium between the hound and grey-hound. This probably is the kind now known by the name of the *Iriſh grey-hound*, a dog now extremely ſcarce in that kingdom, the late king of Poland having procured from them as many as poſſible. They were of the kind called by Buffon *le grand Danois*, and probably imported there by the Danes who long poſſeſſed that kingdom. Their uſe ſeems originally to have been for the chace of wolves with which Ireland ſwarmed till the latter end of the laſt century. As ſoon as theſe animals were extirpated, the numbers of the dogs decreaſed; for, from that period, they were kept only for ſtate.

g. The *vertagus*, or tumbler, is a fourth ſpecies; which took its prey by mere ſubtilty, depending neither on the ſagacity of its noſe, nor its ſwiftneſs: if it came into a warren, it neither barked, nor ran on the rabbits; but by a ſeeming neglect of them, or attention to ſomething elſe, deceived the object till it got within reach, ſo as to take it by a ſudden ſpring. This dog was leſs than the hound, more ſcraggy, had prickt up ears, and by Dr Caius's deſcription ſeems to anſwer to the modern lurcher.

The third ſubdiviſion of the more generous dogs comprehends thoſe which were uſed in fowling.

h. Firſt, the *Hiſpaniolus*, or ſpaniel; from the name, it may be ſuppoſed that we were indebted to Spain for this breed. There were two varieties of this kind: the firſt uſed to ſpring the game, which are the ſame with the ſtarters. The other variety was uſed only for the net, and was called *index*, or the ſetter; a kind well known at preſent. Britain has been long remarkable for producing dogs of this ſort, particular care having been taken to preſerve the breed in the utmoſt purity. They are ſtill diſtinguiſhed by the name of *Engliſh Spaniels*; ſo that, notwithſtanding the derivation of the name, it is probable they are natives of Great Britain.

i. The *aquaticus*, or finder, was another ſpecies uſed in fowling; was the ſame with the water-ſpaniel; and was uſed to find or recover the game that was ſhot.

k. The *Melitæus*, or *fotór*, the ſpaniel gentle or comforter of Dr Caius (the modern lap-dog), was the laſt of this diviſion. The Malteſe little dogs were as much eſteemed by the fine ladies of paſt times as thoſe of Bologna are among the modern. Old Hollingſhed is ridiculouſly ſevere on the fair of his days for their exceſſive paſſion for theſe little animals; which is ſufficient to prove that it was, in his time*, a novelty.

* The reign of Queen *Elizabeth.*

2. The ſecond grand diviſion of dogs comprehends the *ruſtici*, or thoſe that were uſed in the country.

a. The firſt ſpecies is the *paſtoralis*, or ſhepherd's dog; which is the ſame that is uſed at preſent, either in guarding the flocks, or in driving herds of cattle. This kind is ſo well trained for theſe purpoſes as to attend to every part of the herd, be it ever ſo large; confine them to the road; and force in every ſtraggler, without doing it the leaſt injury.

b. The next is the *villaticus*, or *catenarius*; the maſtiff or ban dog; a ſpecies of great ſize and ſtrength, and a very loud barker. Caius tells us that three of theſe were reckoned a match for a bear: and four for a lion; but from an experiment made in the Tower of London, that noble quadruped was found an unequal match to only three. Two of the dogs were diſabled in the combat, but the third forced the lion to ſeek for ſafety by flight. The Engliſh bull-dog ſeems to belong to this ſpecies; and probably is the dog our author mentions under the title of *laniarius*. Great Britain was ſo noted for its maſtiffs, that the Roman emperors appointed an officer in the iſland under the name of *procurator ſynegii*, whoſe ſole buſineſs was to breed, and tranſmit from thence to the amphitheatre, ſuch as would prove equal to the combats of the place. Gratius ſpeaks in high terms of the excellency of the Britiſh dog.

Cynegeticon, lin. 175.

Atque ipſos libeat penetrare Britannos?
O quanta eſt merces, et quantum impendia ſupra!
Si non ad ſpeciem, mentiturofque decores
Protinus: hæc una eſt catulis jactura Britannis.
At magnum cum venit opus, promendaque virtus,
Et vocat extremo præceps diſcrimine Mavors,
Non tunc egregios tantum admirere Moloſſos.

If *Britain's* diſtant coaſt we dare explore,
How much beyond the coaſt the valued ſtore?
If ſhape and beauty not alone we prize,
Which nature to the *Britiſh* hound denies:
But when the mighty toil the huntſman warms,
And all the ſoul is rous'd by fierce alarms,
When Mars calls furious to th' enſanguin'd field,
Even bold *Moloſſians* then to theſe muſt yield.

Strabo tells us that the maſtiffs of Britain were trained to war, and were uſed by the Gauls in their battles; and it is certain a well trained maſtiff might be of uſe in diſtreſſing ſuch half-armed and irregular combatants as the adverſaries of the Gauls ſeem generally to have been before the Romans conquered them.

3. The laſt diviſion is that of the *degeneres*, or curs.

a. The firſt of theſe was the *wappe*, a name derived from its note; its only uſe was to alarm the family by barking, if any perſon approached the houſe.

b. Of this claſs was the *verſator*, or turn-ſpit; and laſtly the *ſalitator* or dancing-dog: or ſuch as was taught variety of tricks, and carried about by idle people as a ſhew. Theſe *degeneres* were of no certain ſhape, being mongrels or mixtures of all kinds of dogs.

M. de Buffon has given a genealogical table of all the known dogs, in which he makes the *chien de berger*, or ſhepherd's dog, the origin of all, becauſe it is naturally the moſt ſenſible. This table or tree is intended not only to exhibit the different kinds of dogs, but to give an idea of their varieties as ariſing from a degeneration in particular climates, and from a commixture of the different races. It is conſtructed in the form of a geographical chart, preſerving as much as poſſible the poſition of the different climates to which each variety naturally belongs. The ſhepherd's dog, as already mentioned, is the root of the tree. This dog, when tranſported into Lapland, or other very cold climates, aſſumes an ugly appearance, and ſhrinks into a ſmaller ſize: but, in Ruſſia, Iceland, and Siberia, where the climate is leſs rigorous, and the people a little more advanced in civilization, he ſeems to be better accompliſhed. Theſe changes are occaſioned ſolely by the influence of thoſe climates, which produce no great alteration in the figure of this dog; for, in each of theſe climates, his ears are erect, his hair thick and long, his aſpect wild, and he barks leſs frequently, and in a different manner, than in more favourable climates, where he acquires a finer poliſh. The Iceland dog is the only one that has not his ears entirely erect; for their extremities are a little inclined; and Iceland, of all the northern regions, has been longeſt inhabited by half civilized men.

See Plate CXXXI.

The ſame ſhepherd's dog, when brought into temperate climates, and among a people perfectly civilized, as Britain, France, Germany, would, by the mere influence of the climate, loſe his ſavage aſpect, his erect ears, his rude, thick, long hair, and aſſume the figure of a bull dog, the hound, and the Iriſh grey-hound. The bull-dog and Iriſh grey-hound have their ears ſtill partly erect, and very much reſemble, both in their manners and ſanguinary temper, the dog from which they derive their origin. The hound is fartheſt removed from the ſhepherd's dog; for his ears are long and entirely pendulous. The gentleneſs, docility, and even the timidity of the hound, are proofs of his great degeneration, or rather of the great perfection he has acquired by the long and careful education beſtowed on him by man.

The hound, the harrier, and the terrier, conſtitute but one race; for, it has been remarked, that in the ſame litter, hounds, harriers, and terriers, have been brought forth, though the female hound had been covered by only one of theſe three dogs. I have joined the common harrier to the Dalmatian dog, or harrier of Bengal, becauſe they differ only in having more or fewer ſpots on their coat. I have alſo linked the turnſpit, or terrier with crooked legs, with the common terrier; becauſe the defect in the legs of the former has originally proceeded from a diſeaſe ſimilar to the rickets, with which ſome individuals had been affected, and tranſmitted the deformity to their deſcendants.

The hound, when tranſported into Spain and Barbary, where all animals have fine, long, buſhy hair, would be converted into the ſpaniel and water-dog. The great and ſmall ſpaniel, which differ only in ſize, when brought into Britain, have changed their white colour into black, and become, by the influence of climate, the great and little King Charles's dog: To theſe may be joined the pyrame, which is only a King Charles's dog, black like the others, but marked with red on the four legs, and a ſpot of the ſame colour above each eye, and on the muzzle.

The Iriſh grey-hound, tranſported to the north, is become the great Daniſh dog; and, when carried to the ſouth, was converted into the common grey-hound.

The

The largeſt grey-hounds come from the Levant, thoſe of a ſmaller ſize from Italy; and thoſe Italian grey-hounds, carried into Britain, have been ſtill farther diminiſhed.

The great Daniſh dog, tranſported into Ireland, the Ukraine, Tartary, Epirus, and Albania, has been changed into the Iriſh grey-hound, which is the largeſt of all dogs.

The bull-dog, tranſported from Britain to Denmark, is become the little Daniſh dog; and the latter, brought into warm climates, has been converted into the Turkiſh dog. All theſe races, with their varieties, have been produced by the influence of climate, joined to the effects of ſhelter, food, and education. The other dogs are not pure races, but have proceeded from commixtures of thoſe already deſcribed. I have marked, in the table, by dotted lines, the double origin of theſe mongrels.

The grey-hound and Iriſh grey-hound have produced the mongrel grey-hound, called alſo the grey-hound with wolf's hair. The muzzle of this mongrel is leſs pointed than that of the true grey-hound, which is very rare in France.

The great Daniſh dog and the large ſpaniel have produced the Calabrian dog, which is a beautiful animal, with long buſhy hair, and larger than the Iriſh grey-hound.

The ſpaniel and terrier have produced the dog called *burgos*.

From the ſpaniel and little Daniſh dog has proceeded the lion-dog, which is now very rare.

The dogs with long, fine, criſped hair, called the *bouffe dogs*, and which are larger than the water-dog, proceed from the ſpaniel and water-dog.

The little water-dog comes from the water-dog and ſmall ſpaniel.

From the bull-dog and Iriſh grey-hound proceeds a mongrel called the *maſtiff*, which is larger than the bull-dog, and reſembles the latter more than the Iriſh grey-hound.

The pug-dog proceeds from the bull-dog and ſmall Daniſh dog.

All theſe dogs are ſimple mongrels, and are produced by the commixture of two pure races. But there are other dogs, called *double mongrels*, becauſe they proceed from the junction of a pure race with a mongrel. The baſtard pug-dog is a double mongrel from a mixture of the pug-dog with the little Daniſh dog. The Alicant dog is alſo a double mongrel, proceeding from the pug-dog and ſmall ſpaniel. The Malteſe, or lap-dog, is a double mongrel, produced between the ſmall ſpaniel and little water-dog.

Laſtly, there are dogs which may be called *triple mongrels*, becauſe they are produced by two mixed races. Of this kind are the Artois and Iſlois dogs, which are produced by the pug-dog and the baſtard pug-dog: to which may be added the dogs called *ſtreet-dogs*, which reſemble no particular kind, becauſe they proceed from races which have previouſly been ſeveral times mixed.

The following is a ſyſtematic catalogue of all the known dogs, as arranged by Mr Pennant in his Hiſtory of Quadrupeds:

1. Shepherd's dog (*Canis domeſticus*, Lin. *Le Chien de Berger*, Buff.); ſo called, becauſe it becomes without diſcipline almoſt inſtantly the guardian of the flocks, keeps them within bounds, reduces the ſtragglers to their proper limits, and defends them from the attacks of the wolves. They have that variety in England; but it is ſmall and weak. It is the paſtoralis of Caius abovementioned. Thoſe of France and the Alps are very large and ſtrong; ſharp-noſed; erect and ſharp eared; very hairy, eſpecially about the neck: and have their tails turned up or curled: and by accident their faces often ſhow the marks of their combats with the wolf.

Its varieties or neareſt allies are: *a*, Pomeranian dog. *b*, Siberian dog. The other varieties in the inland parts of the empire and Siberia noticed by Buffon, are chiefly from the ſhepherd's dog: and there is a high-limbed taper-bodied kind, the common dog of the Calmuc and independent Tartars, excellent for the chaſe and all uſes.

2. The hound, or dog with long, ſmooth, and pendulous ears. This is the ſame with the blood-hound in Caius's Table, (*le Chien courant*, Buff. *Canis ſagax*, Lin.). It is the head of the other kinds with ſmooth and hanging ears: *a*, Harrier; *b*, Dalmatian, vulgarly the Daniſh, a beautiful ſpotted dog; *c*, Turnſpit; *d*, Water dog, great and ſmall.

From this ſtock branches out another race with pendent ears, covered with long hairs, and leſs in ſize; which form,

3. The Spaniel; (*Canis avicularius*, Lin.) Thoſe of this kind vary in ſize from the ſetting dog to the ſpringing ſpaniels, and ſome of the little lap-dogs; as,

a, King Charles's. Charles II. never went out except attended by numbers of this kind. *b*, *Le pyrame* of Buffon. For this ſort, though common in Britain, there is no Engliſh name. It is black, marked on the legs with red, and having a ſpot of the ſame colour aabove each eye. *c*, The Shock-dog.

4. Dogs with ſhort pendent ears, and long legs and bodies; as,

a, Iriſh grey-hound; (*le Matin*, Buff.): a variety once very frequent in Ireland, and uſed in the chaſe of the wolf; now very ſcarce. Probably the ſame with the leviner in Caius's table, deſcribed above.

b, Common grey-hound, deſcribed above under Caius's table; (*le Levrier et Schreber*, Buff. *Canis graius*, Lin.) Its varieties are, 1. *Italian* grey-hound, ſmall and ſmooth: 2. *Oriental* grey-hound, tall, ſlender, with very pendulous ears, and very long hairs on the tail hanging down a great length.

c, Daniſh dog, of a ſtronger make than a grey-hound: the largeſt of dogs; (*le Grand Danois*, Buff.) Mr Pennant thinks it probable, that of this kind were the dogs of Epirus, mentioned by Ariſtotle, lib. iii. c. 21; or thoſe of Albania, the modern Schirwan or Eaſt Georgia, ſo beautifully deſcribed by Pliny, lib. viii. c. 40. Perhaps to this head may be referred the vaſt dogs of Thibet, ſaid by Marco Paolo to be as big as aſſes, and uſed in that country to take wild beaſts, and eſpecially the wild oxen called *Beyamini*.

d, Maſtiff, (*le Dogue de forte race*, Buff. *Canis moloſſus*, Lin.): Very ſtrong and thick made; the head large; the lips great, and hanging down on each ſide: a fine and noble countenance; grows to a great ſize: A Britiſh kind. See above under Dr Caius's table.

5. Dogs with ſhort pendent ears, ſhort compact bodies;

bodies, ſhort noſes, and generally ſhort legs. *a*. Bull-dog *(le Dogue,* Buff.), with a ſhort noſe, and under jaw longer than the upper: a cruel and very fierce kind, often biting before it barks; peculiar to England; the breed ſcarcer than it has been ſince the barbarous cuſtom of bull-baiting has declined. *b*, Pug-dog, *(le Doguin,* Buff.): A ſmall ſpecies; an innocent reſemblance of the laſt. *c*, Baſtard pug, *(le Roquet,* Buff.) *d*, Naked, *(le chien Turc,* Buff.): A degenerate ſpecies with naked bodies; having loſt their hair by the heat of climate.

Dogs are found in the Society iſlands, New Zealand, and the Low iſlands; there are alſo a few in New Holland. Of theſe are two varieties:

a, Reſembling the ſharp-noſed pricked-ear ſhepherd's cur. Thoſe of New Zeland are of the largeſt ſort. In the Society iſlands they are the common food, and are fattened with vegetables, which the natives cram down their throats as we ſerve turkeys when they will voluntarily eat no more. They are killed by ſtrangling, and the extravaſated blood is preſerved in cocoa-nut ſhells, and baked for the table. They grow very fat, and are allowed, even by Europeans who have got over their prejudices, to be very ſweet and palatable. But the taſte for the fleſh of theſe animals was not confined to the iſlanders of the Pacific ocean. The ancients reckoned a young and fat dog excellent food, eſpecially if it had been caſtrated: Hippocrates placed it on a footing with mutton and pork; and in another place ſays, that the fleſh of a grown dog is wholeſome and ſtrengthening, of puppies relaxing. The Romans admired ſucking puppies: they ſacrificed them alſo to their divinities, and thought them a ſupper in which the gods themſelves delighted.

b, The barbet, whoſe hair being long and ſilky, is greatly valued by the New Zelanders for trimming their ornamental dreſs. This variety is not eaten. The iſlanders never uſe their dogs for any purpoſes but what we mention; and take ſuch care of them as not to ſuffer them even to wet their feet. They are exceſſively ſtupid, have a very bad noſe for ſmelling, and ſeldom or never bark, only now and then howl. The New Zelanders feed their dogs entirely with fiſh.

The Marqueſas, Friendly Iſlands, New Hebrides, New Caledonia, and Eaſter Iſle, have not yet received thoſe animals.

Having thus traced the varieties of the Dog, and noticed the peculiarities of each, we ſhall now give its general natural hiſtory.

From the ſtructure of the teeth, it might be concluded *à priori* that the dog is a carnivorous animal. He does not, however, eat indiſcriminately every kind of animal ſubſtance. There are ſome birds, as the colymbus arcticus, which the water-dog will lay hold of with keenneſs, but will not bring out of the water, becauſe its ſmell is exceedingly offenſive to him. He will not eat the bones of a gooſe, crow, or hawk: but he devours even the putrid fleſh of moſt other animals. He is poſſeſſed of ſuch ſtrong digeſtive powers, as to draw nouriſhment from the hardeſt bones. When fleſh cannot be procured, he will eat fiſh, fruits, ſucculent herbs, and bread of all kinds. When oppreſſed with ſickneſs, to which he is very ſubject, eſpecially in the beginning of ſummer, and before ill weather, in order to procure a puke, he eats the leaves of the quicken-graſs, the bearded wheat-graſs, or the rough cock's-foot graſs, which gives him immediate relief. When he ſteals a piece of fleſh, as conſcious of the immorality of the action, he runs off with his tail hanging and bent in betwixt his feet.

His drink is water, which he takes in ſmall quantities at a time, by licking with his tongue. He is in ſome meaſure obliged to lick in this manner, otherwiſe his noſe would be immerſed in the water.

His excrements are generally hard ſcybals, which, eſpecially after eating bones, are white, and go by the name of *album græcum* among phyſicians. This album græcum was for a long time in great repute as a ſeptic; but it is now entirely diſregarded. He does not throw out his excrements promiſcuouſly upon every thing that happens to be in the way, but upon ſtones, trunks of trees, or barren places. This is a wiſe inſtitution of nature; for the excrements of a dog deſtroy almoſt every vegetable or animal ſubſtance. They are of ſuch a putrid nature, that if a man's ſhoe touches them when recently expelled, that particular part will rot in a few days. He obſerves the ſame method in making his urine, which he throws out at a ſide. It is remarkable, that a dog will not paſs a ſtone or a wall againſt which any other dog has piſſed, without following his example, although a hundred ſhould occur in a few minutes, in ſo much that it is aſtoniſhing how ſuch a quantity can be ſecreted in ſo ſhort a time.

The dog is an animal not only of quick motion, but remarkable for travelling very long journeys. He can eaſily keep up with his maſter, either on foot or horſeback, for a whole day. When fatigued, he does not ſweat, but lolls out his tongue. Every kind of dog can ſwim; but the water-dog excels in that article.

The dog runs round when about to lie down, in order to diſcover the moſt proper ſituation. He lies generally on his breaſt, with his head turned to one ſide, and ſometimes with his head above his two fore-feet. He ſleeps little, and even that does not ſeem to be very quiet: for he often ſtarts, and ſeems to hear with more acuteneſs in ſleep than when awake. They have a tremulous motion in ſleep, frequently move their legs, and bark, which is an indication of dreaming.

Dogs are poſſeſſed of the ſenſation of ſmelling in a high degree. They can trace their maſter by the ſmell of his feet in a church, or in the ſtreets of a populous city. This ſenſation is not equally ſtrong in every kind. The hound can trace game, or his maſter's ſteps, 24 hours afterwards. He barks more furiouſly the nearer he approaches the fowls, unleſs he be beat and trained to ſilence.

The dog eats enviouſly, with oblique eyes; is an enemy to beggars; bites at a ſtone flung at it; is fond of licking wounds; howls at certain notes in muſic, and often urines on hearing them.

With regard to the propagation of dogs, the females admit the males before they are 12 months old. They remain in ſeaſon 10, 12, or even 15 days, during which time they will admit a variety males. They come in ſeaſon generally twice in the year, and more frequently in the cold than in the hot months. The male diſcovers the condition of the female by the ſmell; but ſhe ſeldom admits him the firſt ſix or ſeven days. One coitus will make her conceive a great number of young; but, when not reſtrained, ſhe will admit ſeveral dogs every day: ſhe ſeems to have no choice or predilection, except in favour of large dogs: from this circumſtance it ſometimes happens, that a ſmall female, who has admitted a maſtiff, periſhes in bringing forth her young. During the time of copulation, theſe animals cannot ſeparate themſelves, but remain united ſo long as the erection ſubſiſts. This is owing to the ſtructure of the parts. The dog has not only a bone in his penis, but in the middle of the corpus cavernoſum there is a large hollow, which is blown up in the time of erection to a conſiderable bulk. The female, on the other hand, has a larger clitoris than perhaps any other animal: beſides, a large firm protuberance riſes in the time of copulation, and remains perhaps longer than that of the male, and prevents him from retiring till it ſubſides: accordingly, after the act of copulation is over, the male turns about in order to reſt himſelf on his legs, and remains in that poſition till the parts turn flaccid. The female goes with young about nine weeks. They generally bring forth from ſix to twelve puppies. Thoſe of a ſmall ſize bring forth five, four, and ſometimes but two. They continue to copulate and bring forth during life, which laſts generally about 14 or 15 years. The whelps are commonly blind, and cannot open their eyes till the 10th or 12th day: the males are like the dog, the females like the bitch. In the fourth month, they loſe ſome of their teeth, which are ſoon ſucceeded by others.

The dog has ſuch a ſtrong reſemblance to the wolf and the fox, that he is commonly ſuppoſed to be the production of one or other of theſe animals tamed and civilized. Buffon informs us, that he kept a young dog and a young wolf together till they were three years of age, without their diſcovering the leaſt inclination to copulate. He made the ſame experiment upon a dog and a fox; but their antipathy was rather increaſed when the female was in ſeaſon. From theſe experiments he concludes, that dogs, wolves, and foxes, are perfectly diſtinct genera of animals. There has, however, been lately an inſtance to the contrary: Mr Brooke, animal merchant in Holborn, turned a wolf to a Pomeranian bitch in heat; the congreſs was immediate, and as uſual between dog and bitch: ſhe produced ten puppies. Mr Pennant ſaw one of them at Gordon Caſtle, that had very much the reſemblance of a wolf, and alſo much of its nature; being ſlipped at a weak deer, it inſtantly caught at the animal's throat and killed it. "I could not learn (ſays Mr Pennant) whether this mongrel continued its ſpecies; but another of the ſame kind did, and ſtocked the neighbourhood of Fochabers, in the county of Moray (where it was kept), with a multitude of curs of a moſt wolfiſh aſpect.—There was lately living a mongrel offspring of this kind. It greatly reſembled its wolf parent. It was firſt the property of Sir Wolſtein Dixey; afterwards of Sir Willughby Aſton. During day it was very tame; but at night ſometimes relapſed into ferocity. It never barked, but rather howled; when it came into fields where ſheep were it would feign lameneſs, but if no one was preſent would inſtantly attack them. It had been ſeen in copulation with a bitch, which afterwards pupped: the breed was imagined to reſemble in many reſpects the ſuppoſed ſire. It died between the age of five and ſix.—The bitch will alſo breed with the fox. The woodman of the manor of Mongewell, in Oxfordſhire, has a bitch, which conſtantly follows him, the offspring of a tame dog-fox by a ſhepherd's cur; and ſhe again has had puppies by a dog. Since there are ſuch authentic proofs of the further continuance of the breed, we may ſurely add the wolf and fox to the other ſuppoſed ſtocks of theſe faithful domeſtics."

With regard to the natural diſpoſition of the dog: in a ſavage ſtate, he is fierce, cruel, and voracious; but, when civilized and accuſtomed to live with men, he is poſſeſſed of every amiable quality. He ſeems to have no other deſire than to pleaſe and protect his maſter. He is gentle, obedient, ſubmiſſive, and faithful. Theſe diſpoſitions, joined to his almoſt unbounded ſagacity, juſtly claim the eſteem of mankind. Accordingly no animal is ſo much careſſed or reſpected: he is ſo ductile, and ſo much formed to pleaſe, that he aſſumes the very air and temper of the family in which he reſides.

An animal endowed with ſuch uncommon qualities muſt anſwer many uſeful purpoſes. His fidelity and vigilance are daily employed to protect our perſons, our flocks, or our goods. The acuteneſs of his ſmell gains him employment in hunting: he is frequently employed as a turnſpit: at Bruſſels and in Holland he is trained to draw little carts to the herb-market; and in the northern regions draws a ſledge with his maſter in it, or loaden with proviſions. The Kamſchatkans, Eſquimaux, and Greenlanders, ſtrangers to the ſofter virtues, treat theſe poor animals with great neglect. The former, during ſummer, the ſeaſon in which they are uſeleſs, turn them looſe to provide for themſelves; and recall them in October into their uſual confinement and labour: from that time till ſpring they are fed with fiſh-bones and *opana*, i. e. putrid fiſh preſerved in pits, and ſerved up to them mixed with hot water. Thoſe uſed for draught are caſtrated; and four, yoked to the carriage, will draw five poods, or a hundred and ninety Engliſh pounds, beſides the driver; and thus loaden, will travel 30 verſts, or 20 miles a-day; or if unloaden, on hardened ſnow, on ſliders of bone, a hundred and fifty verſts, or a hundred Engliſh miles.

It is pretty certain, Mr Pennant obſerves, that the Kamſchatkan dogs are of wolfiſh deſcent; for wolves abound in that country, in all parts of Siberia, and even under the arctic circle. If their maſter is flung out of his ſledge, they want the affectionate fidelity of the European kind, and leave him to follow, never ſtopping till the ſledge is overturned, or elſe ſtopped by ſome impediment. The great traveller of the 13th century, Marco Polo, had knowledge of this ſpecies of conveyance from the merchants who went far north to traffic for the precious furs. He deſcribes the ſledges; adds, that they were drawn by ſix great dogs; and that they changed them and the ſledges on the road, as we do at preſent in going poſt. The Kamſchatkans make uſe of the ſkins of dogs for clothing, and the long hair for ornament: ſome nations are fond of them as a food; and reckon a fat dog a great delicacy. Both the Aſiatic and American ſavages uſe theſe animals in ſacrifices to their gods, to beſpeak favour or avert evil. When the Koreki dread any infection, they kill a dog, wind the inteſtines round two poles, and paſs between them.

The Greenlanders are not better maſters. They leave their dogs to feed on muſcles or berries; unleſs in a great capture of ſeals, when they treat them with the blood and garbage. Theſe people alſo ſometimes eat their dogs; uſe the ſkins for coverlets, for clothing, or to border and ſeam their habits; and their beſt thread is made of the guts. Theſe northern dogs in general are large; and in the frigid parts at leaſt have the appearance of wolves: are uſually white, with a black face; ſometimes varied with black and white, ſometimes all white; rarely brown or all black: have ſharp noſes, thick hair, and ſhort ears; and ſeldom bark, but ſet up a ſort of growl or ſavage howl. They ſleep abroad; and make a lodge in the ſnow, lying with only their noſes out. They ſwim moſt excellently; and will hunt in packs the ptarmigan, arctic fox, polar bear, and ſeals lying on the ice. The natives ſometimes uſe them in the chaſe of the bear. They are exceſſively fierce; and, like wolves, inſtantly fly on the few domeſtic animals introduced into Greenland. They will fight among themſelves even to death. Canine madneſs is unknown in Greenland. Being to the natives in the place of horſes, the Greenlanders faſten to their ſledges from four to ten; and thus make their viſits in ſavage ſtate, or bring home the animals they have killed. Egede ſays that they will travel over the ice 15 German miles in a day, or 60 Engliſh, with ſledges loaden with their maſters and five or ſix large ſeals.

Thoſe of the neighbouring iſland of Iceland have a great reſemblance to them. As to thoſe of Newfoundland, it is not certain that there is any diſtinct breed: moſt of them are curs, with a croſs of the maſtiff: ſome will, and others will not, take the water, abſolutely refuſing to go in. The country was found uninhabited, which makes it more probable that they were introduced by the Europeans; who uſe them, as the factory does in Hudſon's bay, to draw firing from the woods to the forts. The ſavages who trade to Hudſon's bay make uſe of the wolfiſh kind to draw their furs.

It is ſingular, that the race of European dogs ſhow as ſtrong an antipathy to this American ſpecies as they do to the wolf itſelf. They never meet with them, but they ſhow all poſſible ſigns of diſlike, and will fall on and worry them; while the wolfiſh breed, with every mark of timidity, puts its tail between its legs, and runs from the rage of the others. This averſion to the wolf is natural to all genuine dogs; for it is well known that a whelp, which has never ſeen a wolf, will at firſt ſight tremble, and run to its maſter for protection: an old dog will inſtantly attack it. Yet theſe animals may be made to breed with one another as above ſhown; and the following abſtract of a letter from Dr Pallas to Mr Pennant, dated October 5th 1781, affords a further confirmation of the fact. "I have ſeen at Moſcow about twenty ſpurious animals from dogs and black wolves. They are for the moſt part like wolves, except that ſome carry their tails higher, and have a kind of hoarſe barking. They multiply among themſelves: and ſome of the whelps are greyiſh, ruſty, or even of the whitiſh hue of the arctic wolves; and one of thoſe I ſaw, in ſhape, tail, and hair, and even in barking, ſo like a cur, that was it not for his head and ears, his ill-natured look, and fearfulneſs at the approach of man, I ſhould hardly have believed that it was of the ſame breed."

The dog is liable to many diſeaſes, as the ſcab, madneſs, &c. and he ſeldom wants the tænia, or tape-worm in his guts, eſpecially if he drinks dirty water.

The Wolf.

II. THE ſecond ſpecies of this genus is the LUPUS, or Wolf. He has a long head, pointed noſe, ears erect and ſharp, long legs well clothed with hair; tail buſhy and bending down, with the tip black; head and neck aſh-coloured; body generally pale brown tinged with yellow: ſometimes found white, and ſometimes entirely black. The wolf is larger and fiercer than a dog. His eyes ſparkle, and there is a great degree of fury and wildneſs in his looks. He draws up his claws when he walks, to prevent his tread from being heard. His neck is ſhort, but admits of very quick motion to either ſide. His teeth are large and ſharp; and his bite is terrible, as his ſtrength is great. The wolf, cruel, but cowardly and ſuſpicious, flies from man; and ſeldom ventures out of the woods, except preſſed by hunger: but when this becomes extreme, he braves danger, and will attack men, horſes, dogs, and cattle of all kinds; even the graves of the dead are not proof againſt his rapacity. Theſe circumſtances are finely deſcribed, in the following lines:

By wintry famine rous'd,—— ——
Cruel as death, and hungry as the grave!
Burning for blood! bony, and ghaunt, and grim!
Aſſembling wolves in raging troops deſcend;
And, pouring o'er the country, bear along,
Keen as the north-wind ſweeps the gloſſy ſnow.
All is their prize. They faſten on the ſteed,
Preſs him to earth, and pierce his mighty heart.
Nor can the bull his awful front defend,
Or ſhake the murthering ſavages away.
Rapacious at the mother's throat they fly,
And tear the ſcreaming infant from her breaſt.
The god-like face of man avails him nought.
Even beauty, force divine! at whoſe bright glance
The generous lion ſtands in ſoften'd gaze,
Here bleeds, a hapleſs undiſtinguiſh'd prey.
But if, appris'd of the ſevere attack,
The country be ſhut up, lur'd by the ſcent,
On church-yards drear (inhuman to relate!)
The diſappointed prowlers fall, and dig
The ſhrouded body from the grave; o'er which,
Mix'd with foul ſhades and frighted ghoſts, they howl.

THOMSON'S WINTER.

The wolf, unlike the dog, is an enemy to all ſociety, and keeps no company even with thoſe of his own ſpecies. When ſeveral wolves appear together, it is not a ſociety of peace, but of war; it is attended with tumult and dreadful prowlings, and indicates an attack upon ſome large animal, as a ſtag, an ox, or a formidable maſtiff. This military expedition is no ſooner finiſhed, than they ſeparate, and each returns in ſilence to his ſolitude. There is even little intercourſe between the males and females: They feel the mutual attractions of love but once a-year, and never remain long together. The females come in ſeaſon in winter: many males follow the ſame female; and this aſſociation is more bloody than the former; for they growl, chaſe, fight, and tear one another, and often ſacrifice him

Canis.

him that is preferred by the female. The female commonly flies a long time, fatigues her admirers, and retires, while they ſleep, with the moſt alert or moſt favourite male.

The ſeaſon of love continues only twelve or fifteen days; it commences with the oldeſt females; the young ones are not ſo early diſpoſed. The males have no marked period, but are equally ready at all times. They go from female to female, according as they are in a condition to receive them. They begin with the old females about the end of December, and finiſh with the young ones in the month of February or beginning of March. The time of geſtation is about three months and a half; and young whelps are found from the end of April to the month of July. The wolves copulate like the dogs, and have an oſſeous penis, ſurrounded with a ring, which ſwells and hinders them from ſeparating. When the females are about to bring forth, they ſearch for a concealed place in the inmoſt receſſes of the foreſt. After fixing on the ſpot, they make it ſmooth and plain for a conſiderable ſpace, by cutting and tearing up with their teeth all the brambles and bruſh-wood. They then bring great quantities of moſs, and prepare a commodious bed for their young, which are generally five or ſix, though ſometimes they bring forth ſeven, eight, and even nine, but never leſs than three. They come into the world blind, like the dogs; the mother ſuckles them ſome weeks, and ſoon learns them to eat fleſh, which ſhe prepares for them by tearing it into ſmall pieces. Some time after ſhe brings them field-mice, young hares, partridges, and living fowls. The young wolves begin by playing with theſe animals, and at laſt worry them; then the mother pulls off the feathers, tears them in pieces, and gives a part to each of her young. They never leave their den till the end of ſix weeks or two months. They then follow their mother, who leads them to drink in the hollow trunk of a tree, or in ſome neighbouring pool. She conducts them back to the den, or, when any danger is apprehended, obliges them to conceal themſelves elſewhere. Though, like other females, the ſhe-wolf is naturally more timid than the male; yet when her young are attacked, ſhe defends them with intrepidity; ſhe loſes all ſenſe of danger, and becomes perfectly furious. She never leaves them till their education is finiſhed, till they are ſo ſtrong as to need no aſſiſtance or protection, and have acquired talents fit for rapine, which generally happens in ten or twelve months after their firſt teeth (which commonly fall out in the firſt month) are replaced.

Wolves acquire their full growth at the end of two or three years, and live 15 or 20 years. When old, they turn whitiſh, and their teeth are much worn. When full, or fatigued, they ſleep, but more during the day than the night, and it is always a kind of ſlight ſlumber. They drink often; and, in the time of drought, when there is no water in the hollows, or in the trunks of old trees, they repair, ſeveral times in a day, to the brooks or rivulets. Though extremely voracious, if ſupplied with water, they can paſs four or five days without meat.

The wolf has great ſtrength, eſpecially in the anterior parts of the body, in the muſcles of the neck and jaws. He carries a ſheep in his mouth, and, at the ſame time, outruns the ſhepherds; ſo that he can only be ſtopped or deprived of his prey by dogs. His bite is cruel, and always more obſtinate in proportion to the ſmallneſs of the reſiſtance: for when an animal can defend itſelf, he is cautious and circumſpect. He never fights but from neceſſity, and not from motives of courage. When wounded with a ball, he cries; and yet, when diſpatching him with bludgeons, he complains not. When he falls into a ſnare, he is ſo overcome with terror, that he may be either killed or taken alive without reſiſtance: he allows himſelf to be chained, muzzled, and led where you pleaſe, without exhibiting the leaſt ſymptom of reſentment or diſcontent.

Canis.

The ſenſes of the wolf are excellent, but particularly his ſenſe of ſmelling, which often extends farther than his eye. The odour of carrion ſtrikes him at the diſtance of more than a league. He likewiſe ſcents live animals very far, and hunts them a long time by following their tract. when he iſſues from the wood, he never loſes the wind. He ſtops upon the borders of the foreſt, ſmells on all ſides, and receives the emanations of living or dead animals brought to him from a diſtance by the wind. Though he prefers living to dead animals; yet he devours the moſt putrid carcaſes. He is fond of human fleſh; and, if ſtronger, he would perhaps eat no other. Wolves have been known to follow armies, to come in troops to the field of battle where bodies are careleſsly interred, to tear them up, and to devour them with an inſatiable avidity: And, when once accuſtomed to human fleſh, theſe wolves ever after attack men, prefer the ſhepherd to the flock, devour women, and carry off children. Wolves of this vicious diſpoſition are called *Loups garoux* by the French peaſants, who ſuppoſe them to be poſſeſſed with ſome evil ſpirits; and of this nature were the *were wulfs* of the old Saxons.

The wolf inhabits the continents of Europe, Aſia, Africa, and America, Kamtſchatka, and even as high as the arctic circle. The wolves of north America, are the ſmalleſt; and, when reclaimed, are the dogs of the natives: the wolves of Senegal the largeſt and fierceſt; they prey in company with the lion. Thoſe of the Cape are grey ſtriped with black; others are black.—They are found in Africa as low as the Cape; and are believed to inhabit New Holland, animals reſembling them having been ſeen there by the late circumnavigators. Dampier's people alſo ſaw ſome half-ſtarved animals in the ſame country, which they ſuppoſed to be wolves. In the eaſt, and particularly in Perſia, wolves are exhibited as ſpectacles to the people. When young, they are learned to dance, or rather to perform a kind of wreſtling with a number men. Chardin tells us, that a wolf, well educated in dancing, is ſold at 500 French crowns. This fact proves, that theſe animals, by time and reſtraint, are ſuſceptible of ſome kind of education. M. Buffon brought up ſeveral of them: " When young, or during their firſt year (he informs us), they are very docile, and even careſſing; and, if well fed, neither diſturb the poultry or any other animal: but, at the age of 18 months or two years, their natural ferocity appears, and they muſt be chained, to prevent them from running off and doing miſchief. I brought up one till the age of 18 or 19 months, in a court along with fowls, none of which he ever attacked; but for his firſt eſſay, he killed the whole in one night, without eating any of them. Another, having broken his chain, run off, after killing a dog with whom he had lived in great familiarity."

Whole countries are ſometimes obliged to arm, in order to deſtroy the wolves. Princes have particular equipages for this ſpecies of hunting, which is both uſeful and neceſſary. Hunters diſtinguiſh wolves into *young*, *old*, and *very old*. They know them by the tracts of their feet. The older the wolf, his feet is the larger. The ſhe-wolf's feet are longer and more ſlender; her heel is alſo ſmaller, and her toes thinner. A good blood-hound is neceſſary for hunting the wolf: and, when he falls into the ſcent, he muſt be coaxed and encouraged: for all dogs have an averſion from the wolf, and proceed with coldneſs in the chace. When the wolf is raiſed, the gre-hounds are let looſe in pairs, and one is kept for diſlodging him, if he gets under cover; the other dogs are led before as a reſerve. The firſt pair are let looſe after the wolf, and are ſupported by a man on horſe-back; then the ſecond pair are let looſe, at the diſtance of ſeven or eight hundred paces; and, laſtly, the third pair, when the other dogs begin to join and to teaze the wolf. The whole together ſoon reduce him to the laſt extremity; and the hunters complete the buſineſs by ſtabbing him with a dagger. The dogs have ſuch a reluctance to the wolf's fleſh, that it muſt be prepared and ſeaſoned before they will eat it. The wolf may alſo be hunted with beagles or hounds; but as he darts always ſtraight forward, and runs for a whole day without ſtopping, the chance is irkſome, unleſs the beagles be ſupported by grey-hounds, to teaze him, and give the hounds time to come up.

Wolves are now ſo rare in the populated parts of America, that the inhabitants leave their ſheep the whole night unguarded: yet the government of Pennſylvania and New-Jerſey did ſome years ago allow a reward of twenty ſhillings, and the laſt even thirty ſhillings for the killing of every wolf. Tradition informed them what a ſcourge thoſe animals had been to the colonies, ſo they wiſely determined to prevent the like evil. In their infant ſtate, wolves came down in multitudes from the mountains, often attracted by the ſmell of the corpſes of hundreds of Indians, who died of the ſmall-pox, brought among them by the Europeans: but the animals did not confine their inſults to the dead, but even devoured in their huts the ſick and dying ſavages.

Beſides being hunted, wolves are deſtroyed by pitfalls, traps, or poiſon. A peaſant in France who kills a wolf, carries its head from village to village, and collects ſome ſmall reward from the inhabitants: the Kirgis-Coſſacks take the wolves by the help of a large hawk called *berkut*, which is trained for the diverſion, and will faſten on them and tear out their eyes. Britain, a few centuries ago, was much infeſted by them. It was, as appears by Hollingſhed, very noxious to the flocks in Scotland in 1577; nor was it entirely extirpated till about 1680, when the laſt wolf fell by the hand of the famous Sir Ewen Cameron. We may therefore with confidence aſſert the non-exiſtence of theſe animals, notwithſtanding M. de Buffon maintains that the Engliſh pretend to the contrary. It has been a received opinion, that the other parts of Britain were in early times delivered from this peſt by the care of king Edgar. In England he attempted to effect it, by commuting the puniſhments of certain crimes into the acceptance of a certain number of wolves tongues from each criminal; and in Wales by converting the tax of gold and ſilver into an annual tax of 300 wolves heads. But, notwithſtanding theſe his endeavours, and the aſſertions of ſome authors, his ſcheme proved abortive. We find, that ſome centuries after the reign of that Saxon monarch, theſe animals were again increaſed to ſuch a degree as to become again the object of royal attention: accordingly Edward I. iſſued out his royal mandate to Peter Corbet to ſuperintend and aſſiſt in the deſtruction of them in the ſeveral counties of Glouceſter, Worceſter, Hereford, Salop, and Stafford; and in the adjacent county of Derby (as Cambden, p. 902, informs us), certain perſons at Wormhill held their lands by the duty of hunting and taking the wolves that infeſted the country, whence they were ſtyled *wolve-hunt*. To look back into the Saxon times, we find, that in Athelſtan's reign wolves abounded ſo in Yorkſhire, that a retreat was built at Flixton, in that county, "to defend paſſengers from the wolves, that they ſhould not be devoured by them:" and ſuch ravages did thoſe animals make during winter, particularly in January, when the cold was ſevereſt, that the Saxons diſtinguiſhed that month by the name of the *wolf-month*. They alſo called an outlaw *wolf's-head*, as being out of the protection of the law, proſcribed, and as liable to be killed as that deſtructive beaſt. Ireland was infeſted by wolves for many centuries after their extinction in England; for there are accounts of ſome being found there as late as the year 1710, the laſt preſentment for killing of wolves being made in the county of Cork about that time.

In many parts of Sweden the number of wolves has been conſiderably diminiſhed by placing poiſoned carcaſes in their way: but in other places they are found in great multitudes. Hunger ſometimes compels them to eat lichens: theſe vegetables were found in the body of one killed by a ſoldier; but it was ſo weak, that it could ſcarcely move. It probably had fed on the lichen vulpinus, which is a known poiſon to theſe animals. Madneſs, in certain years, is apt to ſeize the wolf. The conſequences are often very melancholy. Mad wolves will bite hogs and dogs, and the laſt again the human ſpecies. In a ſingle pariſh 14 perſons were victims to this dreadful malady. The ſymptoms are the ſame with thoſe attendant on the bite of a mad dog. Fury ſparkles in their eyes; a glutinous ſaliva diſtils from their mouths; they carry their tails low, and bite indifferently men and beaſts. It is remarkable that this diſeaſe happens in the depth of winter, ſo can never be attributed to the rage of the dog-days. Often towards ſpring, wolves get upon the ice of the ſea, to prey upon the young ſeals, which they catch aſleep: but this repaſt often proves fatal to them; for the ice, detached from the ſhore, carries them to a great diſtance from land, before they are ſenſible of it. In ſome years a large diſtrict is by this means delivered from theſe pernicious beaſts; which are heard howling in a moſt dreadful manner, far in the ſea. When wolves come to make their attack on cattle, they never fail attempting to frighten away the men by their cries; but the ſound of the horn makes them flying like lightning.

There is nothing valuable in the wolf but his ſkin

which

which makes a warm durable fur. His fleſh is ſo bad, that it is rejected with abhorrence by all other quadrupeds; and no animal but a wolf will voluntarily eat a wolf. The ſmell of his breath is exceedingly offenſive. As to appeaſe hunger, he ſwallows indiſcriminately every thing he can find, corrupted fleſh, bones, hair, ſkins half tanned and covered with lime, he vomits frequently, and empties himſelf oftener than he fills. In fine, the wolf is conſummately diſagreeable; his aſpect is baſe and ſavage, his voice dreadful, his odour inſupportable, his diſpoſition perverſe, his manners ferocious; odious and deſtructive when living; and, when dead, he is perfectly uſeleſs.

Hyæna. III. The Hyæna has a ſtraight jointed tail, with the hair of its neck erect, ſmall naked ears, and four toes on each foot. It inhabits Aſiatic Turkey, Syria, Perſia, and Barbary. Like the jackal, it violates the repoſitories of the dead, and greedily devours the putrid contents of the grave; like it, preys on the herds and flocks; yet for want of other food, will eat the roots of plants, and the tender ſhoots of the palms: but, contrary to the nature of the former, it is an unſociable animal; is ſolitary, and inhabits the chaſms of the rocks. The ſuperſtitious Arabs, when they kill one, carefully bury the head, leſt it ſhould be employed for magical purpoſes; as the neck was of old by the Theſſalian ſorcereſs.

> *Viſcera non lyncis, non diræ nodus hyænæ*
> *Defuit.* Lucan, vi. 672.

The ancients were wild in their opinion of the hyæna; they believed that its neck conſiſted of one bone without any joint; that it changed its ſex; imitated the human voice; had the power of charming the ſhepherds, and, as it were, rivetting them to the place they ſtood on: no wonder that an ignorant Arab ſhould attribute preternatural powers to its remains. They are cruel, fierce, and untameable animals, of a moſt malevolent aſpect; have a ſort of obſtinate courage, which will make them face ſtronger quadrupeds than themſelves. Kæmpfer relates, that he ſaw one which had put two lions to flight, regarding them with the utmoſt coolneſs. Their voice is hoarſe, a diſagreeable mixture of growling and roaring.

Mr Pennant deſcribes a variety of this ſpecies, undiſtinguiſhed by former naturaliſts which he calls the *ſpotted hyæna*. It has a large and flat head; ſome long hairs above each eye; very long whiſkers on each ſide of the noſe; a ſhort black mane, hair on the body ſhort and ſmooth; ears ſhort and a little pointed, their outſide black, inſide cinereous; face and upper part of the head black; body and limbs reddiſh brown, marked with diſtinct black round ſpots; the hind legs with black tranſverſe bars; the tail ſhort, black, and full of hair. It inhabits Guinea, Ethiopia, and the Cape: lives in holes in the earth, or cliffs of the rocks; preys by night; howls horribly; breaks into the folds, and kills two or three ſheep; devours as much as it can, and carries away one for a future repaſt; will attack mankind, ſcrape open graves, and devour the dead. Boſman has given this creature the name of *jackal*; by which Buffon being miſled, makes it ſynonymous with the common jackal. This hyæna is called the *tiger-wolf* by the coloniſts at the Cape, where it is a very common and formidable beaſt of prey. Of this animal, formerly but imperfectly known, the following account is given by Dr Sparmann in his voyage to the Cape.

“The night, or the duſk of the evening only, is the time in which theſe animals ſeek their prey, after which they are uſed to roam about both ſeparately and in flocks. But one of the moſt unfortunate properties of this creature is that it cannot keep its own counſel. The language of it cannot eaſily be taken down upon paper: however, with a view to make this ſpecies of wolf better known than it has been hitherto, I ſhall obſerve, that it is by means of a ſound ſomething like the following, *aauae*, and ſometimes *ooao*, yelled out with a tone of deſpair (at the interval of ſome minutes between each howl), that nature obliges this, the moſt voracious animal in all Africa, to diſcover itſelf, juſt as it does the moſt venomous of all the American ſerpents, by the rattle in its tail, itſelf, to warn every one to avoid its mortal bite. This ſame rattleſnake would ſeem, in conſequence of thus betraying its own deſigns, and of its great inactivity (to be as it were nature's ſtep-child), if, according to many credible accounts, it had not the wondrous property of charming its prey by fixing its eye upon it. The like is affirmed alſo of the tiger-wolf. This creature, it is true, is obliged to give information againſt itſelf: but, on the other hand, is actually poſſeſſed of the peculiar gift of being enabled, in ſome meaſure, to imitate the cries of other animals; by which means this arch-deceiver is ſometimes lucky enough to beguile and attract calves, foals, lambs, and other animals. Near ſome of the larger farms, where there is a great deal of cattle, this ravenous beaſt is to be found almoſt every night; and at the ſame time frequently from one hour to another betraying itſelf by its howlings, gives the dogs the alarm. The peaſants aſſured me, that the cunning of the wolves was ſo great (adding, that the trick had now and then even ſucceeded with ſome of them), that a party of them, half flying and half defending themſelves, would decoy the whole pack of dogs to follow them to the diſtance of a gun-ſhot or two from the farm, with a view to give an opportunity to the reſt of the wolves to come out from their ambuſcade, and, without meeting with the leaſt reſiſtance, carry off booty ſufficient for themſelves and their fugitive brethren. As the tiger-wolf, though a much larger and ſtronger animal, does not venture, without being driven to the utmoſt neceſſity, to meaſure its ſtrength with the common dog, this is certainly an evident proof of its cowardice. Neither does this ſame voracious beaſt dare openly to attack oxen, cows, horſes, or any of the large animals, while they make the leaſt appearance as if they would defend themſelves, or even as long as they do not betray any ſigns of fear. On the other hand, it has art enough to ruſh in upon them ſuddenly and unexpectedly, at the ſame time ſetting up a horrid and ſtrange cry, ſo as to ſet them a running in conſequence of the fright, that it may afterwards keep cloſe to their heels with ſafety, till it has an opportunity with one bite or ſtroke to rip up the belly of its prey (even though it ſhould be ſo large an animal as a draught ox), or elſe give it ſome dangerous bite, and ſo at one ſingle bout make itſelf maſter of its antagoniſt. On this account the peaſants are obliged to drive their cattle home every evening before it is dark, excepting the more conſiderable droves of draught oxen, which they let roam about day and night to ſeek their food unattended, by reaſon that they are uſed both to the country and the artifices of the wolves, and can therefore the eaſier depend upon and defend each other.

"Travellers, on the other hand, who are obliged to keep on in their journey, frequently ſuffer great loſſes by turning their cattle out at night; eſpecially of the young ones, which are eaſieſt ſcared. The Hottentots informed me that it was ſtill within the memory of man, that the tiger-wolf was bold enough to ſteal upon them and moleſt them in their huts, particularly by carrying off their children. This, however, is now no longer the caſe; a circumſtance, perhaps, proceeding from the introduction of fire-arms into the country, a circumſtance, which in theſe latter times, has cauſed this, as well as other wild beaſts, to ſtand in greater awe of man than it did formerly. I have heard the following ſtory of the tiger-wolf mentioned, as being related in a certain treatiſe on the Cape, of which I now cannot exactly remember the title. The tale is laughable enough, though perhaps not quite ſo probable. 'At a feaſt near the Cape one night, a trumpeter who had got his fill was carried out of doors in order that he might cool himſelf, and get ſober again. The ſcent of him ſoon drew thither a tiger-wolf, which threw him on his back, and dragged him along with him as a corpſe, and conſequently a fair prize, up towards Table-mountain. During this, however, our drunken muſician waked, enough in his ſenſes to know the danger of his ſituation, and to ſound the alarm with his trumpet, which he carried faſtened to his ſide. The wild beaſt, as may eaſily be ſuppoſed, was not leſs frightened in his turn.' Any other beſides a trumpeter would, in ſuch circumſtances, have undoubtedly been no better than wolf's meat.

In the mean while it is certain, that theſe wolves are to be found almoſt every dark night about the ſhambles at the Cape, where they devour the offals of bones, ſkin, &c. which are thrown out there in great quantities, and drag away with them what they cannot eat. The inhabitants repay theſe good offices of the hyæna with a free and unlimited privilege of acceſs and egreſs. The dogs too hereabouts, perfectly accuſtomed to their company, are ſaid never to throw any impediment in their way; ſo that the beaſt, entertained and fed in the very heart of the town, has been ſeldom known to do any miſchief there. It is likewiſe a well-known fact, that theſe wolves in different parts of Africa, exhibits different degrees of courage; this, however, may perhaps proceed from their being of different ſpecies in different parts.

"Yet in this very greedineſs of the hyæna, and its diſpoſition to conſume every thing it can get at, the provident œconomy of nature is abundantly evinced. The flowery fields at the Cape would certainly ſoon become hideous and disfigured with carcaſes and ſkeletons, the relics of the great quantity of game of all ſorts which graze and die there in ſucceſſion, were not the tiger-wolf manifeſtly ſubſervient to nature in the regulation of her police, by clearing her theatre from them; nay, I had almoſt ſaid the wolf alone: for lions and tigers, for example, never eat bones, and are not very fond of carcaſes. Theſe are ſerviceable in another way. They make the other animals vigilant and attentive to the functions for which nature has deſigned them; and beſides anſwering ſeveral other intentions of Providence, they ſerve, in conjunction with mankind, to keep in a juſt equilibrium the increaſe of the animal kingdom; ſo that it may not exceed the ſupplies afforded it by the vegetable part of the creation, and by this means prevent the neceſſary renewal of the latter by ſeeds, &c. and thus by deſolating it and laying it waſte, in the end impoveriſh and deſtroy themſelves, and die moſt wretched victims to want and hunger; ſo that, notwithſtanding the immenſe quantities of game exiſting in this country, there are very ſeldom found any bones in the haunts they have left, and never after the tiger, lion, jackal, wild cat, and wild dog. Theſe latter animals, that they may not encumber and litter the ground which nature has ordained them to clear, never go out of their dens and caverns when they find themſelves ſick and diſabled; but there, oppreſſed with hunger and diſeaſe, await the tranſitory moment, when they muſt pay obedience to nature's laſt law."

The Mexicanus.

IV. The Mexicanus has a ſmooth, crooked tail. The body is aſh-coloured, variegated with yellow ſpots. It is a native of Mexico, and is called the *mountain-cat* by Seba. It agrees with the European wolf in its manners, attacks cattle, and ſometimes men.

The Fox.

V. The Vulpes, or Fox, has a ſtraight tail, white at the point. His body is yellowiſh, or rather ſtraw-coloured; his ears are ſmall and erect; his lips are whitiſh, and his forefeet black. From the baſe of the tail a ſtrong ſcent is emitted, which to ſome people is very fragrant, and to others extremely diſagreeable. The fox is a native of almoſt every quarter of the globe, and is if ſuch a wild and ſavage nature that it is impoſſible fully to tame him. He is eſteemed to be the moſt ſagacious and the moſt crafty of all beaſts of prey. The former quality he ſhows in his method of providing himſelf with an aſylum, where he retires from preſſing dangers, where he dwells, and where he brings up his young: and his craftineſs is chiefly diſcovered by the ſchemes he falls upon in order to catch lambs, geeſe, hens, and all kinds of ſmall birds. The fox fixes his abode on the border of the wood, in the neighbourhood of cottages: he liſtens to the crowing of the cocks and the cries of the poultry. He ſcents them at a diſtance; he chooſes his time with judgment; he conceals his road as well as his deſign; he ſlips forward with caution, ſometimes even trailing his body, and ſeldom makes a fruitleſs expedition. If he can leap the wall, or get in underneath, he ravages the court-yard, puts all to death, and then retires ſoftly with his prey, which he either hides under the herbage, or carries off to his kennel. He returns in a few minutes for another, which he carries off, or conceals in the ſame manner, but in a different place. In this way he proceeds till the progreſs of the ſun, or ſome movements perceived in the houſe, advertiſe him that it is time to ſuſpend his operations, and to retire to his den. He plays the ſame game with the catchers of thruſhes, wood-cocks, &c. He viſits the nets and bird-lime very early in the morning, carries of ſucceſſively the birds which are entangled, and lays them in different places, eſpecially near the ſides of high-ways, in the furrows, under the herbage or bruſhwood, where they ſometimes lie two or three days; but he knows perfectly where to find them when he is in need. He hunts the young hares in the plains, ſeizes the old ones in their ſeats, never miſſes thoſe which are wounded, digs out the rabbits in the warrens, diſcovers the neſts of partridges and quails, ſeizes the mothers on the eggs, and deſtroys a vaſt quantity of game. The fox is exceedingly voracious; beſides fleſh of all kinds, he eats with equal avidity, eggs, milk, cheeſe, fruits, and particularly grapes. When the young hares and partridges fail him, he makes war againſt rats, field-mice, ſerpents, lizards, toads, &c. Of theſe he deſtroys vaſt numbers; and this is the only ſervice he does to mankind. He is ſo fond of honey, that he attacks the wild bees, waſps, and hornets. They at firſt put him to flight by a thouſand ſtings; but he retires only for the purpoſe of rolling himſelf on the ground to cruſh them; and he returns ſo often to the charge, that he obliges them to abandon the hive, which he ſoon uncovers, and devours both the honey and wax. In a word, he eats fiſhes, lobſters, graſs hoppers, &c.

The fox is not eaſily, and never fully tamed: he languiſhes when deprived of liberty; and if kept too long in a domeſtic ſtate, he dies of chagrin. Foxes produce but once a year; and the litter commonly conſiſt of four or five, ſeldom ſix, and never leſs than three. When the female is full, ſhe retires, and ſeldom goes out of her hole, where ſhe prepares a bed for her young. She comes in ſeaſon in the winter; and young foxes are found in the month of April. When ſhe perceives that her retreat is diſcovered, and that her young have been diſturbed, ſhe carries them off one by one, and goes in ſearch of another habitation. The young are brought forth blind; like the dogs, they grow 18 months or two years, and live 13 or 14 years.—The fox, as well as the congenerous wolf, will produce with the dog-kind, as noticed above.

The ſenſes of the fox are equally good as thoſe of the wolf; his ſentiment is more delicate; and the organs of his voice are more pliant and perfect. The wolf ſends forth only frightful howlings; but the fox barks, yelps, and utters a mournful cry like that of the peacock. He varies his tones according to the different ſentiments with which he is affected: he has an accent peculiar to the chace, the tone of deſire, of complaint, and of ſorrow. He has another cry expreſſive of acute pain, which he utters only when he is ſhot, or has ſome of his members broken; for he never complains of any other wound, and, like the wolf, allows himſelf to be killed with a bludgeon without complaining; but he always defends himſelf to the laſt with great courage and bravery. His bite is obſtinate and dangerous; and the ſevereſt blows will hardly make him quit his hold. His yelping is a ſpecies of barking, and conſiſts of a quick ſucceſſion of ſimilar tones; at the end of which he generally raiſes his voice ſimilar to the cry of the peacock. In winter, and particularly during froſt and ſnow, he yelps perpetually; but, in ſummer, he is almoſt entirely ſilent, and, during this ſeaſon, he caſts his hair. He ſleeps ſound, and may be eaſily approached without weakening: he ſleeps in a round form, like the dog; but, when he only repoſes himſelf, he extends his hind legs, and lies on his belly. It is in this ſituation that he ſpies the birds along the hedges, and meditates ſchemes for their ſurpriſe. The fox flies when he hears the exploſion of a gun, or ſmells gun-powder. He is exceedingly fond of grapes, and does much miſchief in vineyards. Various methods are daily employed to deſtroy foxes: they are hunted with dogs; iron traps are frequently ſet at their holes; and their holes are ſometimes ſmoked to make them run out, that they may the more readily fall into the ſnares, or be killed by dogs or fire-arms.

The chace of the fox requires leſs apparatus, and is more amuſing, than that of the wolf. To the latter every dog has great reluctance: but all dogs hunt the fox ſpontaneouſly and with pleaſure; for, though his own odour be ſtrong, they often prefer him to the ſtag or the hare. He may be hunted with terriers, hounds, &c. Whenever he finds himſelf purſued, he runs to his hole; the terriers with crooked legs, or turnſpits, go in with moſt eaſe. This mode anſwers very well when we want to carry off a whole litter of foxes, both mother and young. While the mother defends herſelf againſt the terriers, the hunters remove the earth above, and either kill or ſeize her alive. But, as the holes are often under rocks, the roots of trees, or ſunk too deep in the ground, this method is frequently unſucceſsful. The moſt certain and moſt common method of hunting foxes, is to begin with ſhutting up their holes, to place a man with a gun near the entrance, and then to ſearch about with the dogs. When they fall in with him, he immediately makes for his hole; but when he comes up to it he is met with a diſcharge from the gun. If he eſcapes the ſhot, he runs with full ſpeed, takes a large circuit, and returns again to the hole, where he is fired upon a ſecond time; but, finding the entrance ſhut, he now endeavours to eſcape by darting ſtraight forward, with the deſign of never reviſiting his former habitation. He is then purſued by the hounds, whom he ſeldom fails to fatigue, becauſe he purpoſely paſſes through the thickeſt parts of the foreſt or places of the moſt difficult acceſs, where the dogs are hardly able to follow him; and, when he takes to the plains, he runs ſtraight out, without ſtopping or doubling.

Of all animals the fox has the moſt ſignificant eye, by which it expreſſes every paſſion of love, fear, hatred, &c. It is remarkably playful; but, like all ſavage creatures half reclaimed, will on the leaſt offence bite thoſe it is moſt familiar with. It is a great admirer of its buſhy tail, with which it frequently amuſes and exerciſes itſelf, by running in circles to catch it: and, in cold weather, wraps it round its noſe. The ſmell of this animal is in general very ſtrong, but that of the urine is remarkably fetid. This ſeems ſo offenſive, even to itſelf, that it will take the trouble of digging a hole in the ground, ſtretching its body at full length over it; and there, after depoſiting its water, cover it over with the earth, as the cat does its dung. The ſmell is ſo obnoxious, that it has often proved the means of the fox's eſcape from the dogs; who have ſo ſtrong an averſion at the filthy effluvia, as to avoid encountering the animal it came from. It is ſaid that the fox makes uſe of its urine as an expedient to force the cleanly badger from its habitation: whether that is the means is rather doubtful; but that the fox makes uſe of the badger's hole is certain: not through want of ability to form its own retreat, but to ſave itſelf ſome trouble; for after the expulſion of the firſt inhabitant, the fox improves as well as enlarges it conſiderably, adding ſeveral chambers, and providently making ſeveral entrances to ſecure a retreat from every quarter. In warm weather, it will quit its habitation for the ſake of baſking in the ſun, or to enjoy the free air; but then it rarely lies expoſed, but chooſes ſome thick brake, that it may reſt ſecure from ſurprize. Crows, magpies, and other birds, who conſider the fox as their common enemy, will often, by their notes of anger, point out its retreat.—The ſkin of this animal is furniſhed with a warm ſoft fur, which in many parts of Europe is uſed to make muffs and to line clothes. Vaſt numbers are taken in Le Vallais, and the Alpine parts of Switzerland. At Lauſanne there are furriers who are in poſſeſſion of betweeen 2000 and 3000 ſkins, all taken in one winter.

Of the fox there are ſeveral varieties, derived from colour; as,

1. The field-fox, or *alopex* of Linnæus, who makes it a diſtinct ſpecies; but it is every way the ſame with the common fox, except in the point of the tail, which is black.

2 The croſs-fox, with a black mark paſſing tranſverſely from ſhoulder to ſhoulder, with another along the back to the tail. It inhabits the coldeſt parts of Europe, Aſia, and North-America: a valuable fur, thicker and ſofter than the common ſort; great numbers of the ſkins are exported from Canada.

3. The black fox is the moſt cunning of any, and its ſkin the moſt valuable; a lining of it is, in Ruſſia, eſteemed preferable to the fineſt ſables: a ſingle ſkin will ſell for 400 rubles. It inhabits the northern parts of Aſia and North-America. The laſt is inferior in goodneſs.

4. The brant fox, as deſcribed by Geſner and Linnæus, is of a fiery redneſs; and called by the firſt *brand-fuchſ*, by the laſt *brandraeſ*; it is ſcarce half the ſize of the common fox: the noſe is black, and much ſharper; the ſpace round the ears ferruginous; the forehead, back, ſhoulders, thighs, and ſides black mixed with red, aſh-colour, and black; the belly yellowiſh; the tail black above, red beneath, and cinereous on its ſide. It is a native of Pennſylvania.

5. The corſac-fox, with upright ears, ſoft, downy hair; tail buſhy; colour in ſummer pale tawney, in winter grey: the baſe and tip of the tail black; a ſmall kind. It inhabits the deſarts beyond the Yaik: lives in holes: howls and barks: is caught by the Kirgis Caſſacks with falcons and grey-hounds; 40 or 50,000 are annually taken, and ſold to the Ruſſians, at the rate of 40 kopeiks, or 20 pence each: the former uſe their ſkins inſtead of money: great numbers are ſent into Turkey.

6. There are three varieties of foxes found in the mountainous parts of Britain, which differ a little in form, but not in colour, from each other. They are diſtinguiſhed in Wales by as many different names. The *milgi*, or *gre-hound-fox*, is the largeſt, talleſt, and boldeſt; and will attack a grown ſheep or wedder: the *maſtiff-fox* is leſs, but more ſtrongly built: the *corgi*, or *cur-fox* is the leaſt; lurks about hedges, out-houſes, &c. and is the moſt pernicious of the three to the feathered tribe. The firſt of theſe varieties has a white tag or tip to the tail; the laſt a black. When hunted, they never run directly forward, but make a great many doublings and turnings; and when in danger of being taken, they emit ſuch a ſmell from their poſteriors that the hunters can hardly endure it.

The arctic Fox.

VI. The LAGOPUS, or arctic fox, with a ſharp noſe; ſhort rounded ears almoſt hid in the fur; long and ſoft hair, ſomewhat woolly; ſhort legs; toes covered on all parts, like that of a common hare, with fur; tail ſhorter and more buſhy than that of the common fox, of a bluiſh grey or aſh colour, ſometimes white: the young of the grey are black before they come to maturity: the hair much longer in winter than in ſummer, as is uſual with animals of cold climates. It inhabits the countries bordering on the Frozen Sea; Kamſchatka, the iſles between it and America, and the oppoſite parts of America diſcovered in captain Bhering's expedition, 1741; is again found in Greenland, Iceland, Spitzbergen, Nova Zembla, and Lapland. It burrows underground, forms holes many feet in length, and ſtrews the bottom with moſs. In Greenland and Spitzbergen, it lives in the cliffs of rocks, not being able to burrow, by reaſon of the froſt: two or three pair inhabit the ſame hole. They are in heat about Lady-day; and during that time, they continue in the open air, but afterwards take to their holes. They go with young nine weeks: like dogs, they continue united in copulation: they bark like that animal, for which reaſon the Ruſſians call them *peſzti*, or dogs. They have all the cunning of the common fox; prey on geeſe, ducks, and other water-fowl, before they can fly; on grouſe of the country, on hares, and the eggs of birds; and in Greenland (through neceſſity) on berries, ſhell fiſh, or any thing the ſea flings up. But their principal food in the north of Aſia and in Lapland is the leming, or Lapland marmot: thoſe of the countries laſt mentioned are very migratory, purſuing the leming which is a wandering animal: ſometimes theſe foxes will deſert the country for three or four years, probably in purſuit of their prey; for it is well known that the migrations of the leming are very inconſtant, it appearing in ſome countries only once in ſeveral years. The people of Jeneſea ſuſpect they go to the banks of the Oby. Their chief rendezvous is on the banks of the Frozen Sea, and the rivers that flow into it, where they are found in great troops. The Greenlanders take them either in pitfalls dug in the ſnow, and baited with the capelin fiſh; or in ſprings made with whalebone, laid over a hole made in the ſnow, ſtrewed over at bottom with the ſame kind of fiſh; or in traps made like little huts, with flat ſtones, with a broad one by way of door, which falls down (by means of a ſtring baited on the inſide with a piece of fleſh) whenever the fox enters and pulls at it. The Greenlanders preſerve the ſkins for traffic; and in caſes of neceſſity eat the fleſh. They alſo make buttons of the ſkins; and ſplit the tendons, and make uſe of them inſtead of thread. The blue furs are much more eſteemed than the white.

The antarctic Fox.

VII. The INDICA, or antarctic fox (the *coyotl* of Fernandez, *the loup-renard* of Bougainville), has ſhort pointed ears; irides hazel; head and body cinereous brown; hair more woolly than that of the common fox, reſembling much that of the arctic; legs daſhed with ruſt-colour; tail duſky, tipped with white; ſhorter and more buſhy than that of the common fox, to which it is about one-third ſuperior in ſize. It has much the habit of the wolf, in ears, tail, and ſtrength of limbs.

The French therefore call it *loup-renard*, or wolf-fox. It may be a wolf degenerated by climate. The largeſt are thoſe of Senegal: the next are the European: thoſe of North America are ſtill ſmaller. The Mexican wolves, which Mr Pennant apprehends to be this ſpecies, are again leſs; and this, which inhabits the Falkland iſles, near the extremity of South America, is dwindled to the ſize deſcribed. This is the only land animal of thoſe diſtant iſles: it has a fetid ſmell, and barks like a dog. It lives near the ſhores; kennels like a fox; and forms regular paths from bay to bay, probably for the conveniency of ſurpriſing the water-fowl, on which it lives. It is at times very meagre, from want of prey; and is extremely tame. The iſlands were probably ſtocked with thoſe animals by means of maſſes of ice broken from the continent, and carried by the currents.

The grey-fox of Cateſby.

VIII. The Grey-fox of Cateſby, &c. has a ſharp noſe; ſharp, long, upright ears; legs long; colour grey, except a little redneſs about the ears.—It inhabits Carolina, and the warmer parts of North America: It differs from the arctic fox in form, and the nature of its dwelling; agrees with the common fox in the firſt, varies from it in the laſt: It never burrows, but lives in hollow trees; it gives no diverſion to the ſportſman; for after a mile's chace, it takes to its retreat; it has no ſtrong ſmell; it feeds on poultry, birds, &c. Theſe foxes are eaſily made tame; their ſkins, when in ſeaſon, made uſe of for muffs.

The ſilver Fox of Louſiana.

IX. The Silver fox of Louiſiana. It reſembles the common fox in form, but has a moſt beautiful coat. The ſhort hairs are of a deep brown; and over them ſpring long ſilvery hairs, which give the animal a very elegant appearance. They live in foreſts abounding in game, and never attempt the poultry which run at large. The woody eminences in Louiſiana are every where pierced with their holes.

The Barbary Fox.

X. The Barbary fox, (*le Chacal*, Buff.) or jackal-adive, has a long and ſlender noſe, ſharp upright ears, long buſhy tail: colour, a very pale brown; ſpace above and below the eyes, black; from behind each ear, there is a black line, which ſoon divides into two, which extend to the lower part of the neck; and the tail is ſurrounded with three broad rings. This ſpecies is of the ſize of the common fox, but the limbs are ſhorter, and the noſe is more ſlender.—M. de Buffon informs us, that Mr Bruce told him this animal was common in Barbary, where it was called *thaleb*. But Mr Pennant obſerves, that Mr Bruce ſhould have given it a more diſtinguiſhing name; for *thaleb*, or *taaleb*, is no more than the Arabic name for the common fox, which is alſo frequent in that country.

The Jackal.

XI. The Aureus, Schakal, or Jackal, as deſcribed by Mr Pennant, has yellowiſh brown irides; ears erect, formed like thoſe of a fox, but ſhorter and leſs pointed: hairy and white within; brown without, tinged with duſky; head ſhorter than that of a fox, and noſe blunter: lips black, and ſomewhat looſe: neck and body very much reſembling thoſe of that animal, but the body more compreſſed: the legs have the ſame reſemblance, but are longer: tail thickeſt in the middle, tapering to the point: five toes on the fore-feet; the inner toe very ſhort, and placed high: four toes on the hind-feet: all covered with hair even to the claws. The hairs are much ſtiffer than thoſe of a fox, but ſcarcely ſo ſtiff as thoſe of a wolf; ſhort about the noſe; on the back, three inches long; on the belly ſhorter. Thoſe at the end of the tail four inches long. Colour of the upper part of the body a dirty tawny; on the back, mixed with black: lower part of the body of a yellowiſh white: tail tipt with black; the reſt of the ſame colour with the back: the legs of an unmixed tawny brown; the fore legs marked (but not always) with a black ſpot on the knees; but on no part are thoſe vivid colours which could merit the title of *golden*, beſtowed on it by Kæmpfer.—The length of this animal from the noſe to the root of the tail is little more than twenty-nine inches Engliſh: the tail, to the ends of the hairs, ten three quarters; the tip reaching to the top of the hind legs: the height, from the ſpace between the ſhoulders to the ground, rather more than eighteen inches and a half; the hind parts a little higher.—This ſpecies inhabits all the hot and temperate parts of Aſia, India, Perſia, Arabia, Great Tartary, and about Mount Caucaſus, Syria, and the Holy-land. It is found in moſt parts of Africa, from Barbary to the Cape of Good Hope.

Profeſſor Gueldenſtaedt*, the able deſcriber of this long-loſt animal, remarks, that the cæcum entirely agrees in form with that of a dog, and differs from that of the wolf and fox. And Mr Pennant obſerves, that there is the ſame agreement in the teeth with thoſe of a dog; and the ſame variation in them from thoſe of the two other animals. Theſe circumſtances ſtrengthen the opinion entertained by ſome writers, that the dogs of the old world did derive their origin from one or other of them. The jackals have indeed ſo much the nature of dogs, as to give reaſonable cauſe to imagine that they are at leaſt the *chief* ſtock from which is ſprung the various races of thoſe domeſtic animals. When taken young, they grow inſtantly tame; attach themſelves to mankind; wag their tails; love to be ſtroked; diſtinguiſh their maſters from others; will come on being called by the name given to them; will leap on the table, being encouraged to it: they drink, lapping; and make water ſideways, with their leg held up. Their dung is hard: *odorat anum alterius, cohæret copula junctus*. When they ſee dogs, inſtead of flying, they ſeek them, and play with them. They will eat bread eagerly; notwithſtanding they are in a wild ſtate carnivorous. They have a great reſemblance to ſome of the Calmuc dogs, which perhaps were but a few deſcents removed from the wild kinds. Our dogs are probably derived from thoſe reclaimed in the firſt ages of the world; altered by numberleſs accidents into the many varieties which now appear among us.

The wild ſchakals go in packs of 40, 50, and even two hundred, and hunt like hounds in full cry from evening to morning. They deſtroy flocks and poultry, but in a leſs degree than the wolf or fox: ravage the ſtreets of villages and gardens near towns, and will even deſtroy children, if left unprotected. They will enter ſtables and outhouſes, and devour ſkins, or any thing made of that material. They will familiarly enter a tent, and ſteal whatſoever they can find from the ſleeping traveller. In default of living prey, they will feed on roots and fruits; and even on the moſt infected carrion: they will greedily diſinter the dead, and devour the putrid carcaſes; for which reaſon, in many countries the graves are made of a great depth. They at-

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* *Nov. Com. Petrop.* xx. 449.

tend caravans, and follow armies, in hopes that death will provide them a banquet.

Their voice naturally is a howl. Barking, Mr Pennant obſerves, is latently inherent; and in their ſtate of nature ſeldom exerted: but its different modifications are adventitious, and expreſſive of the new paſſions and affections gained by a domeſtic ſtate. Their howlings and clamours in the night are dreadful, and ſo loud that people can ſcarcely hear one another ſpeak. Dellon ſays, their voice is like the cries of a great many children of different ages mixed together: when one begins to howl, the whole pack join in the cry. Kæmpfer ſays, that every now and then a ſort of bark is intermixed; which confirms what is above aſſerted by Mr Pennant. Dellon agrees in the account of their being tamed, and entertained as domeſtic animals. During day they are ſilent. They dig burrows in the earth, in which they lie all day, and come out at night to range for prey: they hunt by the noſe, and are very quick of ſcent. The females breed only once a year; and go with young only four weeks; they bring from ſix to eight at a time. Both Mr Guldenſtaedt and Mr Bell contradict the opinion of their being very fierce animals.

This animal is vulgarly called the *Lion's Provider*, from an opinion that it rouzes the prey for that bad-noſed quadruped. The fact is, every creature in the foreſt is ſet in motion by the fearful cries of the jackals; the lion, and other beaſts of rapine, by a ſort of inſtinct, attend to the chace, and ſeize ſuch timid animals as betake themſelves to flight at the noiſe of this nightly pack. The jackal is deſcribed by Oppian, under the name of Λυκος Ξουθος, or *yellow wolf;* who mentions its horrible howl. It may, as M. de Buffon conjectures, be the Θως of Ariſtotle, who mentions it with the wolf, and ſays that it has the ſame internal ſtructure as the wolf, which is common with congenerous animals. The Theos of Pliny may alſo be a variety of the ſame animal; for his account of it agrees with the modern hiſtory of the ſchakal, except in the laſt article: "Thoes, Luporum id genus eſt procerius longitudine, brevitate crurum diſſimile, velox ſaltu, venatu vivens, innocuum homini;" lib. viii. c. 34.

The Meſomelas.

XII. The MESOMELAS, or *Capeſch* of Schreber, the *tenlie* or *kenlie* of the Hottentots, has erect yellowiſh brown ears, mixed with a few ſcattered black hairs: the head is of a yellowiſh brown, mixed with black and white, growing darker towards the hind part: the ſides are of a light brown, varied with duſky hairs: the body and alſo the back part of the legs are of a yellowiſh brown, lighteſt on the body: the throat, breaſt, and belly white. On the neck, ſhoulders, and back, is a bed of a black; broad on the ſhoulders, and growing narrower to the tail: when the hairs are ſmooth, the part on the neck ſeems barred with white; that on the ſhoulders with white conoid marks, one within the other, the end pointing to the back: when the hairs are ruffled, theſe marks vaniſh, or grow leſs diſtinct, and a hoaryneſs appears in their ſtead. The tail is buſhy, of a yellowiſh brown; marked on the upper part with a longitudinal ſtripe of black, and towards the end encircled with two rings of black, and is tipt with white. In length, the animal is two feet three quarters, to the origin of the tail: the tail is one foot. This ſpecies inhabits the countries about the Cape of Good Hope, and probably is found as high as the line.

The Thous.

XIII. The THOUS has a ſmooth crooked tail: the upper part of its body is grey, and its belly white. It is about the ſize of a large cat; and, according to Linnæus, is found at Surinam; it is mentioned by no other naturaliſt.

The Zerda.

XIV. The ZERDA. This animal has a very pointed viſage; large bright black eyes; very large ears, of a bright roſe-colour, internally lined with long hairs; the orifice ſo ſmall as not to be viſible, probably covered with a valve or membrane: the legs and feet are like thoſe of a dog; the tail is taper: colour between a ſtraw and pale brown. Length from noſe to tail, ten inches; ears, three inches and a half long; tail, ſix: height, not five. It inhabits the vaſt deſart of Saara, which extends beyond mount Atlas: It burrows in the ſandy ground, which ſhows the neceſſity of the valves to the ears; and is ſo exceſſively ſwift, that it is very rarely taken alive. It feeds on inſects, eſpecially locuſts: ſits on its rump: is very vigilant: barks like a dog, but much ſhriller, and that chiefly in the night: never is obſerved to be ſportive. We are indebted to Mr Eric Skioldebrand, the late Swediſh conſul at Algiers, for our knowledge of this ſingular animal. He never could procure but one alive, which eſcaped before he examined his teeth: the genus is very uncertain: the form of its head and legs, and ſome of its manners, determined Mr Pennant to rank it in this genus. That which was in poſſeſſion of Mr Skioldebrand fed freely from the hand, and would eat bread or boiled meat. Buffon has given a figure of this animal: but from the authority of Mr Bruce aſcribes to it a different place, and different manners. He ſays that it is found to the ſouth of the Palus Tritonides, in Libya; that it has ſomething of the nature of the hare, and ſomething of the ſquirrel; and that it lives on the palm-trees, and feeds on the fruits.

CANIS Major, the great dog in aſtronomy, a conſtellation of the ſouthern hemiſphere, below Orion's feet, though ſomewhat to the weſtward of him; whoſe ſtars Ptolemy makes 29; Tycho obſerved only 13; Hevelius 21; in the Britannic catalogue they are 31.

CANIS Minor, the little dog, in aſtronomy, a conſtellation of the northern hemiſphere; called alſo by the Greeks, *Procyon*, and by the Latins *Antecanis* and *Canicula*. The ſtars in the conſtellation canis minor, are in Ptolemy's catalogue 2; in Tycho's, 5; in Hevelius's, 13; and in the Britiſh catalogue, 14.

CANISIUS, (Henry) a native of Nimeguen, and one of the moſt learned men of his time, was profeſſor of canon law at Ingolſtadt; and wrote a great number of books; the principal of which are, 1. *Summa Juris Canonici*. 2. *Antiquæ lectionis*, a very valuable work. He died in 1609.

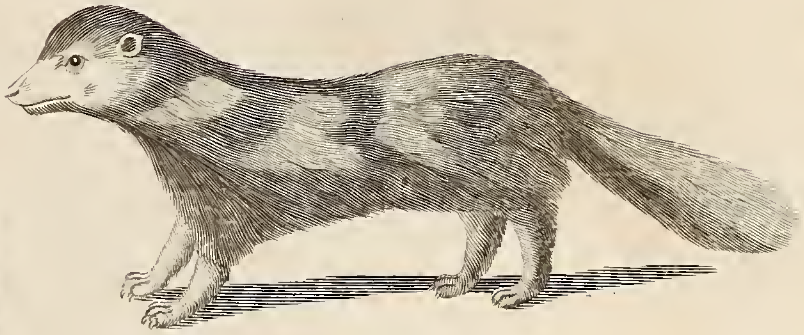
CANITZ, (The baron of) a German poet and ſtateſman, was of an ancient and illuſtrious family in Brandenburg, and born at Berlin in 1564, five months after his father's death. After his early ſtudies, he travelled to France, Italy, Holland, and England; and upon his return to his country, was charged with important negociations by Frederic II. Frederic III. employed him alſo. Canitz united the ſtateſman with the poet; and was converſant in many languages, dead

CANIS

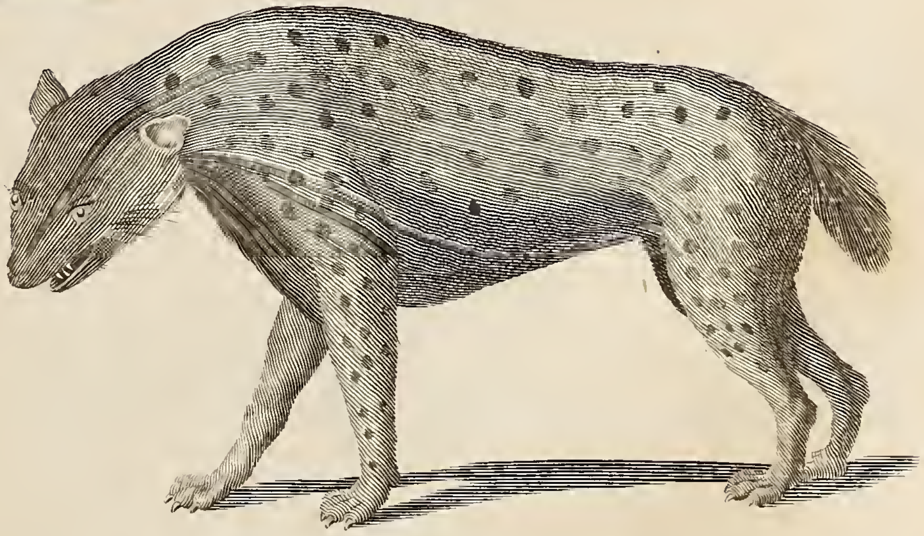
Plate CXX

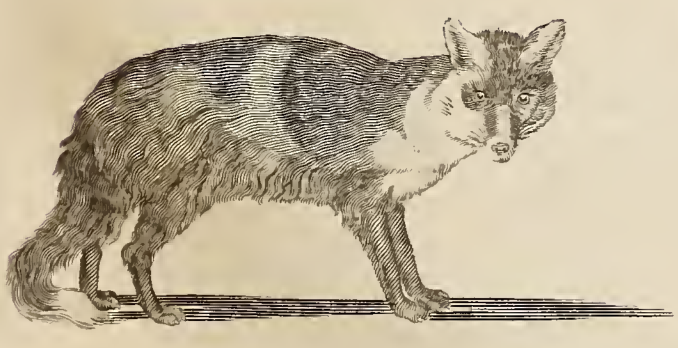

Jackal adive


Zerda


Isatis


Striped Hyæna


Spotted Hyæna


The Fox

R. Scot Sculp. Philad^a

as well as living. His German poems were publiſhed for the tenth time, 1750, in 8vo. He is ſaid to have taken Horace for his model, and to have written purely and delicately. But he did not content himſelf with barely cultivating the fine arts in himſelf; he gave all the encouragement he could to them in others. He died at Berlin, in 1699, privy counſellor of ſtate, aged 45.

CANKER, a diſeaſe incident to trees, proceeding chiefly from the nature of the ſoil. It makes the bark rot and fall. If the canker be in a bough, cut it off; in a large bough, at ſome diſtance from the ſtem; in a ſmall one, cloſe to it: but for over-hot ſtrong ground, the ground is to be cooled about the roots with pond-mud and cow-dung.

CANKER, among farriers. See FARRIERY, § xliv. 2.

CANNA, in botany: A genus of the monogynia order, belonging to the monandria claſs of plants; and in the natural method ranking under the eighth order, *Scitamineæ*. The corolla is erect, and divided into ſix parts, with a diſtinct lip bipartite and rolled back; the ſtyle lanceolate, and growing to the corolla; the calyx is triphyllous.

Species. 1. The indica, or common broad-leaved flowering cane, is a native of both Indies; the inhabitants of the Britiſh iſlands in America call it *Indian ſhot*, from the roundneſs and hardneſs of the ſeeds. It hath a thick, fleſhy, tuberous root, which divides into many irregular knobs; it ſends out many large oval leaves, without order. At their firſt appearance the leaves are like a twiſted horn; but afterwards expand, and are near a foot long, and five inches broad in the middle; leſſening gradually to both ends, and terminated in a point. The ſtalks are herbaceous, riſing four feet high, and are encompaſſed by the broad leafy footſtalks of the leaves; at the upper part of the ſtalk the flowers are produced in looſe ſpikes, each being at firſt covered with a leafy hood, and turns to a brown colour. The flowers are ſucceeded by a fruit or capſule, oblong, rough, and crowned with the three-cornered empalement of the flower which remains. When the fruit is ripe, the capſule opens lengthwiſe into three cells, filled with round, ſhining, hard, and black ſeeds. 2. The latifolia, with a pale red flower, is a native of Carolina, and ſome other northern parts of America. 3. The glauca, with a very large flower, is a native of South America. 4. The lutea, with obtuſe oval leaves, is leſs common in America than the other ſorts. 5. The coccinea, hath larger leaves than any of the other ſpecies, and the ſtalks riſe much higher. The flowers are produced in large ſpikes; and are of a bright crimſon, or rather ſcarlet colour.

Culture. Theſe plants muſt always be kept in pots of rich earth, to be moved to ſhelter in winter. They are propagated by ſeeds ſown on a hot-bed, in the ſpring; and in ſummer, when the plants are a little advanced in growth, prick them ſeparately in ſmall pots of rich earth, plunging them alſo in the hot-bed, giving ſhade, water, and freſh air; to which laſt harden them by degrees, till they bear it fully. In October they muſt be removed into a very good ſtove or green houſe.

CANNABIS, in botany: A genus of the pentandria order, belonging to the dioecia claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ*. The calyx of the male is quinquepartite, with no corolla. In the female the calyx is monophyllous, entire, and gaping at the ſide; there is no corolla, but two ſtyles; the fruit is a nut, bivalved, within the cloſed calyx. Of this there is but one ſpecies, viz. the ſativa. This is propagated in the rich fenny parts of England in great quantities, for its bark, which is uſeful for cordage, cloth, &c. and the ſeeds abound with oil. Hemp is always ſown on a deep, moiſt, rich, ſoil, ſuch as is found in Holland, Lincolnſhire, the fens of the iſland of Ely, where it is cultivated to great advantage, as it might be in many other parts of England where there is a ſoil of the ſame kind; but it will not thrive on clayey or ſtiff cold land. The ground on which hemp is deſigned to be ſown, ſhould be well ploughed, and made very fine by harrowing. About the middle of April the ſeed may be ſown; three buſhels is the uſual allowance for an acre, but two are ſufficient. In the choice of the ſeed, the heavieſt and brighteſt coloured ſhould be preferred; and particular care ſhould be had to the kernel of the ſeed. For the greater certainty in this matter, ſome of the ſeeds ſhould be cracked, to ſee whether they have the germ or future plant perfect: for, in ſome places, the male plants are drawn out too ſoon from the female, i. e. before they have impregnated the female plants with the farina; in which caſe, though the ſeeds produced by theſe females may ſeem fair to the eye, yet they will not grow,* according to the doctrine of Linnæus. When the plants are come up, they ſhould be hoed out in the ſame manner as is practiſed for turnips, leaving them two feet apart; obſerve alſo to cut down all the weeds, which, if well performed, and in dry weather, will deſtroy them. This crop, however, will require a ſecond hoeing, in about ſix weeks after the firſt; and, if this is well performed, the crop will require no further care. The firſt ſeaſon for pulling hemp is uſually about the middle of Auguſt, when they begin to pull what they call the *fimble hemp*, being that which is compoſed of the male plants; but it would be the much better method to defer this for a fortnight or three weeks longer, until thoſe male plants have fully ſhed their farina or duſt, without which the ſeeds will prove only empty huſks. Theſe male plants decay ſoon after they have ſhed their farina. The ſecond pulling is a little after Michaelmas, when the ſeeds are ripe. This is uſually called *karle hemp*, and conſiſts of the female plants which were left. This karle hemp is bound in bundles of a yard compaſs, according to ſtatute meaſure, which are laid in the ſun for a few days to dry; and then it is ſtacked up, or houſed, to keep it dry till the ſeed can be threſhed out. An acre of hemp, on a rich ſoil, will produce near three quarters of ſeed, which, together with the unwrought hemp, is worth from ſix to eight pounds. Hemp is eſteemed very effectual for deſtroying weeds: but this it accompliſhes by impoveriſhing the ground, and thus robbing them of their nouriſhment; ſo that a crop of it muſt not be repeated on the ſame ſpot.

Some ſeeds of a large kind of hemp growing in China were lately ſent by the Engliſh Eaſt India Company to the Society for the encouragement of Arts, Manufactures, and Commerce, who diſtributed them to the members and other gentlemen who appeared likely to cultivate them; and from experiments made in conſe-

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* See *Botany*, ſect. iii.

quence, the plant has been found to ſucceed perfectly in England. The firſt trials were rather unpromiſing, the hemp produced from the foreign ſeeds proving of very little value. But the Reverend Dr Hinton of Northwold, who made the above trial in 1786, having accidentally ſaved ſome ripe ſeeds of that crop, ſowed them in May 1787 on a ſpot of good land. They came up well, and attained as much perfection as ordinary hemp. The produce, when dreſſed, weighed at the rate of 95 ſtone 7 pounds and 12 ounces per acre, (being above 20 ſtone more, he ſays, than the uſual crops of hemp in that neighbourhood); and at the rate of three buſhels two pecks and half a pint of ſeed per acre were ſaved. Dr Hinton ſuppoſes that the ſeeds brough from China failed principally, if not entirely, by having been two years old, at which age hempſeed ſeldom vegetates. Now that it is found to ripen, freſh ſeeds can always be obtained. It will yet, however, require a few years to determine whether this ſpecies will continue to retain its great ſize, or will degenerate and become the common hemp of Europe.

From the leaves of hemp pounded and boiled in water, the natives of the Eaſt Indies prepare an intoxicating liquor of which they are very fond. The plant, when freſh, has a rank narcotic ſmell; the water in which the ſtalks are ſoaked, in order to ſeparate the tough rind for mechanic uſes, is ſaid to be violently poiſonous, and to produce its effects almoſt as ſoon as drank. The ſeeds alſo have ſome ſmell of the herb, and their taſte is unctuous and ſweetiſh: they are recommended, boiled in milk, or triturated with water into an emulſion, againſt coughs, heat of urine, and the like. They are alſo ſaid to be uſeful in incontinence of urine, and for reſtraining venereal appetites; but experience does not warrant their having any virtues of that kind.

CANNÆ, (anc. geog.) a town of Apulia in the Adriatic, at the mouth of the river Aufidus, rendered famous by a terrible overthrow which the Romans here received from the Carthaginians under Hannibal. The Roman conſuls Æmilius Paulus and Terentius Varro, being authorized by the ſenate to quit the defenſive plan, and ſtake the fortunes of the republic on the chance of a battle, marched from Canuſium, and encamped a few miles eaſt, in two unequal diviſions, with the Aufidus between them. In this poſition they meant to wait for an opportunity of engaging to advantage; but Hannibal, whoſe critical ſituation in a deſolated country, without refuge or allies, could admit of no delay, found means to inflame the vanity of Varro by ſome trivial advantages in ſkirmiſhes between the light horſe. The Roman, elated with this ſucceſs, determined to bring matters to a ſpeedy concluſion; but, finding the ground on the ſouth ſide too confined for the operation of ſo large an army, croſſed the river; and Varro, reſting his right wing upon the Aufidus, drew out his forces in the plain. Hannibal, whoſe head quarters were at Cannæ, no ſooner perceived the enemy in motion, than he forded the water below, and marſhalled his troops in a line oppoſite to that of his adverſaries.

The Romans were vaſtly ſuperior in number to the Carthaginians; but the latter were ſuperior in cavalry. The army of the former, conſiſting of 87,000 men, was drawn up in the uſual manner; the *haſtati* in the firſt line, the *principes* in the ſecond, and the *triarii* in the third. The cavalry were poſted on the wings. On the right, the Roman knights flanked the legionaries; in the left, the cavalry of the allies covered their own infantry. The two conſuls commanded the two wings, Emilius the right, and Terentius the left; and the two proconſuls Servilius and Attilius the main body. On the other hand, Hannibal, whoſe army conſiſted of 40,000 foot and 10,000 horſe, placed his Gauliſh and Spaniſh cavalry in his left wing, to face the Roman knights; and the Numidian horſe in his right, over againſt the cavalry of the allies of Rome. As to his infantry, he divided the African battalions into two bodies; one of which he poſted near the Gauliſh and Spaniſh horſe, the other near the Numidian. Between theſe two bodies were placed on one ſide the Gauliſh, on the other the Spaniſh infantry, drawn up in ſuch a manner as to form an obtuſe angle projecting a conſiderable way beyond the two wings. Behind this line he drew up a ſecond which had no projection. Aſdrubal commanded the left wing; Maherbal the right; and Hannibal himſelf, with his brother Mago, the main body. He had alſo taken care to poſt himſelf in ſuch a manner that the wind *Vulturnus*, which riſes at certain ſtated times, ſhould blow directly in the faces of the Romans during the fight, and cover them with duſt. The onſet was begun by the light-armed infantry; the Romans diſcharging their javelins, and the *baleares* their ſtones, with pretty equal ſucceſs; nevertheleſs, the conſul Emilius was wounded. Then the Roman cavalry in the right wing advanced againſt the Gauliſh and Spaniſh in Hannibal's left. As they were ſhut in by the river Aufidus on one ſide, and by their infantry on the other, they did not fight, as uſual, by charging and wheeling off, and then returning to the change; but continued fighting each man againſt his adverſary, till one of them was killed or retired. After they had made prodigious efforts on both ſides to overbear each other, they all on a ſudden diſmounted, and fought on foot with great fury. In this attack the Gauls and Spaniards ſoon prevailed; put the Romans to the rout; and, purſuing them along the river, ſtrewed the ground with their dead bodies, Aſdrubal giving no quarter. This action was ſcarce over, when the infantry on both ſides advanced. The Romans firſt fell upon the Spaniards and Gauls, who, as already obſerved, formed a kind of triangle projecting beyond the two wings. Theſe gave ground, and, purſuant to Hannibal's directions, ſunk into the void ſpace in their rear; by which means they inſenſibly brought the Romans into the centre of the African infantry, and then the fugitives rallying, attacked them in front, while the Africans charged them in both flanks. The Romans, being by this artful retreat drawn into the ſnare and ſurrounded, no longer kept their ranks, but formed ſeveral platoons in order to face every way. Emilius, who was on the right wing, ſeeing the danger of the main body, at the head of his legionaries acted the part both of a ſoldier and general, penetrating into the heart of the enemy's battalions, and cutting great numbers of them in pieces. All the Roman cavalry that were left, attended the brave conſul on foot; and, encouraged by his example, fought like men in deſpair. But, in the mean time, Aſdrubal, at the head of a detachment of Gauliſh and

Cannæ.

Spaniſh infantry brought from the centre, attacked Æmilius's legionaries with ſuch fury, that they were forced to give ground and fly: the conſul being all covered with wounds, was at laſt killed by ſome of the enemy who did not know him. In the main body, the Romans, though inveſted on all ſides, continued to ſell their lives dear; fighting in platoons, and making a great ſlaughter of the enemy. But being at length overpowered, and diſheartened by the death of the two proconſuls Servilius and Attilius who headed them, they diſperſed and fled, ſome to the right, and others to the left, as they could find opportunity; but the Numidian horſe cut moſt of them in pieces: the whole plain was covered with heaps of dead bodies, inſomuch that Hannibal himſelf, thinking the butchery too terrible, ordered his men to put a ſtop to it.—There is a great diſagreement among authors as to the number of Romans killed and taken at the battle of Cannæ. According to Livy, the republic loſt 50,000 men, including the auxiliaries. According to Polybius, of 6000 Roman horſe, only 70 eſcaped to Venuſia with Terentius Varro and 300 of the auxiliary horſe. As to the infantry, that writer tells us, that 70,000 of the Roman foot died on the field of battle fighting like brave men; and that 13,000 were made priſoners. According to Dionyſius of Halicarnaſſus, of 6000 horſe, only 370 eſcaped the general ſlaughter, and of 80,000 foot, 3000 only were left. The moſt moderate computation makes the number of Romans killed to amount to 45,000. The ſcene of action is marked out to poſterity, by the name of *Pezzo di Sangue*, "Field of Blood."

Theſe plains have more than once, ſince the Punic war, afforded room for men to accompliſh their mutual deſtruction. Melo of Bari, after raiſing the ſtandard of revolt againſt the Greek emperors, and defeating their generals in ſeveral engagements, was at laſt routed here in 1019, by the Catapan Bolanus. Out of two hundred and fifty Norman adventurers, the flower of Melo's army, only ten eſcaped the ſlaughter of the day. In 1201, the archbiſhop of Palermo and his rebellious aſſociates, who had taken advantage of the nonage of Frederic of Swabia, were cut to pieces at Cannæ by Walter de Brienne, ſent by the pope to defend the young king's dominions.

The traces of the town of Cannæ are very faint, conſiſting of fragments of altars, cornices, gates, walls, vaults and under-ground granaries. It was deſtroyed the year before the battle; but being rebuilt, became an epiſcopal ſee in the infancy of Chriſtianity. It was again ruined in the ſixth century, but ſeems to have ſubſiſted in an humble ſtate many ages later; for we read of its contending with Barletta for the territory, which till then had been enjoyed in common by them; and in 1284, Charles I. iſſued an edict for dividing the lands to prevent all future litigation. The proſperity of the towns along the coaſt, which increaſed in wealth and population by embarkations for the Cruſadoes and by traffic, proved the annihilation of the great inland cities; and Cannæ was probably abandoned entirely before the end of the thirteenth century.

CANNEQUINS, in commerce, white cotton cloths brought from the Eaſt-Indies. They are a proper commodity for trading on the coaſt of Guinea, particularly about the rivers Senega and Gambia. Theſe linens are folded ſquare-wiſe, and are about eight ells long.

Cannel Coal
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Cannonade

CANNEL COAL. See AMPELITES.

CANNES, a town of France in Provence, and in the viguerie of Graſſe, ſeated on the coaſt of the Mediterranean ſea, with a harbour and a caſtle. E. Long. 7. 7. N. Lat. 43. 34.

CANNIBAL, a modern term for an anthropophagus or man-eater, more eſpecially in the Weſt-Indies. See ANTHROPOHAGI.

CANNON, a military engine for throwing balls, &c. by the help of GUNPOWDER.

The invention of braſs cannon is by Laney aſcribed to J. Owen: he ſays, that they were firſt known in England in the year 1535; but yet acknowledges, that, in 1346, there were four pieces of cannon in the Engliſh army at the battle of Creſſy, and that theſe were the firſt that were known in France. And Mezeray relates, that king Edward, by five or ſix pieces of cannon ſtruck terror into the French army, it being the firſt time they had ſeen any of theſe thundering machines; though others affirm that cannon were known alſo in France at the ſame time; but that the French king, in his hurry to attack the Engliſh, and in confidence of victory, left all his cannon behind him as uſeleſs incumbrances (See ARTILLERY). The Germans carry the invention further back, and attribute it to Albertus Magnus, a Dominican monk, about the year 1250. Voſſius rejects all theſe opinions, and finds cannon in China almoſt 1700 years ago. According to him they were mounted by the emperor Kitey in the year of Chriſt 85. For further particulars of their hiſtory, &c. ſee GUN and GUNNERY.

For the caſting of cannon, ſee FOUNDERY. For their different parts, proportions, management, operation, and effects, ſee GUNNERY.

CANNON, with letter-founders and printers, the name of the lageſt ſize of letters they uſe.

CANNONADE, the application of artillery to the purpoſes of war, or the direction of its efforts againſt ſome diſtant object intended to be ſeized or deſtroyed, as a ſhip, battery, or fortreſs. See GUNNERY.

Since a large ſhip of war may be conſidered as a combination of floating batteries, it is evident that the efforts of her artillery muſt be greatly ſuperior to thoſe of a fortreſs on the ſea-coaſt; that is to ſay, in general; becauſe, on ſome particular occaſions, her ſituation may be extremely dangerous, and her cannonading ineffectual. Her ſuperiority conſiſts in ſeveral circumſtances, as the power of bringing her different batteries to converge to one point; of ſhifting the line of her attack ſo as to do the greateſt poſſible execution againſt the enemy, or to lie where ſhe will be the leaſt expoſed to his ſhot; and chiefly becauſe, by employing a much greater number of cannon againſt a fort than it can poſſibly return, the impreſſion of her artillery againſt ſtone-walls ſoon becomes deciſive and irreſiſtible. Beſides theſe advantages in the attack, ſhe is alſo greatly ſuperior in point of defence: becauſe the cannon-ſhot, paſſing with rapidity through her ſides, ſeldom do any execution out of the line of their flight, or occaſion much miſchief by their ſplinters; whereas they very ſoon ſhatter and deſtroy the faces of a parapet, and produce incredible havoc among the men by the fragments of the ſtones, &c. A ſhip may alſo retreat when ſhe finds it too dangerous to remain longer expoſed to the enemy's fire, or when her own fire cannot produce the deſired effect. Finally, the fluctuating ſituation of a ſhip, and of the element on which ſhe reſts, renders the effects of bombs very uncertain, and altogether deſtroys the effects of the *ricochet*, or rolling and bounding ſhot, which is ſo pernicious, and deſtructive in a fortreſs or land engagement. The chief inconveniency to which a ſhip is expoſed, on the contrary, is, that the low-laid cannon in a fort near the brink of the ſea, may ſtrike her repeatedly on or under the ſurface of the water, ſo as to ſink her before her cannonade can have any conſiderable efficacy.

CANNULA, in ſurgery, a tube made of different metals, principally of ſilver and lead, but ſometimes of iron.

They are introduced into hollow ulcers, in order to facilitate a diſcharge of pus or any other ſubſtance; or into wounds, either accidental or artificial, of the large cavities, as the thorax or abdomen: they are uſed in the operation of bronchotomy; and, by ſome, after cutting for the ſtone, as a drain for urine.

Other cannulas are uſed for introducing cauteries, either actual or potential, into hollow parts, in order to guard the parts adjacent to that to be cauterized, from injury. They are of various figures; ſome being oval, ſome round, and others crooked.

CANO, a kingdom of Africa, in Negroland, with a town of the ſame name. It is bounded by Zaara on the north, by the river Niger on the ſouth, the kingdom of Agades on the weſt, and that of Caſſina on the eaſt. Some of the inhabitants are herdſmen, and others till the ground and dwell in villages. It produces corn, rice, and cotton. Here are alſo many deſerts and mountains covered with woods, in which are wild citrons and lemon trees. The walls and houſes of the town are made of clay, and the principal inhabitants are merchants. E. Long. 16. 18. N. Lat. 21. 5.

CANOBIA, a town of Italy, in the duchy of Milan, ſeated on the weſtern bank of Lago Maggiore, or the Greater Lake. E. Long. 8. 47. N. Lat. 45. 55.

CANOE, a ſort of Indian boat or veſſel, formed of the trunk of a tree hollowed, and ſometimes of ſeveral pieces of the bark put together.

Canoes are of various ſizes, according to the uſes for which they may be deſigned, or the countries wherein they are formed. The largeſt are made of the cotton tree; ſome of them will carry between 20 and 30 hogſheads of ſugar or molaſſes. Some are made to carry ſail: and for this purpoſe are ſteeped in water till they become pliant; after which their ſides are extended, and ſtrong beams placed between them, on which a deck is afterwards laid that ſerves to ſupport their ſides. The other ſorts very rarely carry ſail, unleſs when going before the wind: their ſails are made of a ſort of ſhort ſilk graſs or ruſhes. They are commonly rowed with paddles, which are pieces of light wood ſomewhat reſembling a corn-ſhovel; and inſtead of rowing with it horizontally like an oar, they manage it perpendicularly. The ſmall canoes are very narrow, having only room for one perſon in breath, and ſeven or eight lengthwiſe. The rowers, who are generally American ſavages, are very expert in managing their paddles uniformly, and in balancing the canoes with their bodies; which would be difficult for a ſtranger to do, how well accuſtomed ſoever to the conducting of European boats, becauſe the canoes are extremely light, and liable to be overturned. The American Indians, when they are under the neceſſity of landing to avoid a water fall, or of croſſing the land from one river to another, carry their canoes on their heads, till they arrive at a place where they can launch them again. This is the general conſtruction of canoes, and method of managing them: but ſome nations have veſſels going under the name of canoes, which differ conſiderably from the above; as the inhabitants of Greenland, Hudſon's-bay, Otaheite, &c.

CANON, a perſon who poſſeſſes a prebend, or revenue allotted for the performance of divine ſervice, in a cathedral or collegiate church.

Canons are of no great antiquity: Paſchier obſerves, that the name canon was not known before Charlemagne; at leaſt the firſt we hear of are in Gregory de Tours, who mentions a college of canons inſtituted by Baldwin XVI. archbiſhop of that city, in the time of Clotharius I. The common opinion attributes the inſtitution of this order to Chrodegangus, biſhop of Metz, about the middle of the eighth century.

Originally canons were only prieſts, or inferior eccleſiaſtics, who lived in community; reſiding by the cathedral church, to aſſiſt the biſhop; depending entirely on his will; ſupported by the revenues of the biſhopric; and living in the ſame houſe, as his domeſtics, or counſellors, &c. They even inherited his moveables till the year 817, when this was prohibited by the council of Aix-la-Chapelle, and a new rule ſubſtituted in the place of that which had been appointed by Chrodegangus, and which was obſerved for the moſt part in the weſt till the twelfth century. By degrees, theſe communities of prieſts, ſhaking off their dependence, formed ſeparate bodies; whereof the biſhops, however, were ſtill heads. In the tenth century, there were communities or congregations of the ſame kind, eſtabliſhed even in cities where there were no biſhops; theſe were called collegiates, as they uſed the terms congregation and college indifferently: the name chapter, now given to theſe bodies, being much more modern. Under the ſecond race of the French kings, the canonical, or collegiate life, had ſpread itſelf all over the country; and each cathedral had its chapter, diſtinct from the reſt of the clergy. They had the name canon from the Greek κανων, which ſignifies three different things; a rule, a penſion, or fixed revenue to live on, and a catalogue or matricula; all which are applicable to them.

In time, the canons freed themſelves from their rules, the obſervance relaxed, and, at length, they ceaſed to live in community: yet they ſtill formed bodies; pretending to other functions beſides the celebration of the common office in the church; yet aſſuming the rights of the reſt of the clergy; making themſelves as a neceſſary council of the biſhop; taking upon them the adminiſtration of a ſee during a vacancy, and the election of a biſhop to ſupply it. There are even ſome chapters exempt from the juriſdiction of the biſhop, and owning no head but their dean. After the example of cathedral chapters, collegiate ones alſo continued to form bodies, after they had abandoned living in community.

CANONS are of various kinds; as,

Cardinal CANONS, which are thoſe attached, and, as the Latins call it, *incardinati* to a church, as a prieſt is to a pariſh.

Domicellary CANONS, where young canons, who not being in orders, had no right in any particular chapters.

Expectative CANONS, were ſuch as, without having any revenue or prebend, had the title and dignities of canons, a voice in the chapter, and a place in the choir; till ſuch time as a prebend ſhould fall.

Foreign CANONS, were ſuch as did not officiate in the canonries to which they belonged. To theſe were oppoſed manſionary canons, or canons reſidentiary.

Lay, or *honorary* CANONS, are ſuch among the laity as have been admitted, out of honour and reſpect, into ſome chapter of canons.

Regular CANONS, are canons that ſtill live in community; and who, like religious, have, in proceſs of time, to the practice of their rules, added the ſolemn profeſſion of vows. They are called regulars, to diſtinguiſh them from thoſe ſecular canons who abandon living in community, and at the ſame time the obſervance of the canons made as the rule of the clergy, for the maintenance of the ancient diſcipline. The canons ſubſiſted in their ſimplicity till the eleventh, ſome ſay the twelfth century, when ſome of them, ſeparating from the community, took with them the name of canons, or acephalous prieſts, becauſe they declined to live in community with the biſhop; and thoſe who were left thenceforth acquired the denomination of canons regular, and adopted moſt of the profeſſions of the rule of St Auguſtine. This order of regular canons of St Auguſtine was brought into England by Adelwald, confeſſor to Henry I. who erected a priory at Noſtel in Yorkſhire; and obtained for them the church of Carliſle as an epiſcopal ſee, with the privilege of chooſing their own biſhop. They were ſingularly protected and encouraged by Henry I. who gave them the priory of Dunſtable in 1107, and by queen Maud, who, in the following year, gave them the priory of the Holy Trinity in London. It appears, that under the reign of Edward I. they had 53 priories.

Tertiary CANONS, thoſe who had only the third part of the revenues of the canonicate.

CANON, in an eccleſiaſtical ſenſe, is a law or rule, either of doctrine or diſcipline, enacted eſpecially by a council, and confirmed by the authority of the ſovereign.

Canons are properly deciſions of matters of religion; or regulations of the policy and diſcipline of a church, made by councils, either general, national, or provincial. Such are the canons of the council of Nice, or Trent, &c.

There have been various collections of the canons of the Eaſtern councils: but four principal ones, each ampler than the preceding. The firſt, according to Uſher. A. D. 380, containing only thoſe of the firſt œcumenical council, and the firſt provincial ones: they were but 164 in number. To theſe Dionyſius Exiguus, in the year 520, added the 50 canons of the apoſtles, and thoſe of the other general councils. The Greek canons in this ſecond collection end with thoſe of the council of Chalcedon; to which are ſubjoined thoſe of the council of Sardica, and the African councils. The fourth and laſt collection comes down as low as the ſecond council of Nice; and it is on this that Balſamon and Zonaras have commented.

Apoſtolical CANONS, are thoſe which have been uſually aſcribed to St Clement. Bellarmin, Baronious, &c. will have them to be genuine canons of the apoſtles: Cotelerius obſerves, that they cannot be aſcribed to the apoſtles or Clement, becauſe they are not received with other books of ſcripture, are not quoted by the writers of the firſt ages, and contain many things not agreeable to the apoſtolical times: Hincmar, De Marca, Beveridge, &c. take them to be framed by the biſhops who were the apoſtles diſciples in the ſecond or third century; S. Baſnage is of opinion, that they were collected by an anonymous writer in the fifth century; but Daille, &c. maintain them to have been forged by ſome heretic in the ſixth century; and S. Baſnage conjectures, that ſome of them are ancient, and others not older than the ſeventh century. The Greek church allow only 85 of them, and the Latins only 50; though there are 84 in the edition given of them in the Corpus Juris Canonici.

CANON is alſo uſed for the authoriſed catalogue of the ſacred writings. See BIBLE.

The ancient canon, or catalogue of the books of the Old Teſtament, was made by the Jews, and is ordinarily attributed to Ezra; who is ſaid to have diſtributed them into the law, the prophets, and the hagiographa, to which our Saviour refers, Luke, chap. xxiv. ver. 44. The ſame diviſion is alſo mentioned by Joſephus, cont. Appion.

This is the canon allowed to have been followed by the primitive church, till the council of Carthage; and, according to St Jerom, this conſiſted of no more than 22 books; anſwering to the number of the Hebrew alphabet; though at preſent they are claſſed into 24 diviſions, containing Geneſis, Exodus, Leviticus, Numbers, Deuteronomy, Joſhua, Judges, Samuel, Kings, Iſaiah, Jeremiah, Ezekiel, the twelve minor prophets, the Pſalms, the Proverbs, Job, Canticles, Ruth, Lamentations, Eccleſiaſtes, Eſther, Daniel, Ezra, comprehending the book of Nehemiah and the Chronicles. However, this order is not univerſally obſerved, either among Jews or Chriſtians: nor were all the books above enumerated admitted into the canon in Ezra's time. It is moſt likely, ſays Dr Prideaux, that the two books of Chronicles, Ezra, Nehemiah, Eſther, and Malachi, were added in the time of Simon the Juſt, when the canon was completed. But that council enlarged the canon very conſiderably, taking into it the books which we call apocryphal; which the council of Trent has further enforced, enjoining all theſe to be received as books of Holy Scripture, upon pain of anathema, and being attainted of hereſy. The Romaniſts, in defence of this canon, ſay, that it is the ſame with that of the Council of Hippo, held in 393; and with that of the third council of Carthage, in 397; at which were preſent 46 biſhops, and, among the reſt, St Auguſtine; who declared that they received it from their fathers.

Their canon of the new teſtament perfectly agrees with ours. It conſiſts of books that are well known; ſome of which have been univerſally acknowledged; ſuch are the four Goſpels, the Acts of the Apoſtles, thirteen Epiſtles of St Paul, one Epiſtle of St Peter, and one Epiſtle of St John: and others, concerning which doubts were entertained, but which were afterwards received as genuine; ſuch are the epiſtle to the Hebrews, that of James, the ſecond of Peter, the ſecond and third of John, that of Jude, and the Revelation. Theſe books were written at different times, and they are authenticated, not by the decrees of councils, or infallible authority, but by ſuch kinds of evidence as is thought ſufficient in the caſe of any other ancient writings. They were very extenſively diffuſed; they were read in every Chriſtian ſociety; they were valued and preſerved with care by the firſt Chriſtians; they were cited by Chriſtian writers of the ſecond, third and fourth century, as by Irenæus, Clement the Alexandrian, Tertullian, Origen, Euſebius, &c. and their genuineneſs is proved by the teſtimony of thoſe who were contemporary with the apoſtles themſelves, and by tradition. The four Goſpels, and moſt of the other books of the New Teſtament, were collected either by one of the apoſtles, or ſome of their diſciples and ſucceſſors, before the end of the firſt century. The catalogue of canonical books furniſhed by the more ancient Chriſtian writers, as Origen about the year 210, Euſebius and Athanaſius in 315, Epiphanius in 370, Jerome in 382, Auſtin in 394, and many others, agrees with that which is now received among Chriſtians. For the time of writing the ſeveral books of the New Teſtament, ſee the titles of the books themſelves; as the Goſpel of St MATTHEW, MARK, &c.

Some of the fathers diſtinguiſh the inſpired writings into three claſſes; proto-canonical, deutero-canonical, and aprocryphal.

Paſchal CANON, a table of the moveable feaſts, ſhowing the day of Eaſter, and the other feaſts depending on it, for a cycle of 19 years.

The paſchal canon is ſuppoſed to be the calculation of Euſebius of Cæſarea; and to have been done by order of the council of Nice.

CANON, in monaſtic orders, a book wherein the religious of every convent have a fair tranſcript of the rules of their order, frequently read among them as their local ſtatutes. This is alſo called *regula*, as containing the rule and inſtitution of their order.

The canon differs from the miſſale, martyrologium, and necrologium.

CANON, again, is uſed for the catalogue of Saints acknowledged and canonized in the Roman church.

CANON is alſo uſed, by way of excellence in the Romiſh church, for the ſecret words of the maſs, from the preface to the *Pater;* in the middle of which the prieſt conſecrates the hoſt. The common opinion is, that the canon of the maſs commences with *Te igitur*, &c. The people are to be on their knees, hearing the canon; and are to rehearſe it to themſelves, ſo as not to be heard.

CANON, in the ancient muſic, is a rule or method of determining the intervals of notes.

Ptolemy rejecting the Ariſtoxenian way of meaſuring the intervals in muſic, by the magnitude of a tone (which was ſuppoſed to be formed by the difference between a diapente and a diateſſaron), thought that muſical intervals ſhould be diſtinguiſhed, according to the ratios or proportions which the ſounds terminating thoſe intervals bear to one another, when conſidered according to their degree of acuteneſs or gravity; which, before Ariſtoxenus, was the old Pythagorean way. He therefore made the diapaſon conſiſt in a double ratio; the diapente, in a ſeſquialterate; the diateſſaron, in a ſeſquitertian; and the tone itſelf, in a ſeſquioctave; and all the other intervals, according to the proportion of the ſounds that terminate them: wherefore taking the canon (as it is called) for a determinate line of any length, he ſhows how this canon is to be cut accordingly, ſo that it may repreſent the reſpective intervals: and this method anſwers exactly to experiment, in the different lengths of muſical chords. From this canon, Ptolemy and his followers have been called *Canonici*; as thoſe of Ariſtoxenus were called *Muſici*.

CANON, in modern muſic, is a kind of fugue, which they call a *perpetual fugue*; becauſe the different parts beginning one after another, repeat inceſſantly the ſame air.

Formerly, ſays Zarlino, they placed, at the head of perpetual fugues, particular directions which ſhowed how this kind of fugues was to be ſung; and theſe directions being properly the rules by which perpetual fugues were compoſed were called *canoni*, *rules*, or *canons*. From this cuſtom, others taking the title for the thing ſignified, by a metonimy, termed this kind of compoſition *canon*. Such canons as are compoſed with the greateſt facility, and of conſequence moſt generally uſed, begin the fugue either with the octave or the uniſon; that is to ſay, that every part repeats in the ſame tone the melody of the preceding. In order to form a canon of this kind, it is only neceſſary for the compoſer to make an air according to his taſte; to add in ſcore as many parts as he chooſes, where the voices in octave or uniſon repeat the ſame melody; then forming a ſingle air from all theſe parts ſucceſſively executed, to try whether this ſucceſſion may form an entire piece which will give pleaſure, as well in the harmony as the melody.

In order to execute ſuch a *canon*, he who ſings the firſt part begins alone, and continues till the air is finiſhed; then recommences immediately, without any ſuſpence of ſound or interruption of time: as ſoon as he has ended the firſt couplet, which ought to ſerve for the perpetual ſubject upon which the whole *canon* has been compoſed, the ſecond part begins and repeats the ſame couplet, whilſt the firſt who had begun purſues the ſecond: others in ſucceſſion begin, and proceed the ſame way, as ſoon as he who precedes has reached the end of the firſt couplet. Thus, by inceſſantly recommencing, an univerſal cloſe can never be found, and the *canon* may be repeated as long as the ſingers pleaſe.

A perpetual fugue may likewiſe conſiſt of parts which begin with the intervals of a fourth or fifth, or, in other words, every part may repeat the melody of the firſt, a fourth, or a fifth higher or lower. It is then neceſſary that the whole *canon* ſhould be invented *di prima intenzione*, as the Italians ſay; and that ſharps or flats ſhould be added to the notes, whoſe natural gradations do not anſwer exactly, by a fourth or fifth, to the melody of the preceding part, and produce the ſame intervals with itſelf. Here the compoſer cannot pay the leaſt regard to modulation; his only care is, that the melody may be the ſame, which renders the formation of a *canon* more difficult; for at every time when any part reſumes the fugue, it takes a new key; it changes the tone almoſt at every note, and what is ſtill worſe, no part is at the ſame time found in the ſame tone with another; hence it is that this kind of *canons*, in other reſpects far from being eaſy to be purſued, never produces a pleaſing effect, however good the harmony may be, and however properly it may be ſung.

There is a third kind of *canon*, but very ſcarce, as well becauſe it is extremely difficult, as becauſe it is for the moſt part incapable of giving pleaſure, and can boaſt no other merit but the pains which have been thrown away in its compoſition. This may be called a *double canon inverted*, as well by the inverſions which are practiſed in it with reſpect to the melody of the parts, as by thoſe which are found among the parts themſelves, in ſinging. There is ſuch an artifice in this kind of *canon*, that, whether the parts be ſung in their natural order, or whether the paper in which they are ſet be turned the contrary way, to ſing them backward from the end to the beginning, in ſuch a manner that the baſs becomes the upper part, and the reſt undergo a ſimilar change, ſtill you have pretty harmony, and ſtill a regular *canon*. The reader may conſult Rouſſeau's Dictionary in this article, where he is referred to plate D fig. 11. for two examples of canons of this ſort extracted from Bontempi, who likewiſe gives rules for their compoſition. But he adds, that the true principle from which this rule is deduced will be found at the word *Syſteme*, in his account of the ſyſtem of Tartini, to which we muſt likewiſe once more refer the reader; as a quotation of ſuch length muſt have protracted our article to an enormous extent.

To form a *canon* in which the harmony may be a little varied, it is neceſſary that the parts ſhould not follow each other in a ſucceſſion too rapid, and that the one ſhould only begin a conſiderable time after the other. When they follow one another ſo immediately as at the diſtance of a ſemibreve or minim, the duration is not ſufficient to admit a great number of chords, and the canon muſt of neceſſity exhibit a diſagreeable monotony; but it is a method of compoſing, without much difficulty, a canon in as many parts as the compoſer chooſes. For a *canon* of four bars only, will conſiſt of eight parts if they follow each other at the diſtance of half a bar; and by each bar which is added, two parts will conſtantly be gained.

The emperor Charles VI. who was a great muſician, and compoſed extremely well, took much pleaſure in compoſing and ſinging *canons*. Italy is ſtill replete with moſt beautiful *canons* compoſed for this prince, by the beſt maſters in that country. To what has been ſaid by Rouſſeau, we need only ſubjoin, that the Engliſh *catch* and the Italian *canon* are much the ſame; as any intelligent reader may perceive, from comparing the ſtructure and execution of the Engliſh *catch* with the account of *canons* which has now been given.

Canon, in geometry and algebra, a general rule for the ſolution of all caſes of a like nature with the preſent inquiry. Thus every laſt ſtep of an equation is a canon; and, if turned into words, becomes a rule to ſolve all queſtions of the ſame nature with that propoſed.

Canon-Law, a collection of eccleſiaſtical laws, ſerving as the rule and meaſure of church-government.

The power of making laws was exerciſed by the church before the Roman empire became Chriſtian. The canon-law that obtained throughout the Weſt, till the 12th century, was the collection of canons made by Dionyſius Exiguus in 520, the capitularies of Charlemagne, and the decrees of the popes from Sircius to Anaſtaſius.

The canon-law, even when papal authority was at its height in England, was of no force when it was found to contradict the prerogative of the king, the laws, ſtatutes, and cuſtoms of the realm, or the doctrine of the eſtabliſhed church.

The eccleſiaſtical juriſdiction of the ſee of Rome in England was founded on the canon-law; and this created quarrels between kings and ſeveral archbiſhops and prelates who adhered to the papal uſurpation.

Beſides the foreign canons, there were ſeveral laws and conſtitutions made there for the government of the church: but all theſe received their force from the royal aſſent; and if, at any time, the eccleſiaſtical courts did, by their ſentence, endeavour to enforce obedience to ſuch canons, the courts at common law, upon complaints made, would grant prohibition. The authority veſted in the church of England of making canons, was aſcertained by a ſtatute of Henry VIII. commonly called the *act of the clergy's ſubmiſſion*; by which they acknowledged, that the convocation had always been aſſembled by the king's writ; ſo that though the power of making canons reſided in the clergy met in convocation, their force was derived from the authority of the king's aſſenting to, and confirming them.

The old canons continued in full force till the reign of James I. when the clergy being aſſembled in convocation, the king gave them leave to treat and conſult upon canons; which they did, and preſented them to the king, who gave them the royal aſſent: theſe were a collection out of the ſeveral preceding canons and injunctions. Some of theſe canons are now obſolete. In the reign of Charles I. ſeveral canons were paſſed by the clergy in convocation.

CANONESS, in the Romiſh church, a woman who enjoys a prebend, affixed, by the foundation, to maids, without their being obliged to renounce the world or make any vows.

CANONICA, in philoſophical hiſtory, an appellation given by Epicurus to his doctrine of logic. It was called *canonica*, as conſiſting of a few canons or rules for directing the underſtanding in the purſuit and knowledge of truth. Epicurus's *canonica* is repreſented as a very ſlight and inſufficient logic by ſeveral of the ancients, who put a great value on his ethics and phyſics. Laertius even aſſures us, that the Epicureans rejected logic as a ſuperfluous ſcience; and Plutarch complains that Epicurus made an unſkilful and prepoſterous uſe of ſyllogiſms. But theſe cenſures ſeem too ſevere. Epicurus was not averſe to the ſtudy of logic, but even gave better rules in this art than thoſe philoſophers who aimed at no glory but that of logics. He only ſeems to have rejected the dialectics of the ſtoics, as full of vain ſubtleties and deceits, and fitted rather for parade and diſputation than real uſe. The ſtreſs of Epicurus's *canonica* conſiſts in his doctrine of the criteria of truth. All queſtions in philoſophy are either concerning words or things: concerning things,

we

we ſeek their truth ; concerning words, their ſignification : things are either natural or moral ; and the former are either perceived by ſenſe or by the underſtanding. Hence, according to Epicurus, ariſe three criterions of truth, *viz.* ſenſe, anticipation or prænotion, and paſſion. The great canon or principle of Epicurus's logic is, that the ſenſes are never deceived ; and therefore, that every ſenſation or perception of an appearance is true.

CANONICAL, ſomething that belongs to, or partakes of, the nature of a rule or canon.

Canonical Hours, are certain ſtated times of the day, conſigned, more eſpecially by the Romiſh church, to the offices of prayer and devotion. Such are *matins, lauds, ſixth, ninth, veſpers.* In Britain the canonical hours are from eight to twelve in the forenoon, before or after which marriage cannot be legally performed in any pariſh-church.

Canonical Obedience, is that ſubmiſſion which, by the eccleſiaſtical laws, the inferior clergy are to pay to their biſhops, and religious to their ſuperiors.

Canonical Sins, in the ancient church, thoſe which were capital or mortal. Such eſpecially were idolatry, murder, adultery, hereſy, and ſchiſm.

Canonical Puniſhments, are thoſe which the church may inflict ; ſuch as excommunication, degradation, and penance ; in Roman Catholic countries, alſo faſting, alms, whipping, &c.

Canonical Life, the method or rule of living preſcribed by the ancient clergy who lived in community. The canonical life was a kind of medium between the monaſtic and clerical lives. Originally the orders of monks and clerks were entirely diſtinct ; but pious perſons, in proceſs of time, inſtituted colleges of prieſts and canons, where clerks brought up for the miniſtry, as well as others already engaged therein, might live under a fixed rule, which, though ſomewhat more eaſy than the monaſtic, was yet more reſtrained than the ſecular. This was called the *canonical life,* and thoſe who embraced it *canons.*—Authors are divided about the founder of the canonical life. Some will have it to be founded by the apoſtles ; others aſcribe it to pope Urban I. about the year 1230, who is ſaid to have ordered biſhops to provide ſuch of their clergy as were willing to live in community, with neceſſaries out of the revenues of their churches. The generality attribute it to St Auguſtine ; who, having gathered a number of clerks to devote themſelves to religon, inſtituted a monaſtery within his epiſcopal palace, where he lived in community with them. Onuphrius Panvinius brings the inſtitution ſomewhat lower : according to him, pope Gelaſius I. about the year 495, placed the firſt regular canons of St. Auguſtine in the Lateran church.

Canonical Letters, in the ancient church, were a ſort of teſtimonials of the orthodox faith, which the biſhops and clergy ſent each other to keep up the catholic communion, and diſtinguiſh orthodox Chriſtians from Arians and other heretics. They were denominated *canonical,* either as being compoſed according to a certain rule or form, or becauſe they were given to the *canonici,* that is, thoſe comprehended in the canon or catalogue of their church. When they had occaſion to travel into other dioceſes or countries, dimiſſory and recommendatory letters, alſo letters of peace, &c. were ſo many ſpecies of canonical letters.

Canonical is alſo an appellation given to thoſe epiſtles in the New Teſtament more frequently called *catholic* or *general* epiſtles.

CANONICUM, in a general ſenſe, denotes a tax or tribute.

Canonicum is more particularly uſed in the Greek church for a fee paid by the clergy to biſhops, archbiſhops, and metropolitans, for degrees and promotions.

Canonicum alſo denotes a due of firſt-fruits, paid by the Greek laity to their biſhops, or, according to Du Cange, to their prieſts. The *canonicum* is aſſeſſed according to the number of houſes or chimnies in a place.

The emperor Iſaac Comnenus made a conſtitution for regulating the *canonicum* of biſhops, which was confirmed by another made in 1086, by his nephew Alexis Comnenus. A village containing thirty fires, was to pay for its *canonicum* one piece of gold, two of ſilver, one ſheep, ſix buſhels of barley, ſix of wheat flour, ſix meaſures of wine, and thirty hens.

CANONIST, a perſon ſkilled in or who makes profeſſion of the ſtudy and practice of the canon law. Canoniſts and civilians are uſually combined in the ſame perſons : and hence the title of *doctor juris utriuſque,* or *legum doctor,* uſually expreſſed in abbreviature, L. L. D. or J. U. D.

CANONIZATION, a ceremony in the Romiſh church, by which perſons deceaſed are ranked in the catalogue of the ſaints. It ſucceeds beatification.

Before a beatified perſon is canonized, the qualifications of the candidate are ſtrictly examined into, in ſome conſiſtories held for that purpoſe ; after which, one of the conſiſtorial advocates, in the preſence of the pope and cardinals, makes the panegyric of the perſon who is to be proclaimed a ſaint, and gives a particular detail of his life and miracles : which done, the holy father decrees his canonization, anda ppoints the day.

On the day of canonization the pope officiates in white, and their eminences are dreſt in the ſame colour. St Peter's church is hung with rich tapeſtry, upon which the arms of the pope, and of the prince or ſtate requiring the canonization, are embroidered in gold and ſilver. An infinite number of lights blaze all round the church, which is crowded with pious ſouls, who wait with devout impatience till the new ſaint has made his public entry as it were into paradiſe, that they may offer up their petitions to him without danger of being rejected.

The following maxim with regard to canonization is now obſerved, though it has not been followed above a century, *viz.* not to enter into the inquiries prior to canonization, till 50 years, at leaſt, after the death of the perſon to be canonized. By the ceremony of canonization, it appears that this rite of the modern Romans has ſomething in it very like the apotheoſis or deification of the ancient Romans, and, in all probability, takes its riſe from it ; at leaſt ſeveral ceremonies of the ſame nature are conſpicuous in both.

CANONRY, the benefice filled by a canon. It differs from a prebend, in that the prebend may ſubſiſt without the canonicate: whereas the canonicate is inſeparable from the prebend: again, the rights of ſuffrages, and other privileges, are annexed to the canonicate, and not to the prebend.

CANOPUS, in aſtronomy, a ſtar of the firſt magnitude in the rudder of Argo, a conſtellation of the ſouthern hemiſphere.

Canopus, in Pagan mythology, one of the deities of the ancient Egyptians, and, according to ſome, the god of water. It is ſaid, that the Chaldeans, who worſhipped fire, carried their fancied deity thro' other countries to try its power, in order that, if it obtained the victory over the other gods, it might be acknowledged as the true object of worſhip; and it having eaſily ſubdued the gods of wood, ſtone, braſs, ſilver, and gold, its prieſts declared, that all gods did it homage. This the prieſts of Canopus hearing, and finding that the Chaldeans had brought their god to contend with Canopus, they took a large earthen veſſel, in which they bored ſeveral holes, which they afterwards ſtopped with wax, and having filled the veſſel with water, painted it of ſeveral colours, and fitting the head of an idol to it, brought it out, in order to contend with the Chaldean deity. The Chaldeans accordingly kindled their fire all around it; but the heat having melted the wax, the water guſhed out thro' the holes, and extinguiſhed the fire; and thus Canopus conquered the god of the Chaldeans.

Canopus, or *Canobus*, according to Strabo, had been Menelaus's pilot, and had a temple erected to him in a town called *Canopus*, near one of the mouths of the Nile. Dionyſius mentions it.

> Και τεμειος ϖεριπυςον Αμυκλαι οιο Κανωβȣ,
> There ſtands Canobus' temple known to fame;
> The pilot who from fair Amycla came.

Voſſius remarks, on this occaſion, the vanity of the Greeks, who, as he conjectures, hearing of an Egyptian deity named *Canopus*, took from thence an opportunity of deifying the pilot of Menelaus who bore the ſame name, and giving out that the Egyptian god Canopus had been a Greek. F. Monfaucon gives ſeveral repreſentations of this deity. One, in alluſion to the victory abovementioned, throws out water on every ſide through little holes.

Canopus, or *Canobus*, (anc. geog.) a town of the Lower Egypt, on the Mediterranean, an hundred and twenty ſtadia, or fifteen miles to the eaſt of Alexandria; as old as the war of Troy, Canopus, or Canobus, Menelaus's ſteerſman, being there buried. *Canopaei*, the gentilitious name: famous for their luxury and debauchery, (Strabo, Juvenal.) See Aboukir.

CANOPY, in architecture and ſculpture, a magnificent kind of decoration, ſerving to cover and crown an altar, throne, tribunal, pulpit, chair, or the like. The word is formed from the barbarous Latin *canopeum*, of κωνωπειον, *a net ſpread over a bed to keep off the gnats*, κωνωψ, *a gnat*.

Canopies are alſo borne over the head in proceſſions of ſtate, after the manner of umbrellas. The canopy of an altar is more peculiarly called *Ciborium*.

The Roman grandees had their canopies, or ſpread veils, called *thenſæ*, over their chairs: the like were alſo in temples over the ſtatues of the gods. The modern cardinals ſtill retain the uſe of canopies.

CANOSA, a town of Puglia in Italy, occupying part of the ſite of the ancient Canuſium. The old city was founded by Diomede, according to Strabo. It afterwards became a Roman colony, and one of the moſt conſiderable cities of this part of Italy for extent, population, and magnificence in building. The æra of Trajan ſeems to have been that of its greateſt ſplendour; but this pomp only ſerved to mark it as a capital object for the avarice and fury of the Barbarians. Genſeric, Totila, and Autharis, treated it with extreme cruelty. The deplorable ſtate to which this province was reduced in 590 is conciſely but ſtrongly painted by Gregory the Great, in theſe terms: "On every ſide we hear groans! on every ſide we behold crowds of mourners, cities burnt, caſtles raſed to the ground, countries laid waſte, provinces become deſerts, ſome citizens led away captives, and others inhumanly maſſacred." No town in Puglia ſuffered more than Canoſa from the outrages of the Saracens; the conteſts between the Greeks and Normans increaſed the meaſure of its woes, which was filled by a conflagration that happened when it was ſtormed by duke Robert. In 1090, it was aſſigned, by agreement, to Bohemund prince of Antioch, who died here in 1111. Under the reign of Ferdinand the Third, this eſtate belonged to the Grimaldis. On their forfeiture, the Affaititi acquired it, and ſtill retain the title of marquis, though the Capeci are the proprietors of the fief.

Swinburn's Travels in Sicily, page 408.

The ancient city ſtood in a plain between the hills and the river Ofanto, and covered a large tract of ground. Many brick monuments, though degraded and ſtripped of their marble caſing, ſtill atteſt its ancient grandeur. Among them may be traced the fragments of aqueducts, tombs, amphitheatre baths, military columns, and two triumphal arches, which, by their poſition, ſeem to have been two city gates. The preſent town ſtands above, on the foundations of the old citadel, and is a moſt pitiful remnant of ſo great a city, not containing above three hundred houſes. The church of St Sabinus, built, as is ſaid, in the ſixth century, is now without the incloſure. It is aſtoniſhing, that any part of this ancient cathedral ſhould have withſtood ſo many calamities. Its altars and pavements are rich in marbles; and in a ſmall court adjoining, under an octagonal cupola, is the mauſoleum of Bohemund, adorned in a minute Gothic ſtyle.

CANSO, a ſea-port town of Acadia, or Nova Scotia, in North America, ſeated on a narrow ſtrait which ſeparates Nova Scotia from Cape Breton. Near this town is a fine fiſhery for cod. W. Long. 62. N. Lat. 46.

CANSTAT, a town of Swabia, in Germany, in the duchy of Wirtemberg, ſituated on the river Neckar, in E. Long. 9. 9. N. Lat. 48. 51.

CANT, a quaint affected manner of ſpeaking, adapted chiefly to the lower ſort. Skinner racks his invention for the origin of this word; which he ſucceſſively deduces from the German, Flemiſh, and Saxon tongues. According to the general opinion, Cant is originally the proper name of a Cameronian preacher in Scotland, who by exerciſe had obtained the faculty of talking in the pulpit in ſuch a tone and dialect as was underſtood by none but his own congregation: ſince Andrew Cant's time, the word has been extended to ſignify all ſudden exclamations, and whining unmuſical tones, eſpecially in praying and preaching. But this origin of the word has been diſputed by others; and perhaps the true derivation is from the Latin *cantare* "to ſing."

Cant is alſo applied to words and phraſes affected by particular perſons or profeſſions for low ends, and not authoriſed by the eſtabliſhed language*. The difference between *cant* and *technical* ſeems to be this: the former is reſtrained to words introduced out of folly, affectation, or impoſture; the latter is applied to ſuch as are introduced for the ſake of clearneſs, preciſion, and ſignificancy.

Cant is alſo uſed to denote a ſale by auction. The origin of the word in this ſenſe is dubious; it may come, according to ſome, from *quantum*, how much; according to others, from *cantare*, to ſing or cry aloud; agreeably to which, we ſometimes alſo call it an *out-cry*.

Cant-Timbers, in ſhip-building, thoſe timbers which are ſituated at the two ends of a ſhip. They derive their name from being *canted*, or raiſed obliquely from the keel; in contradiſtinction from thoſe whoſe planes are perpendicular to it. The upper ends of thoſe on the bow, or fore-part of the ſhip, are inclined to the ſtern; as thoſe in the after, or hind part, incline to the ſtern-poſt above. See *Ship-Building*.

CANTABRIA, (anc. geog.) a diſtrict of Terraconenſis, on the Oceanus Cantabricus or bay of Biſcay; now Biscay. The inhabitants were famous for their warlike character. In conjunction with the Aſturians†, they carried on deſperate wars with the Romans; but were ſubdued by them about 25 years before Chriſt. Being impatient, however, of a foreign yoke, they in a few years revolted. Moſt of their youth had been already taken priſoners by the Romans, and ſold for ſlaves to the neighbouring nations: but having found means to break their chains, they cut the throats of their maſters; and returning into their own country, attacked the Roman garriſons with incredible fury. Agrippa marched againſt them with great expedition; but, on his arrival, met with ſo vigorous a reſiſtance, that his ſoldiers began to deſpair of ever being able to reduce them. As the Cantabrians had waged war with the Romans for upwards of 200 years, they were well acquainted with their manner of fighting, no way inferior to them in courage, and were now become deſperate; well knowing, that if they were conquered, after having ſo often attempted to recover their liberty, they muſt expect the moſt ſevere uſage, and cruel ſlavery. Animated with this reflection, they fell upon the Romans with a fury hardly to be expreſſed, routed them in ſeveral engagements, and defended themſelves when attacked by the enemy with ſuch intrepidity, that Agrippa afterwards owned, that he had never, either by ſea or land, been engaged in a more dangerous enterprize. That brave commander was obliged to uſe intreaties, menaces, and to brand ſome of his legionaries with ignominy, before he could bring them to enter the liſts with ſuch a formidable enemy. But having at laſt, with much ado, prevailed upon them to try the chance of an engagement in the open field, he ſo animated them by his example, that after a moſt obſtinate diſpute, he gained a complete victory, which indeed coſt him dear, but put an end to that deſtructive war. All the Cantabrians fit to bear arms were cut in pieces; their caſtles and ſtrong holds taken and raſed; and their women, children, and old men (none elſe being left alive), were obliged to abandon the mountainous places, and ſettle in the plain.

Dr Wallis ſeems to make the Cantabrian the ancient language of all Spain: which, according to him, like the Gauliſh, gave way to a kind of broken Latin called *romance*, or *romanſhe*; which by degrees was refined into the Caſtilian or preſent Spaniſh. But we can hardly ſuppoſe, that ſo large a country, inhabited by ſuch a variety of people, ſpoke all the ſame language. The ancient Cantabrian, in effect, is ſtill found to ſubſiſt in the more barren and mountainous parts of the province of Biſcay, Aſturias, and Navarre, as far as Bayonne, much as the Britiſh does in Wales; but the people only talk it: for writing, they uſe either the Spaniſh or French, as they happen to live under the one or the other nation. Some attribute this to jealouſy of foreigners learning the myſteries of their language; others to a poverty of words and expreſſions. The Cantabrian does not appear to have any affinity with any other known language, abating that ſome Spaniſh words have been adopted in it for things whoſe uſe the Biſcayens were anciently unacquainted with. Its pronunciation is not diſagreeable. The Lord's prayer, in the Cantabarian tongue, runs thus: *Gure aita cervetan aicena, ſantifica bedi hire icena, ethor bedi hire reſuma, eguin bedi hire vorondatea cervan becala lurrean ere*, &c.

CANTABRICA, in botany: A ſynonime of a ſpecies of Convolvulus.

CANTABRUM, in antiquity, a large kind of flag uſed by the Roman emperors, diſtinguiſhed by its peculiar colour, and bearing on it ſome words or motto of good omen, to encourage the ſoldiers.

CANTACUZENUS, (Johannes) of Conſtantinople, a celebrated ſtateſman, general, and hiſtorian, was born in that city, of a very ancient and noble family. He was bred to letters and to arms, and admitted to the higheſt offices of the ſtate. The emperor Andronicus loaded him with wealth and honour; made him generaliſſimo of his forces; and was deſirous of having him join him in the government, but this he refuſed. Andronicus dying in 1341, left to Cantacuzenus the care of the empire, till his ſon John Paleologus, who was then but nine years of age, ſhould be fit to take it upon himſelf. This truſt he faithfully diſcharged; till the empreſs dowager and her faction forming a party againſt him, declared him a traitor. On this the principal nobility and the army beſought him to aſcend the throne; and accordingly he was crowned on the 21ſt of May 1342. This was followed by a civil war, which laſted five years; when he admitted John a partner with him in the empire, and their union was confirmed by his giving him his daughter in marriage. Suſpicions and enmities, however, ſoon ariſing, the war broke out again, and continued till John took Conſtantinople in 1355. A few days after, Cantacuzenus, unwilling to continue the effuſion of blood, abdicated his ſhare of the empire and retiring to a monaſtery, took the habit of a monk, and the name of *Joaſaphas*. His wife alſo retired to a nunnery, and changed her name of *Irene* for that of *Eugenia*. In this retirement he lived till the year 1411, when he was upwards of 100 years of age. Here he wrote a hiſtory of his own times, a Latin tranſlation of which, from the Greek manuſcript, was pub-

* See *Canting Language*.

† See *Aſturia*.

publiſhed by Pontanus at Ingolſtadt, in 1603: and a ſplendid edition was printed at Paris in 1645, in three volumes folio, of the original Greek, and Pontanus's Latin verſion. He alſo wrote an apology for the Chriſtian religon againſt that of Mahomet, under the name of *Chriſtodulus*.

CANTALIVERS, in architecture, pieces of wood framed into the front or ſides of a houſe, to ſuſpend the mouldings and eyes over it.

CANTAR, or CANTARO, an eaſtern weight, of different value in different places, equal at Acra in Turkey to 603 pounds, at Tunis and Tripoli to 114 pounds.

CANTAR is alſo an Egyptian weight, which is denominated a *quintal*, and conſiſts of an hundred or of an hundred and fifty rotolos, according to the goods they are to weigh.

CANTARO is alſo an Egyptian weight, which at Naples is equivalent to 25 pounds, at Genoa to 150 pounds. At Leghorn there are three kinds of *cantaros*, one weighing 150 pounds, another 151, and a third 160 pounds.

CANTARO is alſo a Spaniſh liquid meaſure, in uſe eſpecially at Alicant, containing three gallons.

CANTARO is alſo a meaſure of capacity, uſed at Cochin, containing four rubies, the rubi 32 rotolos.

CANTARINI, (Simon) a famous painter, called the *Peſareſe*, from his being born at Peſaro, was the diſciple of Guido; and copied the manner of his maſter ſo happily, that it is often difficult to diſtinguiſh between their works. He died at Verona in 1648.

CANTATA, in muſic, a ſong or compoſition, intermixed with recitatives, airs, and different movements, chiefly intended for a ſingle voice, with a thorough baſs, though ſometimes for other inſtruments.

The cantata, when performed with judgment, has ſomething in it very agreeable; the variety of the movement not clogging the ear, like other compoſitions. It was firſt uſed in Italy, then in France, whence it paſſed to us.

CANTAZARO, an epiſcopal city of Italy, in the kingdom of Naples, and in the territory of Calabria Ulterior. It is the reſidence of the governor of the province, and is ſeated near the ſea, in E. Long. 17. 0. N. Lat. 38. 59.

CANTECROIX, a ſmall territory of the Netherlands, in Brabant, and in the quarter of Antwerp, with the title of a principality; there is a ſmall town of the ſame name, but Lire is the capital.

CANTEMIR, (Demetrius) ſon of a prince of Moldavia. Diſappointed by not ſucceeding his father in that dignity, held under the Ottoman Port, he went over with his army to the Czar Peter the great, againſt whom he had been ſent by the Grand Signior: he ſignalized himſelf in the Czar's ſervice; and in the republic of letters, by a Latin hiſtory of the origin and decline of the Ottoman empire, &c. Died in 1723.

CANTEMIR, (Antiochus) eſteemed the founder of the Ruſſian poetry, was the youngeſt ſon of the preceding. Under the moſt ingenious profeſſors, whom the czar had invited to Peterſburgh, he learned mathematics, phyſic, hiſtory, moral philoſophy, and polite literature; without neglecting the ſtudy of the Holy Scriptures, to which he had a great inclination. Scarce had he finiſhed his academic courſe, when he printed a Concordance to the Pſalms in the Ruſſian language, and was elected member of the academy. The affairs of ſtate in which he was ſoon after engaged, did not make him neglect his literary purſuits. In order to make himſelf uſeful to his fellow-citizens, he compoſed his ſatires, to ridicule certain prejudices which had got footing among them. When but 23 years of age, he was nominated miniſter at the court of Great Britain; and his dexterity in the management of public affairs was as much admired as his taſte for the ſciences. He had the ſame reputation in France, whither he went in 1738, in quality of miniſter plenipotentiary, and ſoon after was inveſted with the character of ambaſſador extraordinary. The wiſe and prudent manner in which he conducted himſelf during the different revolutions which happened in Ruſſia during his abſence, gained him the confidence and eſteem of three ſucceſſive princes. He died of a dropſy, at Paris, in 1744, aged 44. Beſides the pieces already mentioned, he wrote, 1. Some fables and odes. 2. A tranſlation of Horace's epiſtles into Ruſſian verſe. 3. A proſe tranſlation of Fontenelle's plurality of worlds; and, 4. Algarotti's dialogues on ſight. The abbe Guaſco has written his life in French, and tranſlated his ſatires into that language.

CANTERBURY, a city of England, and capital of the county of Kent, ſituated in E. Long. 1. 15. N. Lat. 51. 16. It had the names of *Durovernum* and *Darvernum* given it by the Romans, and *Durobernia* by Bede, which are thought to be derived from *Durwhem*, ſignifying a rapid ſtream, ſuch as the Stour, on which it ſtands, is. The Britons call it *Caer-Kent*, i. e. the city of Kent; and its preſent Engliſh name is of the ſame import, derived from the Saxon. Modern writers in Latin call it *Cantuaria*. Its great antiquity appears not only from Antoninus's itinerary, but from the military way which has been diſcovered here, and the cauſeways leading to Dover and Lymme, beſides the coins and other curioſities found about it. The archiepiſcopal and metropolitical dignity ſeems to have been ſettled here very early; and to prevent its being removed, an anathema was decreed againſt any who ſhould attempt it. After that, the city flouriſhed greatly; though it ſuffered in common with other towns during the Daniſh invaſions, and at other times by the caſualties of fire. The city was given entirely to the biſhops by William Rufus, and was held in the utmoſt veneration in the Popiſh times, eſpecially after the murder of Becket in the reign of Henry II. to whoſe ſhrine ſo great was the reſort, and ſo rich were the offerings, that Eraſmus, who was an eye-witneſs of its wealth, ſays the whole church and chapel in which he was interred glittered with jewels; and at the diſſolution, the plate and jewels filled two great cheſts, each of which required eight ſtrong men to carry out. The cathedral was granted by Ethelbert, king of Kent, upon his converſion, to Auſtin the monk, together with his palace, and the royalty of the city and its territories. This Auſtin founded a monaſtery for monks, called from him *Auguſtine*. After the cathedral had been ſeveral times deſtroyed by fire and rebuilt, the preſent was begun about the year 1174, and augmented and embelliſhed by the ſucceeding archbiſhops, till it was completed in the reign of Henry V. It is a noble Gothic pile, and before the reformation had 37 altars. A great many kings, princes, cardinals, and archbiſhops, are buried in it. At the diſſolution, Henry VIII. ſeized all the revenues both of the church and monaſtery, except what he allotted for the maintenance of a dean, 12 prebendaries, and ſix preachers, whom he eſtabliſhed in place of the monks. During the grand rebellion, it ſuffered much; the uſurper Cromwell having made a ſtable of it for his dragoons. After the reſtoration, it was repaired, and made what it now appears.

Beſides the cathedral and other churches, as well as a monaſtery, the city had anciently a caſtle on the ſouth-ſide, and ſtrong walls, with towers, a ditch, and rampart; it had alſo a mint and an exchange. As to its government, it ſeems to have been entirely ſubject to the archbiſhop, both in ſpirituals and temporals; at leaſt from the time that William Rufus gave it ſolely to biſhop Anſelm, till the reformation. It is now a county of itſelf; and the corporation conſiſts of a mayor, recorder, 12 aldermen, a ſheriff, 24 common-council-men, a mace-bearer, ſword-bearer, and four ſerjeants at mace. Every Monday a court is held at Guildhall for civil and criminal cauſes; and every other Tueſday for the government of the city. Here were formerly 2000 or 3000 French Proteſtants employed in the ſilk manufacture; but this branch is now greatly decayed in the place, ſince Spitalfields became ſo flouriſhing. Beſides the cathedral, it contains 15 pariſh-churches, ſeven hoſpitals, a free-ſchool, a houſe of correction, a gaol for criminals, and a ſumptuous conduit for ſupplying the inhabitants with water. It conſiſts of four ſtreets, diſpoſed in the form of a croſs, and divided into ſix wards, which are about three miles in circumference. It is ſurrounded on all hands with hop-grounds much to its advantage, and is famed for its excellent brawn.

The dioceſe of Canterbury contains 257 pariſhes, beſides chapels, in Kent, and about 100 more in other dioceſes. Theſe are called *Peculiars;* it being an ancient privilege of this ſee, that, whereſoever the archbiſhops had either manors or advowſons, the place was exempted from the juriſdiction of the ordinary of the dioceſe where it was ſituated, and was deemed in the dioceſe of Canterbury. This ſee is valued in the king's books at L. 2816 : 17 : $9\frac{1}{4}$, but is reckoned to produce a clear revenue of L. 8000 a-year. The clergy's tenths come to L. 651 : 18 : $2\frac{1}{4}$. This ſee had many great privileges in the time of Popery, ſome of which it ſtill retains. The archbiſhop is accounted primate and metropolitan of all England, and is the firſt peer in the realm; having the precedence of all dukes, not of the blood-royal, and all the great officers of ſtate. In common ſpeech, he is ſtyled *His Grace*, and he writes himſelf *Divina Providentia;* whereas other biſhops ſtyle themſelves *Divina Permiſſione*. At coronations, he places the crown on the king's head; and, wherever the court may be, the king and queen are the proper domeſtic pariſhioners of the archbiſhop of Canterbury. The biſhop of London is accounted his provincial dean, the biſhop of Wincheſter his ſub-dean, the biſhop of Lincoln his chancellor, and the biſhop of Rocheſter his chaplain. This ſee hath yielded to the church 18 ſaints; to the church of Rome, 9 cardinals; to the civil ſtate of England 12 lord chancellors, 4 lord treaſurers, and 1 lord chief juſtice; and 9 chancellors to the Univerſity of Oxford. To this ſee belongs only one archdeacon, viz. of Canterbury. To the cathedral belongs an archbiſhop, a dean, a chancellor, an archdeacon, 12 prebends, 6 preachers, 6 minor canons, 6 ſubſtitutes, 12 lay clerks, 10 choriſters, 2 maſters, 50 ſcholars, and 12 almſmen.

CANTERBURY-Bell, in botany: The Engliſh name of a ſpecies of CAMPANULA.

CANTERUS, (William) an eminent linguiſt and philologer, was born at Utrecht, in 1542. He ſtudied at Louvain and Paris; and gave ſurpriſing proofs of his progreſs in Greek and Latin literature. He afterwards viſited the ſeveral univerſities of Germany and Italy; and died at Louvain, in 1575, aged 33. He underſtood ſix languages, beſides that of his native country; and, notwithſtanding his dying ſo young, wrote ſeveral philological and critical works, among which are, *Notæ, Scholia, Emendationes, et Explicationes, in Euripidem, Sophoclem, Æſchylum, Ciceronem, Propertium, Auſonium,* &c. and many tranſlations of Greek authors.

CANTHARIDES. See CANTHARIS and MELOE.

CANTHARIS, in zoology, a genus of inſects belonging to the order of inſecta coleoptera. The feelers of this genus are ſetaceous; the breaſt is marginated, and ſhorter than the head; the elytra, or wing-caſes, are flexile; and the ſides of the belly are plated and papillous. Linnæus enumerates 27 ſpecies of the cantharis, moſt of them to be found in different parts of Europe. The cantharis uſed in making bliſtering plaſters, is ranked under a different genus, *viz.* the MELOE.

CANTHI, in anatomy, cavities at the extremities of the eye-lids, commonly called the *corners of the eye:* the greater of them, or the greater canthus, is next the noſe; the leſſer of them, or the little canthus, lies towards the temple.

CANTICLES, a canonical book of the Old Teſtament, otherwiſe called the *Song of Solomon;* by the Jews the *Song of Songs, Canticum Canticorum*. The book of Canticles is uſually ſuppoſed to be an epithalamium compoſed by Solomon, on occaſion of his marriage with the king of Egypt's daughter. But thoſe who penetrate further into the myſtery, find in it the marriage of Jeſus Chriſt with human nature, the church, and good men. On this principle the Canticles is held to be a continued allegory, wherein, under the terms of a common wedding, a divine and ſpiritual marriage is expreſſed. This ſong contains the adventures of ſeven days and ſeven nights; the exact time allowed for the celebration of marriage among the Hebrews. The Jews themſelves, apprehending the book liable to be underſtood in a groſs and carnal manner, prohibited the reading of it before the age of 30, and the ſame uſage anciently obtained in the Chriſtian church. Among the ancients, Theodore Mopſuetanus rejected the book of Canticles as not divine. Divers rabbins have alſo queſtioned its being written by inſpiration. It is alleged, that the name of God is not once found in it. Mr Whiſton has a diſcourſe expreſs to prove that the Canticles is not a ſacred book of the Old Teſtament. He alleges it indeed to have been written by king Solomon the ſon of David; but aſſerts that it was compoſed at the time when that prince, blinded by his concubines, was ſunk in luſt and idolatry. This he chiefly infers from the general character of vanity and diſſoluteneſs which reigns thro' the Canticles; in which there is not, according to Whiſton one thought that leads the mind towards religion, but all is worldly and carnal, to ſay no worſe. For the myſtic ſenſe, he aſſerts it to be without foundation; and that the book is not cited as canonical by any writer before the deſtruction of Jeruſalem. Mr Whiſton will have it to have been taken into the canon between the years 77 and 128, when allegories came into vogue, and the rabbins began to corrupt the text of Scripture. Grotius, Nierembergius, the Dutch divines who criticiſed F. Simon, Menetrier, Baſnage, and ſome others, ſeem alſo to take the Canticles for a profane compoſition, on a footing with the love-pieces of Catullus or Ovid. But this opinion is refuted by Michaelis, Majus, Witſius, Nat. Alexander, Outrein, Francius, and others. Mr Whiſton's arguments have been particularly conſidered by Itchener, and alſo by Dr Gill. R. Akiba finds the book of Canticles more divine than the reſt: the whole world, according to this rabbin, is not worth that day when the Canticles was given to Iſrael; for, whereas all the hagiographers are holy, the Canticles is the holy of holies.

CANTIMARONS, or CATIMARONS, a kind of floats or rafts, uſed by the inhabitants of the coaſt of Coromandel to go a fiſhing in, and to trade along the coaſt. They are made of three or four ſmall canoes, or trunks of trees dug hollow, and tied together with cacao ropes, with a triangular ſail in the middle, made of matts. The perſons who manage them are almoſt half in the water, there being only a place in the middle a little raiſed to hold their merchandize; which laſt particular is only to be underſtood of the trading cantimarons, and not of thoſe who go fiſhing.

CANTIN, (Cape) a promontory of the coaſt of Morocco in Africa, ſituated in W. Long. 10. 2. N. Lat. 33. 9.

CANTING, a ſea-phraſe, denotes the act of turning any thing about.

CANTING *Language*, or *dialect*, is a myſterious ſort of jargon uſed by gypſies, thieves, and ſtrolling beggars, to expreſs their ſentiments to each other, without being underſtood by the reſt of mankind. This dialect is not founded on any rules: yet, even out of that irregularity many words ſeem to retain ſomething of ſcholarſhip; as *togeman*, a gown, from *toga* in the Latin; *pannam*, bread, from *panis*; *caſan*, cheeſe, from *caſeus*, &c. It is obſervable, that, even unknown to ourſelves, we have adopted ſome of their terms into our vulgar language; as *bite* and *bilk*, to cheat; *bounce*, to vapour; *bowſe*, ſtrong drink; *filch*, to ſteal; *ſlog*, to whip; *rig*, game or ridicule; *roaſt*, to rally; *rhino*, money. From the ſame ſource proceed the words *ſham*, *banter*, *bubble*, *bully*, *ſharper*, *cutting*, *ſhuffling*, *palming*, &c. An anonymous author has given a canting dictionary, comprehending all the terms uſed by the ſeveral tribes of gypſies, beggars, ſhoplifters, highwaymen, foot-pads, and other clans of cheats and villains, with a collection of ſongs in the canting dialect; London, 1725, 8vo.

CANTIUM, (anc. geog.) a promontory of Britain, literally denoting a head land; giving name to a territory called Cantium, now Kent; and to a people called Cantii, (Cæſar), commended for their great humanity and politeneſs. The promontory now the North *Foreland*. It is ſuppoſed that this was the firſt diſtrict in Britain which received a colony from the continent; and that it had frequently changed its maſters, by new colonies coming over from time to time, and driving the inhabitants further north. In the midſt of all theſe revolutions it ſtill retained its ancient name (which was ſo agreeable to its ſhape and ſituation), and gave the ſame name to all the ſucceſſive tribes by which it was inhabited. Thoſe who poſſeſſed it at the time of the firſt Roman invaſion were evidently of Belgic origin, and had come over ſo lately, that they differed in nothing from their countrymen on the continent. "The inhabitants of Kent (ſays Cæſar) are the moſt civilized of all the Britons, and differ but very little in their manners from the Gauls." This great reſemblance between the people of Kent and their neighbours on the continent, might be partly owing to the ſituation of their country, which being neareſt to the continent, was moſt frequented by ſtrangers from thence. It was this ſituation alſo which expoſed them to the firſt aſſaults of the Romans. For Cæſar, in both his expeditions into Britain, landed in Kent; and therefore we may conclude, that the Cantii had a great ſhare in the vigorous oppoſition that was made to his landing, and in the ſeveral battles and ſkirmiſhes which were fought againſt him after his landing; particularly, they made a very bold, but unſucceſsful attempt, upon his naval camp. The Cantii did not make the ſame vigorous reſiſtance to the Romans on their next invaſion in the reign of Claudius. For Aulus Plautius, the Roman general in that expedition, traverſed their country without ſeeing an enemy; and as they now ſubmitted to the power of Rome without a ſtruggle, ſo they continued in a ſtate of quiet ſubmiſſion to it to the very laſt. The ſituation of Cantium occaſioned its being much frequented by the Romans, who generally took their way through it in their marches to and from the continent. Few places in Britain are more frequently mentioned by the Roman writers than Rutupium and Portus Rutupenſis, moſt probably Richborough and Stonar. Rutupium was the ſame in thoſe times that Dover is now: the uſual place of embarking for, and landing from, the continent. Before the final departure of the Romans out of Britain, Portus Dubris, now Dover, had become a conſiderable place, and a well frequented harbour, where the third iter of Antoninus ends, and from whence they often embarked for Gaul. Portus Lemanus, ſuppoſed to be Lime near Weſt Hythe, was alſo a noted ſea-port in theſe times, and the termination of the fourth iter of Antoninus. Durobrivæ and Durovernum, now Rocheſter and Canterbury, were both Roman towns and ſtations, and are often mentioned in the itinerary and other books. Beſides theſe, there were ſeveral other Roman ſtations, towns, and ports in Cantium, which need not be particular enumerated here. Cantium, in the moſt perfect ſtate of the Roman government, made a part of the province which was called Flavia Cæſarienſis.

CANTO denotes a part or diviſion of a poem, anſwering to what is otherwiſe called a *book*. The word is Italian, where it properly ſignifies *ſong*. Taſſo, Arioſto, and ſeveral other Italians, have divided their longer or heroic poems into cantos. In imitation of them, Scarron has alſo divided his *Gigantomachia*, and Boileau his *Lutrin*, into chants or ſongs. The like uſage has been adopted by ſome Engliſh writers, as Butler, who divides his Hudibras, and Dr Garth his Diſpenſary, into cantos. A late tranſlator of part of Virgil's Æneid has even ſubdivided a book of Virgil into ſeveral cantos.

CANTO, in the Italian muſic, ſignifies a *ſong*: hence *canto ſimplice* is where all the notes or figures are equal, and called alſo *canto fermo*; *canto figurato*, that where the figures are unequal, and expreſs different motions.

CANTO alſo ſignifies the treble part of a ſong: hence *canto concertante*, the treble of the little chorus; *canto ripieno*, the treble of the grand chorus, or that which ſings only now and then in particular places. *Canto* ſignifies the firſt treble, unleſs ſome other word be added to it, as *ſecondo*; in which caſe it denotes the ſecond treble.

CANTON, in geography, denotes a ſmall diſtrict or country conſtituting a diſtinct government: ſuch are the cantons of Switzerland.

CANTON, *Quang-tong*, or Koanton, one of the ſouthern provinces of China; bounded on the north-eaſt by Fokien, on the north by Kiang-ſi, on the weſt by Quang-ſi and the kingdom of Tonking, and every where elſe by the ſea. The country is diverſified with hills and plains, and the ſoil in general ſo fertile that it produces two crops annually. Beſides many of the fruits of Europe, and thoſe common in other parts of the Indies, the province of Canton produces ſome peculiar to itſelf. Abundance of valuable aromatic woods are alſo to be met with in this province, as well as eagle-wood, ebony, &c.; and in the mineral kingdom the province furniſhes gold, precious ſtones, tin, quickſilver, and copper. Silk and ſugar are alſo cultivated here, and pearls are fiſhed up on the coaſts; ſo that every thing which can contribute to the pleaſure or convenience of life is to be met with in Canton. "One begins (ſays F. Premare) to have an idea of China, on entering the river Canton. Both ſides of it preſent large fields of rice which reſemble green meadows, and extend beyond the reach of ſight. They are interſected by an infinite number of ſmall canals, in ſuch a manner that the barks which paſs and repaſs in them ſeem at a diſtance, while the water which carries them is concealed, to glide along the graſs. Farther inland the country appears covered with trees and cultivated along the valleys; and the whole ſcene is interſperſed with villages, rural ſeats, and ſuch a variety of delightful proſpects, that one is never tired of viewing them, and regrets to be obliged to paſs them ſo quickly.

All the coaſts of this province abound with fiſh, and furniſh vaſt numbers of crabs, oyſters, and tortoiſes of an immenſe ſize. The inhabitants keep a prodigious number of tame ducks, which they hatch in ovens or dunghills, though it does not appear that they borrowed this cuſtom from the Egyptians. The docility of theſe creatures exceeds what we ſhould be apt at firſt to imagine. The inhabitants load a number of ſmall barks with them, and carry them in flocks to feed on the ſea-ſhore, where they find ſhrimps and other animals proper for their nouriſhment. But though the ducks from the different barks are thus unavoidably mixed together in the day-time, they are eaſily collected by only beating on a baſon, on which they immediately collect themſelves into different flocks, and each returns to its proper bark.

In this province the Chineſe have alſo a method of preſerving not only the fleſh of their ducks in ſuch a manner that it loſes nothing of its original flavour, but their eggs alſo. The latter operation is performed by covering the eggs with a coat of clay mixed with ſalt. When mixed in this manner, it ſeems that the ſalt has the property of penetrating through the pores of the ſhell, and thus impregnating the ſubſtance in the egg, which it could not do by ſimple ſolution of water.

Canton, though it ſuffered much in the Chineſe wars, is at preſent one of the moſt flouriſhing provinces of the empire; and being at a great diſtance from court, its government is one of the moſt important. A great number of fortreſſes, many of which are cities provided with numerous garriſons, have been built along the coaſts for the ſuppreſſion of pirates and robbers; for which purpoſe alſo a certain number of troops are kept properly poſted in different parts of the province. It is divided into ten diſtricts, which contain as many cities of the firſt claſs, and 84 of the ſecond and third. The air in general is warm but healthy, and the people are very induſtrious. They poſſeſs in an eminent degree the talent of imitation, ſo that if they are only ſhown any European work they can execute others like it with ſurpriſing exactneſs. The moſt remarkable cities in the province beſides Canton the capital are, 1. Chao-tcheou-fou, chiefly noted for a monaſtery of the bonzes in its neighbourhood, to which the adjacent country belongs, and the origin of which is traced back for 8 or 900 years. It has under its juriſdiction ſix cities of the third claſs; near one of theſe grows a reed of which ſeveral inſtruments are made, which cannot be diſtinguiſhed from real ebony. The air of Chao-tcheou-fou, however, is unhealthy; and great numbers of the inhabitants are carried off annually by contagious diſtempers, which prevail from the middle of October to the beginning of December. 2. Kao-tcheou-fou, ſituated in a delightful and plentiful country. In the neighbourhood is found a ſingular kind of ſtone much reſembling marble, on which are natural repreſentations of rivers, mountains, landſcapes, and trees. Theſe ſtones are cut into ſlabs, and made into tables, &c. Crabs are alſo caught on the coaſts here, which very much reſemble thoſe of Europe; but, ſays M. Groſier, they have this ſingularity, that when taken out of the water, they become petrified without loſing any thing of their natural figure. 3. Kiuntcheou-fou, the capital of the iſland of Hai-nan. See HAI-NAN.

CANTON, a large, populous, and wealthy city of China, capital of the province of that name, ſtands on the banks of the river Taa, or great river, which, near the city, is wide and ſpacious. The wall of the city is pretty high, and about ſix or ſeven miles in circumference, though not more than one-third of the ground is occupied by buildings, the other parts being appropriated to pleaſure grounds or to fiſh-ponds. The country is extremely pleaſant, and towards the eaſt hilly, ſo as to command a beautiful proſpect of the city and ſubſurbs, the compaſs of which, together, is about ten miles.

The buildings of Canton are in general low, conſiſting of one ſtory and a ground flour, which is covered with earth or red tiles in order to keep it cool; but the houſes of the moſt reſpectable merchants and mandarins are comparatively lofty and well built. In different parts of the city and ſuburbs are joſs houſes or temples, in which are placed the images worſhipped by the Chineſe; before whom are placed, at particular ſeaſons, a vaſt variety of ſweetmeats, oranges, great plenty of food ready dreſſed, and alſo incenſe, which is kept perpetually burning.

The ſtreets of Canton are long and narrow, paved with flat ſtones, adorned at intervals with triumphal arches, which have a pleaſing effect, and much crowded with people. On both ſides are ſhops as in London, appropriated to the ſale of different commodities; and a kind of awning is extended from houſe to houſe, which prevents the ſun's rays from incommoding either inhabitants or paſſengers. At the end of every ſtreet is a barrier, which, with the gates of the city, are ſhut in the evening. In China Street, which is pretty long and conſiderably wider than the reſt, reſide merchants; whoſe trade, ſo far as reſpects China, lackered ware, fans, &c. is wholly confined to Europeans. Moſt of them ſpeak the foreign languages tolerably well, or at leaſt ſufficiently intelligible to tranſact buſineſs. Beſides theſe merchants, there is a company of twelve or thirteen, called the *Cohong;* who have an excluſive right by appointment from authority to purchaſe the cargoes from the different ſhips, and alſo to ſupply them with teas, raw ſilks, &c. in return. The eſtabliſhment of the Cohong, though injurious to private trade, is admirably well adapted for the ſecurity of the different companies with which they traffic; becauſe each individual becomes a guarantee for the whole: ſo that if one fail, the others conſider themſelves as reſponſible.

In Canton there are no carriages; all burdens are carried by porters acroſs their ſhoulders on bamboos; as are alſo the principal people in ſedan chairs, and the ladies always. The ſtreets of Canton may be traverſed from morning till evening without ſeeing a woman, thoſe excepted who are Tartars, and even theſe but very ſeldom.

On the wharf of the river, which is commodious and pleaſant, ſtand the factories of the different European nations, viz. the Dutch, French, Swedes, Danes, Engliſh, &c. In thoſe reſide the ſupercargoes belonging to their reſpective companies, who are appointed to diſpoſe of the cargoes brought to market; to ſupply the ſhips with others for Europe in return; and, during their abſence, to contract with the merchants for ſuch articles as may be judged neceſſary for the next fleet. Between the reſidents of the factories the moſt perfect cordiality ſubſiſts; in each a common and ſplendid table is kept at the company's expence, and viſits are reciprocally exchanged; ſo that nothing is wanting to make reſidence at Canton agreeable to an European, but the pleaſure naturally reſulting from the ſociety of women.

The ſide of the river next the city is covered with boats, which form a kind of town or ſtreets, in which live the poorer ſort of the Chineſe, or rather the deſcendants of the Tartars. Some of the men come on ſhore in the morning to their reſpective employments, and in thoſe ſampans or boats which are not ſtationary, the women and alſo the men carry paſſengers from place to place in the ſame manner as is done by wherries on the Thames. On this river live many thouſand ſouls who never were permitted to come on ſhore; whoſe only habitation is their boat; in which they eat, drink, ſleep, carry on many occupations, keep ducks, &c. and occaſionally a hog.

The manufactures of Canton are principally carried on in the ſuburbs; though it has been frequently ſuppoſed that they were confined to the city; and this, by ſome writers, has been given as a reaſon why Europeans are not permitted to enter within the gates. But this is a miſtake; and perhaps the true reaſon for this very ſingular reſtraint is, that the houſes in which they keep their women are chiefly within the city.

At Wampoa, a large commodious place for anchorage, and which is about 12 or 14 miles from Canton, the European veſſels lie and unload their cargoes, which are tranſmitted by lighters to the factories; and by the ſame conveyance receive their reſpective freights. Between this place and the city are three hoppo, or cuſtom-houſes, at which the boats paſſing and repaſſing are obliged to ſtop, and undergo with its paſſengers an examination, in order to prevent ſmuggling. The lighters juſt mentioned, and alſo the captain's pinnace, are, however, excepted; the former having proper officers on board for the purpoſe, and the latter being narrowly watched and examined at the landing.

The weather at Canton is, in ſummer, extremely hot; and in the months of December, January, and February, cold: the country is nevertheleſs pleaſant and healthful, abounding with all the neceſſaries and delicacies of life, which may be procured on terms much cheaper than in Europe. The number of inhabitants has been eſtimated at one million; but later calculations have made the number conſiderably leſs. N. Lat. 23. 30. E. Long. 113. 20.

Canton, (John) an ingenious natural philoſopher, was born at Stroud, in Glouceſterſhire, in 1718; and was placed, when young, under the care of a Mr Davis, of the ſame place, a very able mathematician, with whom, before he had attained the age of nine years, he had gone through both vulgar and decimal arithmetic. He then proceeded to the mathematics, and particularly to algebra and aſtronomy, wherein he had made a conſiderable progreſs, when his father took him from ſchool, and put him to learn his own buſineſs, which was that of a broad cloth weaver. This circumſtance was not able to damp his zeal for the acquiſition of knowledge. All his leiſure time was devoted to the aſſiduous cultivation of aſtronomical ſcience; and, by the help of the Caroline tables, annexed to "Wing's Aſtronomy," he computed eclipſes of the moon and other phænomena. His acquaintance with that ſcience he applied likewiſe to the conſtructing of ſeveral kinds of dials. But the ſtudies of our young philoſopher being frequently purſued to very late hours, his father, fearing that they would injure his health, forbad him the uſe of a candle in his chamber any longer than for the purpoſe of going to bed, and would himſelf often ſee that his injunction was obeyed. The ſon's thirſt of knowledge was, however, ſo great, that it made him attempt to evade the prohibition, and to find means of ſecreting his light till the family had retired to reſt, when he roſe to proſecute undiſturbed his favourite purſuits. It was during this prohibition, and at theſe hours,

hours, that he computed, and cut upon ſtone, with no better an inſtrument than a common knife, the lines of a large upright ſun-dial, on which, beſides the hour of the day, was ſhown the riſing of the ſun, his place in the ecliptic, and ſome other particulars. When this was finiſhed, and made known to his father, he permitted it to be placed in the front of his houſe, where it excited the admiration of ſeveral gentlemen in the neighbourhood, and introduced young Mr Canton to their acquaintance, which was followed by the offer of the uſe of their libraries. In the library of one of theſe gentlemen, he found “Martin's Philoſophical Grammar,” which was the firſt book that gave him a taſte for natural philoſophy. In the poſſeſſion of another gentleman, a few miles from Stroud, he firſt ſaw a pair of globes; an object that afforded him uncommon pleaſure, from the great eaſe with which he could ſolve thoſe problems he had hitherto been accuſtomed to compute. The dial was beautified a few years ago at the expence of the gentlemen at Stroud, ſeveral of whom had been his ſchool-fellows, and who continued ſtill to regard it as a very diſtinguiſhed performance. Among other perſons with whom he became acquainted in early life, was the late reverend and ingenious Dr Henry Miles of Tooting, a learned and reſpectable member of the Royal Society, and of approved eminence in natural knowledge. This gentleman, perceiving that Mr Canton poſſeſſed abilities too promiſing to be confined within the narrow limits of a country town, prevailed on his farther to permit him to come to London. Accordingly he arrived at the metropolis March 4, 1737, and reſided with Dr Miles at Tooting till the 6th of May following; when he articled himſelf, for the term of five years, as a clerk to Mr Samuel Watkins, maſter of the academy in Spital-ſquare. In this ſituation, his ingenuity, diligence, and good conduct, were ſo well diſplayed, that on the expiration of his clerkſhip in May 1742, he was taken into partnerſhip with Mr Watkins for three years; which gentleman he afterwards ſucceeded in Spital-ſquare, and there continued during his whole life. In 1744, he married Penelope, the eldeſt daughter of Mr Thomas Colbrooke, and niece to James Colbrooke, Eſq; banker in London.

Towards the end of 1745, electricity, which ſeems early to have engaged Mr Canton's notice, received a very capital improvement by the diſcovery of the famous Leyden Phial. This event turned the thoughts of moſt of the philoſophers of Europe to that branch of natural philoſophy; and our author, who was one of the firſt to repeat and to purſue the experiment, found his aſſiduity and attention rewarded by many capital diſcoveries. Towards the end of 1749, he was concerned with his friend, the late Mr Benjamin Robins, in making experiments in order to determine to what height rockets may be made to aſcend, and at what diſtance their light may be ſeen. In 1750 was read at the Royal Society, Mr Canton's “Method of making artificial magnets, without the uſe of, and yet far ſuperior to, any natural ones.” This paper procured him the honour of being elected a member of the Society, and the preſent of their gold medal. The ſame year he was complimented with the degree of M. A. by the univerſity of Aberdeen; and, in 1751, was choſen one of the council of the Royal Society.

In 1752, our philoſopher was ſo fortunate as to be the firſt perſon in England, who, by attracting the electric fire from the clouds during a thunder-ſtorm, verified Dr Franklin's hypotheſis of the ſimilarity of lightning and electricity. Next year, his paper intitled, “Electrical Experiments, with an attempt to account for their ſeveral Phænomena,” was read at the Royal Society. In the ſame paper Mr Canton mentioned his having diſcovered, by a great number of experiments, that ſome clouds were in a poſitive, and ſome in a negative, ſtate of electricity. Dr Franklin, much about the ſame time, made the like diſcovery in America. This circumſtance, together with our author's conſtant defence of the doctor's hypotheſis, induced that excellent philoſopher, immediately on his arrival in England, to pay Mr Canton a viſit, and gave riſe to a friendſhip which ever after continued without interruption or diminution. In the “Lady's Diary for 1756,” our author anſwered the prize queſtion that had been propoſed in the preceding year. The queſtion was, “How can what we call the ſhooting of ſtars be beſt accounted for; what is the ſubſtance of this phænomenon; and in what ſtate of the atmoſphere doth it moſt frequently ſhow itſelf?” The ſolution, though anonymous, was ſo ſatisfactory to his friend, Mr Thomas Simpſon, who then conducted that work, that he ſent Mr Canton the prize, accompanied with a note, in which he ſaid, he was ſure that he was not miſtaken in the author of it, as no one beſides, that he knew of, could have anſwered the queſtion. Our philoſopher's next communication to the public, was a letter in the “Gentleman's Magazine for September 1759,” on the electrical properties of the tourmalin, in which the laws of that wonderful ſtone are laid down in a very conciſe and elegant manner. On December 13th, in the ſame year, was read at the Royal Society, “An attempt to account for the regular diurnal variation of the Horizontal Magnetic Needle; and alſo for its irregular variation at the time of an Aurora Borealis.” A complete year's obſervations of the diurnal variations of the needle are annexed to the paper. On Nov. 5, 1761, our author communicated to the Royal Society an account of the Tranſit of Venus, June 6, 1761, obſerved in Spital-ſquare. Mr Canton's next communication to the Society, was a letter addreſſed to Dr Benjamin Franklin, and read Feb. 4, 1762, containing ſome remarks on Mr Delaval's electrical experiments. On Dec. 16, in the ſame year, another curious addition was made by him to philoſophical knowledge, in a paper, intitled, “Experiments to prove that water is not incompreſſible.” Theſe experiments are a complete refutation of the famous Florentine experiment which ſo many philoſophers have mentioned as a proof of the incompreſſibility of water. On St Andrew's day 1763, our author was the third time elected one of the council of the Royal Society; and on Nov. 8, in the following year, were read, before that learned body, his farther “Experiments and obſervations on the compreſſibility of water, and ſome other fluids.” The eſtabliſhment of this fact, in oppoſition to the received opinion, formed on the haſty deciſion of the Florentine academy, was thought to be deſerving of the Society's gold medal. It was accordingly moved for in the council of 1764; and after ſeveral invidious delays, which terminated much to the honour of Mr Canton, it was preſented to him November 30, 1765.

The next communication of our ingenious author to the Royal Society, which we ſhall take notice of in this place, was on Dec. 22, 1768, being "An eaſy method of making a Phoſphorus that will imbibe and emit light like the Bolognian ſtone; with experiments and obſervations." When he firſt ſhowed to Dr Franklin the inſtantaneous light acquired by ſome of this phoſphorus from the near diſcharge of an electrified bottle, the doctor immediately exclaimed, "And God ſaid, let there be light, and there was light." The dean and chapter of St Paul's having, in a letter to the preſident, dated March 6, 1769, requeſted the opinion of the Royal Society relative to the beſt and moſt effectual method of fixing electrical conductors to preſerve that cathedral from damage by lightning, Mr Canton was one of the committee appointed to take the letter into conſideration, and to report their opinion upon it. The gentlemen joined with him in this buſineſs were, Dr Watſon, Dr Franklin, Mr Delaval, and Mr Wilſon. Their report was made on the 8th of June following; and the mode recommended by them has been carried into execution. The laſt paper of our author's, which was read before the Royal Society, was on Dec. 21, 1769; and contained "Experiments to prove that the Luminouſneſs of the Sea ariſes from the putrefaction of its animal ſubſtances." In the account now given of his communications to the public, we have chiefly confined ourſelves to ſuch as were the moſt important, and which threw new and diſtinguiſhed light on various objects in the philoſophical world. Beſides theſe, he wrote a number of papers, both in earlier and in later life, which appeared in ſeveral different publications, and particularly in the Gentleman's Magazine.

The cloſe and ſedentary life of Mr Canton, ariſing from an unremitted attention to the duties of his profeſſion, and to the proſecution of his philoſophical enquiries and experiments, probably contributed to ſhorten his days. The diſorder into which he fell, and which carried him off, was a dropſy. His death happened on March 22, 1772, in the 54th year of his age.

CANTONING, in the military art, is the allotting diſtinct and ſeparate quarters to each regiment; the town where they are quartered being divided into as many cantons as there are regiments.

CANTRED, or CANTREF, ſignifies an hundred villages. It is a Britiſh word, compounded of the adjective *cant*, i. e. hundred; and *tref*, a town or village. In Wales ſome of the counties are divided into cantreds, as in England into hundreds.

CANTYRE, (from *Cantierre*, ſignifying a "headland); the ſouthern diviſion of the ſhire of Argyle in Scotland. It is a peninſula, ſtretching 37 miles from north to ſouth, and ſeven miles in breadth. It is moſtly plain, arable, and populous; inhabited promiſcuouſly by Highlanders and Lowlanders; the latter being invited to ſettle in this place by the Argyle family, that the lands might be the better cultivated. It gives the title of *marquis* to the duke, and is by Lochfyn divided from Argyle Proper. This loch is an inlet from the ſea, about 60 miles in length and four in breadth, affording heretofore an excellent herring-fiſhery. There are many paltry villages in this country, but no town of any conſequence except Campbeltown.

Cantyre was granted to the houſe of Argyle after a ſuppreſſion of a rebellion of the Macdonalds of the Iſles (and it is ſuppoſed of this peninſula) in the beginning of the laſt century, and the grant was afterwards ratified by parliament. The ancient inhabitants were the Mac-donalds, Mac-eachrans, Mac-kays, and Mac-maths.

Mull of CANTYRE, the ſouth cape or promontory of the peninſula. There is here a light-houſe 235 feet above the ſea at high-water, ſituated on the rocks called the *Merchants*, Lat. 55. 22. Long. 5. 42. weſt of London. The ſound of Iſla from the light-houſe bearing, by the compaſs, N. by E. diſtant 27 miles; the ſouth end of Iſla N. N. W. diſtant 25 miles; the north end of Rathlin iſland, N. W. by W. one half W.; the Maiden Rocks, S. by W. one half W. diſtant 14 miles; Copland light, S. by W. one half W. diſtant 31 miles. The lanthorn is ſeen from N. N. E. 1-4th E. from S. by W. 1-4th W. and intermediate points of the compaſs N. of thoſe two points.

CANTZ, a town of Sileſia in Germany. E. Long. 16. 36. N. Lat. 51. 6.

CANVAS, in commerce, a very clear unbleached cloth of hemp, or flax, wove regularly in little ſquares. It is uſed for working tapeſtry with the needle, by paſſing the threads of gold, ſilver, ſilk, or wool, through the intervals or ſquares.

CANVAS is alſo a coarſe cloth of hemp, unbleached, ſomewhat clear, which ſerves to cover women's ſtays, alſo to ſtiffen men's clothes, and to make ſome other of their wearing apparel, &c.

CANVAS is alſo uſed among the French for the model or firſt words whereon an air or piece of muſic is compoſed, and given to a poet to regulate and finiſh. The canvas of a ſong contains certain notes of the compoſer, which ſhow the poet the meaſure of the verſes he is to make. Thus Du Lot ſays, he has canvas for ten ſonnets againſt the muſes.

CANVAS is alſo the name of a cloth made of hemp, and uſed for ſhip-ſails.

CANVAS, among painters, is the cloth on which they uſually draw their pictures; the canvas being ſmoothed over with a ſlick-ſtone, then ſized, and afterwards whited over, makes what the painters call their *primed cloth*, on which they draw their firſt ſketches with coal or chalk, and afterwards finiſh with colours.

CANUSIUM, (anc. geog.) a town of Apulia, on the right or ſouth ſide of the Aufidus, to the weſt of Cannæ; whether the Romans fled after the defeat ſuſtained there. It was famous for its red ſhining wool; whence thoſe who wore clothes made of it were called *Canuſinati*. Now called CANOSA; which ſee.

CANUTE, the firſt Daniſh king of England after Ironſide. He married Emma widow of king Ethelred; and put to death ſeveral perſons of quality who ſtood in his way to the crown. Having thus ſettled his power in England, he made a voyage to his other kingdom of Denmark, in order to reſiſt the attacks of the king of Sweden; and he carried along with him a great body of the Engliſh under the command of the earl of Godwin. This nobleman had here an opportunity of performing a ſervice by which he both reconciled the king's mind to the Engliſh nation, and, gaining to himſelf the friendſhip of his ſovereign, laid the foundation of that immenſe fortune which he acquired to his family. He was ſtationed next the Swediſh camp; and, obſerving a favourable opportunity which he was obliged ſuddenly to ſeize, he attacked the enemy in the night, drove them ſuddenly from their trenches, threw them into diſorder, purſued his advantage, and obtained a deciſive victory over them. Next morning, Canute, ſeeing the Engliſh camp entirely abandoned, imagined that theſe diſaffected troops had deſerted to the enemy; and he was agreeably ſurpriſed to find that they were at that time engaged in purſuit of the diſcomfited Swedes. He was ſo pleaſed with this ſucceſs, and the manner of obtaining it, that he beſtowed his daughter in marriage upon Godwin, and treated him ever after with the moſt entire confidence and regard.

In another voyage which he afterwards made to Denmark, Canute attacked Norway, and expelled the juſt but unwarlike Olaus from his kingdom, of which he kept poſſeſſion till the death of that prince. He had now by his conqueſts and valour attained the utmoſt height of his ambition; and having leiſure from wars and intrigues, he felt the unſatisfactory nature of all human enjoyments; and, equally weary of the glory and turmoils of this life, he began to caſt his view towards that future exiſtence which is ſo natural for the human mind, whether ſatiated by proſperity or diſguſted with adverſity, to make the object of its attention. Unfortunately the ſpirit which prevailed in that age gave a wrong direction to his devotion; and, inſtead of making atonement to thoſe whom he had formerly injured by his acts of violence, he entirely employed himſelf in thoſe exerciſes of piety which the monks repreſented as moſt meritorious. He built churches; he endowed monaſteries; he enriched eccleſiaſtics; and he beſtowed revenues for the ſupport of chantries at Aſſington and other places, where he appointed prayers to be ſaid for the ſouls of thoſe who had there fallen in battle againſt him. He even undertook a pilgrimage to Rome, where he ſojourned a conſiderable time; and, beſides obtaining from the Pope ſome privileges for the Engliſh ſchool erected there, he engaged all the princes through whoſe dominions he was obliged to paſs, to deſiſt from thoſe heavy impoſitions and tolls which they were accuſtomed to exact from the Engliſh pilgrims. By this ſpirit of devotion, no leſs than by his equitable and politic adminiſtration, he gained in a good meaſure the affections of his ſubjects.

Canute, who was the greateſt and moſt powerful prince of his time, ſovereign of Denmark and Norway as well as of England, could not fail to meet with adulation from his courtiers; a tribute which is liberally paid even to the meaneſt and weakeſt of princes. Some of his flatterers breaking out one day in admiration of his grandeur, exclaimed, that every thing was poſſible for him: upon which the monarch, it is ſaid, ordered a chair to be ſet on the ſea-ſhore while the tide was making; and, as the waters approached, he commanded them to retire, and to obey the voice of him who was lord of the ocean. He feigned to ſit ſome time in expectation of their ſubmiſſion; but when the ſea ſtill advanced towards him, and began to waſh him with its billows, he turned to his courtiers, and remarked to them, That every creature in the univerſe was feeble and impotent, and that power reſided with one Being alone, in whoſe hands were all the elements of nature, who could ſay to the ocean, "Thus far ſhalt thou go, and no farther," and who could level with his nod the moſt towering piles of human pride and ambition. From that time, it is ſaid, he never would wear a crown. He died in the 20th year of his reign; and was interred at Wincheſter, in the old monaſtery.

CANZONE, in muſic, ſignifies, in general, a ſong, where ſome little fugues are introduced: but it is ſometimes uſed for a ſort of Italian poem, uſually pretty long, to which muſic may be compoſed in the ſtyle of a cantata. If this term be added to a piece of inſtrumental muſic, it ſignifies much the ſame as cantata: if placed in any part of a ſonata, it implies the ſame meaning as *allegro*, and only denotes that the part to which it is prefixed is to be played or ſung in a briſk and lively manner.

CANZONETTA, a diminutive of canzone, denoting a little ſhort ſong. The canzonette neapolitane has two ſtrains, each whereof is ſung twice over, as the vaudevilles of the French: The canzonette ſiciliane is a ſpecies of jigg, the meaſure whereof is uſually twelve-eighths, and ſix-eighths, and ſometimes both, as rondeaus.

CAORLO, a ſmall iſland in the gulf of Venice, on the coaſt of Friuli, 20 miles ſouth-weſt of Aquileia, ſubject to Venice. It has a town of the ſame name, with a biſhop's ſee.

CAOUTCHOUC, Elastic-Resin, or *India Rubber*, a ſubſtance produced from the ſyringe-tree of Cayenne, and other parts of South America, and poſſeſſed of the moſt ſingular properties. No ſubſtance is yet known which is ſo pliable, and at the ſame time ſo elaſtic; and it is farther a matter of curioſity, as being capable of reſiſting the action of very powerful menſtrua. From the account of M. de la Condamine, we learn, that this ſubſtance oozes out, under the form of a vegetable milk, from inciſions made in the tree: and that it is gathered chiefly in time of rain, becauſe, though it may be collected at all times, it flows then moſt abundantly. The means employed to inſpiſſate and indurate it, M. de la Borde ſays, are kept a profound ſecret. M. Bomare, and others, affirm, that it thickens and hardens gradually by being expoſed to the air; and as ſoon as it acquires a ſolid conſiſtence, it manifeſts a very extraordinary degree of flexibility and elaſticity. Accordingly the Indians make boots of it, which water cannot penetrate, and which, when ſmoked, have the appearance of real leather. Bottles are alſo made of it, to the necks of which are faſtened hollow reeds, ſo that the liquor contained in them may be ſquirted through the reeds or pipes by preſſure. One of theſe filled with water is always preſented to each of the gueſts at their entertainments, who never fail to make uſe of it before eating. This whimſical cuſtom led the Portugueſe in that country to call the tree that produces this reſin *pao di xirringa*, and hence the name of *ſeringat* is given both to the tree and to its reſinous production. Flambeaux, an inch and a half in diameter, and two feet long, are likewiſe made of this reſin, which give a beautiful light, have no bad ſmell, and burn twelve hours. A kind of cloth is alſo prepared from it, which the inhabitants of Quito apply to the ſame purpoſes as our oil-cloth and ſail-cloth. It is formed, in fine, by means of moulds, into a variety of figures for uſe and ornament; and the proceſs is ſaid to be thus:—The juice, which is obtained by inciſion, is ſpread over pieces of clay formed into the deſired ſhape, and as faſt as one layer is dry, another is added, till the veſſel be of the proper thickneſs: the whole is then held over a ſtrong ſmoke of vegetables on fire, whereby it hardens into the texture and appearance of leather; and before the finiſhing, while yet ſoft, is capable of having any impreſſion made on the outſide, which remains ever after. When the whole is done, the inſide mould is picked out.

Ever ſince this reſin has been known in Europe, its chemical qualities, and other intereſting properties, have been very diligently inveſtigated. In particular, it has been endeavoured to diſcover ſome method of diſſolving it in ſuch a manner that it would aſſume different figures with equal eaſe as when in its original ſtate of milk. In the memoirs of the academy of ſciences for 1768, we have an account of ſeveral attempts for this purpoſe, and how it may be effected.—The ſtate of vegetable milk in which the caoutchouc reſin is found when it comes from the tree, led Mr Macquer to imagine that it was compoſed of an oil and a watery matter. From its wanting aromatic flavour, from its little volatility, and from its being incapable of ſolution in ſpirit of wine, he concluded that the oil which entered its compoſition was not an eſſential, but a fatty one. Hence he thought it probable that it paſſed from a fluid to a ſolid form by the evaporation of the watery part, and that the oily ſolvents would reduce it to a ſoft ſtate. The firſt trials he made for diſſolving it were with linſeed oil, eſſence of turpentine, and ſeveral others. But all he could obtain by means of theſe menſtrua was a viſcid ſubſtance incapable of being hardened, and totally void of elaſticity. The rectified eſſential oil of turpentine was employed ſeemingly with greater ſucceſs. To ſeparate from this menſtruum the caoutchouc which it had diſſolved, Mr Macquer added ſpirit of wine: but the conſequence was, that part only of the oil united with the ſpirit; the reſt remaining obſtinately attached to the reſin which it had diſſolved, and thus preventing it from aſſuming a ſolid conſiſtence. The author next endeavoured to diſſolve it by means of heat in Papin's digeſter. But neither water, nor ſpirit of wine, although in this way capable of diſſolving the hardeſt bones, could produce any other effect upon it than to render it more firm than before. After this, he tried what effect the milky juice of other vegetables would have upon it. He uſed ſeveral kinds, particularly that of the fig. But, in this way, he could obtain no ſolution. From the great volatility of ether, he was next induced to try it as a menſtruum; and, for this purpoſe, he prepared ſome with great attention. The caoutchouc, cut into little bits, and put into a proper veſſel with as much ether as was ſufficient to cover it, was perfectly diſſolved without any other heat than that of the atmoſphere. This ſolution was tranſparent and of an amber colour. It ſtill preſerved the ſmell of ether, but mixed with the diſagreeable odour of the caoutchouc, and it was little leſs fluid than pure ether. Upon its being thrown into water, no milky liquor was produced; but there aroſe to the ſurface a ſolid membrane which poſſeſſed the great elaſticity and other peculiar properties of the caoutchouc. He obſerves, however, that two pints of the beſt ether, obtained by rectifying eight or ten points of the common ether by a gentle heat, muſt be uſed, in order to the ſucceſs of the operation.—The diſtinguiſhing properties of this ſubſtance, viz. its ſolidity, flexibility, and elaſticity, and its quality of reſiſting the action of aqueous, ſpirituous, ſaline, oily, and other common ſolvents, render it extremely fit for the conſtruction of tubes, catheters, and other inſtruments, in which theſe properties are wanted. In order to form this reſin into ſmall tubes, M. Macquer prepared a ſolid cylindrical mould of wax, of the deſired ſize and ſhape; and then dipping a pencil into the etherial ſolution of the reſin, daubed the mould over with it, till he had covered it with a coat of reſin of a ſufficient thickneſs. The whole piece is then thrown into boiling water; by the heat of which the wax is ſoon melted, and riſes to the ſurface, leaving the reſinous tube completely formed behind.

A reſin ſimilar to this was ſome years ago diſcovered by M. Poivre, in the iſle of France; and there are various milky juices extracted from trees in America and elſewhere, which by previous mixtures and preparations are formed into an elaſtic reſin, but of an inferior quality to that of Cayenne: ſuch, for inſtance, are the juices obtained from the *Cecropia peltata*, the *Ficus religioſo* and *indica*, &c.

Of the genuine trees, thoſe growing along the banks of the river of the Amazons are deſcribed by M. Condamine as attaining a very great height, being at the ſome time perfectly ſtraight, and having no branches except at top, which is but ſmall, covering no more than a circumference of ten feet. Its leaves bear ſome reſemblance to thoſe of the *manioc*: they are green on the upper part, and white beneath. The ſeeds are three in number, and contained in a pod conſiſting of three cells, not unlike thoſe of the *ricinus* or *palma Chriſti*; and in each of them there is a kernel, which being ſtripped and boiled in water produces a thick oil or fat, anſwering the purpoſes of butter in the cookery of that country.

A method of diſſolving this elaſtic gum without ether, for the purpoſes of a varniſh or the like, is as follows: Take one pound of the ſpirit of turpentine, and a pound of the gum cut into very ſmall pieces; pour the turpentine into a long-necked matraſs, which muſt be placed in a ſand-bath; throw in the gum, not all at once, but by little and little according as it is perceived to diſſolve: When entirely diſſolved, pour into the matraſs a point of nut or linſeed oil, or oil of popies, rendered deſiccative in the uſual manner with litharge: Then let the whole boil for a quarter of an hour, and the preparation is finiſhed. This would make an excellent varniſh for air-balloons, were it not ſo expenſive on account of the price of the gum.—Another method, invented by Mr Baldwin, is as follows. Take any quantity of the caoutchouc, as two ounces avoirdupois: cut it into ſmall bits with a pair of ſciſſars. Put a ſtrong iron ladle (ſuch as plumbers or glaziers melt their lead in) over a common pitcoal or other fire. The fire muſt be gentle, glowing, and without ſmoke. When the ladle is hot, much below

low a red heat, put a ſingle bit into the ladle. If black ſmoke iſſues, it will preſently flame and diſappear; or it will evaporate without flame: the ladle is then too hot. When the ladle is leſs hot, put in a ſecond bit, which will produce a white ſmoke. This white ſmoke will continue during the operation, and evaporate the caoutchouc: therefore no time is to be loſt; but little bits are to be put in, a few at a time, till the whole are melted. It ſhould be continually and gently ſtirred with an iron or braſs ſpoon. Two pounds, or one quart, of the beſt drying oil (or of raw linſeed oil which, together with a few drops of neats foot oil, has ſtood a month, or not ſo long, on a lump of quicklime, to make it more or leſs drying) is to be put into the melted caoutchouc, and ſtirred till hot: and the whole poured into a glazed veſſel, through a coarſe gauze, or fine ſieve. When ſettled and clear, which will be in a few minutes, it is fit for uſe, either hot or cold.

The Abbé Clavigero informs us, that the elaſtic gum is called by the Mexicans *Olin* or *Olli*, and by the Spaniards of that kingdom *Ule*: That it diſtils from the Olquahuitl, which is a tree of moderate ſize; the trunk of which is ſmooth and yellowiſh, the leaves pretty large, the flowers white, and the fruit yellow and rather round, but angular; within which there are kernels as large as filberds, and white, but covered with a yellowiſh pellicle: That the kernel has a bitter taſte, and the fruit always grows attached to the bark of the tree: That when the trunk is cut, the Ule which diſtils from it is white, liquid, and viſcous; afterwards it becomes yellow; and laſtly of a leaden colour, though rather blacker, which it always retains. The tree, he adds, is very common in the kingdom of Guatimala.

As to the genus of this tree, it does not ſeem to be yet aſcertained. Aublet, in his *Hiſtoire des Plants de la Guiane* (p. 871.), deſcribes the tree, the fruit, and manner of collecting the juice; but never ſaw the flower: he calls it, however, *Hevea Guianenſis*. In Jacquin's America, it is called *Echites corymboſa*. The younger Linnæus, in his *Supplementum Plantarum* (p. 422), names it *Jatropha elaſtica*; but acknowledges that he only gives it this name, from the ſtructure of the fruit having moſt reſemblance to that genus, his dry ſpecies wanting the flowers.

Of the above gum, it is ſaid, the Chineſe make elaſtic rings for laſcivious purpoſes.—Among us it is uſed by ſurgeons for injecting liquids, and by painters for rubbing out black-lead pencil marks, &c.

CAP, a part of dreſs made to cover the head, much in the figure thereof.

The uſe of caps and hats is referred to the year 1449, the firſt ſeen in theſe parts of the world being at the entry of Charles VII. into Rouen: from that time they began to take place of the hoods, or chaperoons, that had been uſed till then. When the cap was of velvet, they called it *mortier*; when of wool, ſimply *bonnet*. None but kings, princes, and knights, were allowed the uſe of the mortier. The cap was the head-dreſs of the clergy and graduates. Paſquier ſays, that it was anciently a part of the hood worn by the people of the robe; the ſkirts whereof being cut off as an incumbrance, left the round cap an eaſy commodious cover for the head; which round cap being afterwards aſſumed by the people, thoſe of the gown changed it for a ſquare one, firſt invented by a Frenchman, called Patrouillet: he adds, that the giving of the cap to the ſtudents in the univerſities, was to denote that they had acquired full liberty, and were no longer ſubject to the rod of their ſuperiors; in imitation of the ancient Romans, who gave a *pileus*, or cap, to their ſlaves, in the ceremony of making them free: whence the proverb, *Vocare ſervos ad pileum*. Hence, alſo, on medals, the cap is the ſymbol of liberty, whom they repreſent holding a cap in her right hand, by the point.

The Romans were many ages without any regular covering for the head: when either the rain or ſun was troubleſome, the lappet of the gown was thrown over the head; and hence it is that all the ancient ſtatues appear bareheaded, excepting ſometimes a wreath, or the like. And the ſame uſage obtained among the Greeks, where, at leaſt during the heroic age, no caps were known. The ſort of caps or covers of the head in uſe among the Romans on divers occaſions, were the *pitra*, *pileus*, *cucullus*, *galerus*, and *palliolum*; the differences between which are often confounded by ancient as well as modern writers.

The French clergy wear a ſhallow kind of cap, called *calotte*, which only covers the top of the head, made of leather, ſattin, worſted, or other ſtuff. The red cap is a mark of dignity allowed only to thoſe who are raiſed to the cardinalate. The ſecular clergy are diſtinguiſhed by black leathern caps, the regulars by knit and worſted ones.

Churchmen, and the members of univerſities, ſtudents in law, phyſic, &c. as well as graduates, wear ſquare caps. In moſt univerſities doctors are diſtinguiſhed by peculiar caps, given them in aſſuming the doctorate. Wickliff calls the canons of his time *biſurcati*, from the caps. Paſquier obſerves, that in his time, the caps worn by the churchmen, &c. were called ſquare caps; though, in effect, they were round yellow caps.

The Chineſe have not the uſe of the hat, like us; but wear a cap of a peculiar ſtructure, which the laws of civility will not allow them to put off: it is different for the different ſeaſons of the year: that uſed in ſummer is in form of a cone, ending at top in a point. It is made of a very beautiful kind of mat, much valued in that country, and lined with ſattin: to this is added, at top, a large lock of red ſilk, which falls all round as low as the bottom; ſo that in walking, the ſilk fluctuating regularly on all ſides, makes a graceful appearance: ſometimes, inſtead of ſilk, they uſed a kind of bright red hair, the luſtre whereof no weather effaces. In winter they wear a pluſh cap, bordered with martlet's or fox's ſkin; as to the reſt, like thoſe for the ſummer. Theſe caps are frequently ſold for eight or ten crowns: but they are ſo ſhort, that the ears are expoſed.

The cap is ſometimes uſed as a mark of infamy; in Italy the Jews are diſtinguiſhed by a yellow cap; at Lucca by an orange one. In France, thoſe who had been bankrupts were obliged ever after to wear a green cap, to prevent people from being impoſed on in any future commerce. By ſeveral arrets in 1584, 1622, 1128, 1688, it was decreed, that if they were at any time found without their green cap, their protection ſhould

ſhould be null, and their creditors impowered to caſt them into priſon: but the ſentence is not now executed.

Cap of Maintenance, one of the regalia, or ornaments of ſtate belonging to the kings of England, before whom it was carried at the coronation and other great ſolemnities. Caps of Maintenance are alſo carried before the mayors of the ſeveral cities in England.

Cap, in ſhip building, a ſtrong, thick, block of wood, uſed to confine two maſts together, when one is erected at the head of the other in order to lengthen it. It is for this purpoſe furniſhed with two holes perpendicular to its length and breadth, and parallel to its thickneſs: one of theſe is ſquare, and the other round; the former being ſolidly fixed upon the upper end of the lower maſt, whilſt the latter receives the maſt employed to lengthen it, and ſecures it in this poſition.

CAPACIO, an epiſcopal town of Italy, in the kingdom of Naples, and in the Hither Principato. E. Long. 15. 18. N. Lat. 40. 40.

CAPACITY, in a general ſenſe, an aptitude or diſpoſition to hold or retain any thing.

Capacity, in geometry, is the ſolid contents of any body; alſo our hollow meaſure for wine, beer, corn, ſalt, &c. are called *meaſures of capacity.*

Capacity, in law, the ability of a man, or body politic, to give or take lands or other things, or ſue actions.

Engliſh law allows the king two capacities; a natural, and a political: in the firſt, he may purchaſe lands to him and his heirs; in the ſecond, to him and his ſucceſſors. The clergy of the church of England have the like.

CAPARASON, or Caparison, the covering or clothing laid over an horſe; eſpecially a ſumpter horſe, or horſe of ſtate. The word is Spaniſh, being an augmentative of *cape, caput, head.*

Anciently the caparaſons were a kind of iron armour, wherewith horſes were covered in battle.

CAPE, in geography, an high land running out with a point into the ſea, as Cape-Nord, Cape-Horn, the Cape of Good Hope, &c.

Cape-Elk. See Cervus.

Cape-Breton. See Breton.

Cape-Coaſt Caſtle. See Coast.

Cape of Good Hope. See Good Hope.

Cape-Verd. See Verd.

CAPELL, (Edward) a gentleman well known by his indefatigable attention to the works of Shakeſpeare, was a native of the county of Suffolk, and received his education at the ſchool of St Edmund's Bury. In the dedication of his edition of Shakeſpeare, in 1768, to the duke of Grafton, he obſerves, that "his father and the grandfather of his grace were friends, and to the patronage of the deceaſed nobleman he owed the leiſure which enabled him to beſtow the attention of 20 years on that work." The office which his grace beſtowed on Mr Capell was that of deputy-inſpector of the plays, to which a ſalary is annexed of 200l. a-year. So early as the year 1745, as Mr Capell himſelf informs us, ſhocked at the licentiouſneſs of Hanmer's plan, he firſt projected an edition of Shakeſpeare, of the ſtricteſt accuracy, to be collated and publiſhed, in due time, *ex fide codicum.* He immediately proceeded to collect and compare the oldeſt and ſcarceſt copies; noting the original excellencies and defects of the rareſt quartos, and diſtinguiſhing the improvements or variations of the firſt, ſecond, and third folios: and, after many years labour, produced a very beautiful ſmall octavo, in 10 volumes, with "an Introduction." There is not, the authors of the Monthly Review obſerve, among the various publications of the preſent literary æra, a more ſingular compoſition than that "Introduction." In ſtyle and manner, it is more obſolete and antique than the age of which it treats. It is Lord Herbert of Cherbury, walking the new pavement in all the trappings of romance; but, like Lord Herbert, it diſplays many valuable qualities accompanying this air of extravagance, much ſound ſenſe, and appropriate erudition. In the title-page of "Mr William Shakeſpeare his Commedies, Hiſtories, and Tragedies," it was alſo announced and promulgated, "Whereunto will be added, in ſome other volumes, notes critical and explanatory, and a body of various readings entire." "The Introduction" likewiſe declared, that theſe "notes and various readings" would be accompanied with another work, diſcloſing the ſources from which Shakeſpeare "drew the greater part of his knowledge in mythological and claſſical matters, his fable, his hiſtory, and even the ſeeming peculiarities of his language—to which," ſays Mr Capell, "we have given for title, The School of Shakeſpeare." Nothing ſurely could be more properly conceived than ſuch deſigns, nor have we ever met with any thing better grounded on the ſubject of "the learning of Shakeſpeare" than what may be found in the long note to this part of Mr Capell's Introduction. It is more ſolid than even the popular "Eſſay" on this topic. Certain quaintneſſes of ſtyle, and peculiarities of printing and punctuation, attended the whole of this publication. The outline, however, was correct; and the critic, with unremitting toil, proceeded in his undertaking. But while he was diving into the claſſics of Caxton (to continue the Reviewers account), and working his way underground, like the river Mole, in order to emerge with all his glories; while he was looking forward to his triumphs; certain other active ſpirits went to work upon his plan, and, digging out the promiſed treaſures, laid them prematurely before the public, defeating the effect of our critic's diſcoveries by anticipation. Steevens, Malone, Farmer, Percy, Reed, and a whole hoſt of literary ferrets, burrowed into every hole and corner of the warren of modern antiquity, and over-ran all the country, whoſe map had been delineated by Edward Capell. Such a contingency nearly ſtaggered the ſteady and unſhaken perſeverance of our critic, at the very eve of the completion of his labours, and as his editor informs us—for, alas! at the end of near 40 years, the publication was poſthumous, and the critic himſelf no more!—he was almoſt determined to lay the work wholly aſide. He perſevered, however, by the encouragement of ſome noble and worthy perſons: and to ſuch their encouragement, and his perſeverance, the public was, in 1783, indebted for three large volumes in 4to, under the title of "Notes and various readings of Shakeſpeare; together with the School of Shakeſpeare, or extracts from divers Engliſh

Books, that were in print in the Author's time; evidently ſhowing from whence his ſeveral Fables were taken, and ſome parcel of his Dialogue. Alſo farther Extracts, which contribute to a due underſtanding of his Writings, or give a light to the Hiſtory of his Life, or to the Dramatic Hiſtory of his Time. By Edw. Capell."—Beſides the works already mentioned, Mr Capell was the editor of a volume of ancient poems called "Proluſions;" and the alteration of "Antony and Cleopatra," as acted at Drury Lane in 1758. He died January 24, 1781.

CAPELLA, in aſtronomy, a bright fixed ſtar in the left ſhoulder of the conſtellation Auriga.

CAPELLE, a town of France, in Picardy, and in the Tierache, eight miles from Guiſe. It was taken by the Spaniards in 1636; but retaken the year after. E. Long. 3. 59. N. Lat. 49. 58.

CAPELLETS, in farriery. See there, § xxxvi. 4.

CAPELLUS, (Lewis) an eminent French Proteſtant divine, born at Sedan in Champaigne about the year 1579. He was author of ſome learned works; but is chiefly known from the controverſy he engaged in with the younger Buxtorf concerning the antiquity of Hebrew points, which Capelles undertook to diſprove. His *Critica Sacra* was alſo an elaborate work, and excited ſome diſputes. He died in 1658, having made an abridgement of his life in his work, *De gente Capellori*.

CAPER, in botany. See CAPPARIS.

CAPER alſo denotes a veſſel uſed by the Dutch for cruiſing and taking prizes from the enemy; in which ſenſe, caper amounts to the ſame with privateer. Capers are commonly double-officered, and crowded with hands even beyond the rates of ſhips of war, becauſe the thing chiefly in view is boarding the enemies.

CAPERNAUM, a city celebrated in the goſpels, being the place where Jeſus uſually reſided during the time of his miniſtry. This city is no where mentioned in the Old Teſtament under this or any other name like it; and therefore it is not improbable that it was one of thoſe towns which the Jews built after their return from the Babyloniſh captivity. It ſtood on the ſea-coſt, *i. e.* on the coaſt of the ſea of Galilee, in the borders of Zebulon and Nephtalim (Matt. iv. 15.), and conſequently towards the upper part thereof. It took its name no doubt from an adjacent ſpring of great repute for its clear and limpid waters; and which, according to Joſephus, was by the natives called *Capernaum*. As this ſpring might be ſome inducement to the building the town in the place where it ſtood, ſo its being a convenient wafting place from Galilee to any part on the other ſide of the ſea, might be ſome motive to our Lord for his moving from Nazareth, and making this the place of his moſt conſtant reſidence. Upon this account Capernaum was highly honoured, and ſaid by our Lord himſelf to be *exalted unto heaven*; but becauſe it made no right uſe of this ſignal favour, it drew from him the ſevere denunciation, that it ſhould *be brought down to hell* (Matt. xi. 23.), which has certainly been verified: for, as Dr Wells obſerves, ſo far is it from being the metropolis of all Galilee, as it once was, that it conſiſted long ſince of no more than ſix poor fiſhermens cottages, and may perhaps be now totally deſolate.

CAPEROLANS, a congregation of religions in Italy, ſo called from Peter Caperole their founder, in the 15th century.

The Milaneſe and Venetians being at war, the enmity occaſioned thereby ſpread itſelf to the very cloyſters. The ſuperiors of the province of Milan, of minor brothers, which extended itſelf as far as the territories of the republic of Venice, carried it ſo haughtily over the Venetians, that thoſe of the covenant of Breſcia reſolved to ſhake off a yoke which was grown inſupportable to them. The ſuperiors, informed of this, expelled out of the province thoſe whom they conſidered as the authors of this deſign; the principal of whom were Peter Caperole, Matthew de Tharvillo and Bonaventure of Breſcia. Peter Caperole, a man of an enterpriſing genius, found means to ſeparate the convents of Breſcia, Bergamo, and Cremona, from the province of Milan, and ſubject them to the conventuals. This occaſioned a law-ſuit between the vicar-general and theſe convents, which was determined in favour of the latter; and theſe convents, in 1475, by the authority of Pope Sixtus IV. were erected into a diſtinct vicariate, under the title of that of *Breſcia*. This not ſatisfying the ambition of Caperole, he obtained, by the interpoſition of the Doge of Venice, that this vicariate might be erected into a congregation, which was called from him *Caperolans*. This congregation ſtill ſubſiſts in Italy, and is compoſed of 24 convents, ſituated in Breſcia, Bergamo, and Cremona.

CAPERQUIN, a town of Ireland, in the county of Waterford, and province of Munſter, ſituated on the river Blackwater. W. Long. 7. 50. N. Lat. 52. 5.

CAPESTAN, a town of France, in Lower Languedoc, in the dioceſe of Narbonne, and near the royal canal. E. Long. 3. 5. N. Lat. 43. 35.

CAPH, a Jewiſh meaſure of capacity for things eſtimated by Kimchi at the 30th part of the log, by Arbuthnot at the 16th part of the hin, or 32d of the ſeah, amounting to five-eighths of an Engliſh pint. The caph does not occur in Scripture as the name of any meaſure.

CAPHAR, a duty which the Turks raiſe on the Chriſtians who carry or ſend merchandiſes from Aleppo to Jeruſalem and other places in Syria.

This duty of caphar was firſt impoſed by the Chriſtians themſelves, when they were in poſſeſſion of the Holy Land, for the maintenance of the troops which were planted in difficult paſſes to obſerve the Arabs and prevent their incurſions. It is ſtill continued, and much increaſed by the Turks, under pretence of defending the Chriſtians againſt the Arabs; with whom, nevertheleſs, they keep a ſecret intelligence, favouring their excurſions and plunders.

CAPHTOR, (anc. geog.) a town or diſtrict of Higher Egypt: and hence the people called *Caphtorim* or *Caphtoraei*.—Caphtor is an iſland of Egypt, Ai Caphtor, (Jeremiah); probably one of thoſe in the Nile. Dr Wells ſuppoſes it to be Coptos, which ſtood in a ſmall iſland. Thence came the *Caphtorim* or *Caphtoraei*, in Paleſtine; who with the Philiſtines conſpired to extirpate the Hevaei; and whoſe name was ſwallowed up in that of the Philiſtines.

CAPI-AGA, or *Capi-Agaſſi*, a Turkiſh officer who is governor of the gates of the ſeraglio, or grand maſter of the ſeraglio.

The capi-aga is the firſt dignity among the white eunuchs:

eunuchs: he is always near the perſon of the grand ſignior: he introduces ambaſſadors to their audience; nobody enters or goes out of the grand ſignior's apartment but by his means. His office gives him the privilege of wearing the turban in the ſeraglio, and of going every where on horſeback. He accompanies the grand ſignior to the apartment of the ſultanas, but ſtops at the door without entering. His appointment is very moderate; the grand ſignior bears the expence of his table, and allows him at the rate of about ſixty French livres per day: but his office brings him in abundance of preſents; no affair of conſequence coming to the emperor's knowledge without paſſing through his hand. The capi-aga cannot be baſhaw when he quits his poſt.

CAPIAS, in law, a writ of two ſorts; one before judgment in an action, and the other after. That before judgment is called *capias ad reſpondendum*, where an original is iſſued out, to take the defendant, and make him anſwer the plaintiff. That after judgment is of divers kinds; as,

Capias ad Satisfaciendum, a writ of execution that iſſues on a judgment obtained, and lies where any perſon recovers in a perſonal action, as for debt, damages, &c. in which caſe this writ iſſues to the ſheriff, commanding him to take the body of him againſt whom the debt is recovered, who is to be kept in priſon till he make ſatisfaction.

Capias pro Fine, is a writ lying where a perſon is fined to the king, for ſome offence committed againſt a ſtatute, and he does not diſcharge the fine according to the judgment: therefore his body ſhall be taken by this writ, and committed to gaol till the fine is paid.

Capias Utlegatum, a writ which lies againſt any one outlawed, upon any action perſonal or criminal, by which the ſheriff is ordered to apprehend the party outlawed, for not appearing on the exigent, and keep him in ſafe cuſtody till the day of return, when he is ordered to preſent him to the court, to be there farther ordered for his contempt.

Capias in Withernam, a writ that lies for cattle *in withernam*: that is, where a diſtreſs taken is driven out of the county, ſo that the ſheriff cannot make deliverance upon a replevin; then this writ iſſues, commanding the ſheriff to take as many beaſts of the diſtrainer, &c.

CAPIGI, a porter or door-keeper of the Turkiſh ſeraglio. There are about five hundred *capigis* or porters in the ſeraglio, divided into two companies; one conſiſting of three hundred, under a chief called *Capigi-Baſſa*, who has a ſtipend of three ducats per day; the other conſiſts of two hundred, diſtinguiſhed by the name of *Cuccicapigi*, and their chief *Cuccicapigi-Baſſa*, who has two ducats. The capigis have from ſeven to fifteen aſpers per day; ſome more, others leſs. Their buſineſs is to aſſiſt the janizaries in the guard of the firſt and ſecond gates of the ſeraglio; ſometimes all together, as when the Turk holds a general council, receives an ambaſſador, or goes to the moſque; and ſometimes only in part; being ranged on either ſide to prevent people entering with arms, any tumults being made, &c. The word, in its original, ſignifies *gate*.

CAPILLAMENT, in a general ſenſe, ſignifies a hair: whence the word is applied to ſeveral things, which on account of their length, or the fineneſs, reſemble hairs: as,

Capillaments of the Nerves, in anatomy, the fine fibres or filaments whereof the nerves are compoſed.

CAPILLARY, in a general ſenſe, an appellation given to things on account of their extreme fineneſs or reſembling hairs

Capillary Tubes, in phyſics, are ſmall pipes of glaſs, whoſe canals are extremely narrow, their diameter being only a half, a third, or a fourth of a line.

The aſcent of water, &c. in capillary tubes, is a phenomenon that has long embarraſſed the philoſophers: for let one end of a glaſs tube open at both extremities be immerged in water, the liquor within the tube will riſe to a conſiderable height above the external ſurface: or if two or more tubes are immerged in the ſame fluid, one a capillary tube, and the other of a larger bore, the fluid will aſcend heigher in the former than in the latter; and this will be in a reciprocal ratio of the diameters of the tubes.

In order to account for this phenomenon, it will be neceſſary firſt to premiſe, that the attraction between the particles of glaſs and water is greater than the attraction between the particles of waters themſelves: for if a glaſs tube be placed in a poſition parallel to the horizon, and a drop of water be applied to the under ſide of the tube, it will adhere to it; nor will it fall from the glaſs till its bulk and gravity are ſo far increaſed, as to overcome the attraction of the glaſs. Hence it is eaſy to conceive how ſenſibly ſuch a power muſt act on the ſurface of a fluid, not viſcid, as water, contained within the ſmall cavity or bore of a glaſs-tube; as alſo that it will be proportionably ſtronger as the diameter of the bore is ſmaller; for it will be evident that the efficacy of the power is in the inverſe proportion of the diameter, when it is conſidered, that ſuch particles only as are in contact with the fluid, and thoſe immediately above the ſurface, can effect it.

Now theſe particles form a periphery contiguous to the ſurface, the upper part of which attracts and raiſes the ſurface, while the lower part, which is in contact with it, ſupports it: ſo that neither the thickneſs nor length of the tube is of any conſequence here; the periphery of particles only, which is always proportionable to the diameter of the bore, is the only acting power. The quantity of the fluid raiſed will therefore be as the ſurface of the bore which it fills, that is, as the diameter; for otherwiſe the effect would not be proportional to the cauſe, ſince the quantities are always as the ratio of the diameters; the heights therefore to which the fluids will riſe, in different tubes, will be inverſely as the diameters.

Some doubt whether the law holds throughout, of the aſcent of the fluid being always higher as the tube is ſmaller: Dr Hook's experiments, with tubes almoſt as fine as cobwebs, ſeem to ſhow the contrary. The water in theſe, he obſerves, did not riſe ſo high as one would have expected. The higheſt he ever found it, was at 21 inches above the level of the water in the baſon; which is much ſhort of what it ought to have been by the law abovementioned. See Cohesion.

Capillary Veſſels. Many ſmall veſſels of animal bodies have been diſcovered by the modern invention of injecting the veſſels of animals with a coloured fluid which upon cooling grows hard. But though moſt anatomiſts know the manner of filling the large trunks, few are acquainted with the art of filling the capillaries. Dr Monro, in the Medical Eſſays, has given what after many trials he has found ſucceſsful. See INJECTION.

CAPILLUS VENERIS. See ADIANTHUM.

CAPILUPI, or CAPILUPUS, (Camillus), a native of Mantua, in the 16th century. He wrote a book, entitled, *The Stratagem;* in which he relates not only what was perpetrated at Paris during the maſſacre on St Bartholomew's day, but alſo the artful preparations which preceded that horrid maſſacre. It is, however, blended with a great number of falſities.

CAPILUPI, (Lœlius) an Italian poet, brother to the former, made himſelf famous by his Centos of Virgil. The manner in which he applied Virgil's expreſſions to repreſent things which the poet never dreamt of, is admired. His Cento againſt women is very ingenious, but very ſatirical. The poems of Capilupi are inſerted in the *Deliciæ Poetarum Italorum.*

CAPISCOLUS, or CAPISCHOLUS, in eccleſiaſtical writers, denotes a dignitary in certain cathedrals, who had the ſuperintendency of the choir, or band of muſic, anſwering to what in other churches is called *chanter* or *precentor.* The word is alſo written *cabiſcolus,* and *caputſcholæ,* q. d. the head of the ſchool, or band of muſic.

The capiſcolus is alſo called *ſcolaſticus,* as having the inſtruction of the young clerks and choriſters, how to perform their duty.

CAPITA, (diſtribution by) in law, ſignifies the appointing to every one an equal ſhare of a perſonal eſtate; when all the claimants claim in their own rights, as in equal degrees of kindred, and not *jure repræſentationis.*

CAPITA, (ſucceſſion by), where the claimants are next in degree to the anceſtor, in their own right, and not by right of repreſentation.

CAPITAL, of the Latin *caput,* "the head," is uſed on various occaſions, to expreſs the relation of a head, chief, or principal: thus,

CAPITAL *City,* in geography, denotes the principal city of a kingdom, ſtate, or province.

CAPITAL *Stock,* among merchants, bankers, and traders, ſignifies, the ſum of money which individuals bring to make up the common ſtock of a partnerſhip when it is firſt formed. It is alſo ſaid of the ſtock which a merchant at firſt puts into trade for his account. It likewiſe ſignifies the fund of a trading company or corporation, in which ſenſe the word ſtock is generally added to it. Thus we ſay, the capital ſtock of the bank, &c. The word capital is oppoſed to that of profit or gain, though the profit often increaſes the capital, and becomes of itſelf part of the capital, when joined with the former.

CAPITAL *Crime,* ſuch a one as ſubjects the criminal to capital puniſhment, that is, to loſs of life*.

CAPITAL *Picture,* in painting, denotes one of the fineſt and moſt excellent pieces of any celebrated maſter.

CAPITAL *Letters,* in printing, large or initial letters, wherein titles, &c. are compoſed; with which all periods, verſes, &c. commence; and wherewith alſo all proper names of men, kingdoms, nations, &c. begin. The practice which, for ſome time, obtained among our printers, of beginning every ſubſtantive with a capital, is now juſtly fallen into diſrepute; being a manifeſt perverſion of the deſign of capitals, as well as an offence againſt beauty and diſtinctneſs.

CAPITAL, in architecture, the uppermoſt part of a column or pilaſter, ſerving as the head or crowning, and placed immediately over the ſhaft, and under the entablature. See ARCHITECTURE.

CAPITANA, or CAPTAIN *Galley,* the chief or principal galley of a ſtate, not dignified with the title of a kingdom. The capitana was anciently the denomination of the chief galley of France, which the commander went on board of. But ſince the ſuppreſſion of the office of captain-general of the gallies in 1669, they have no capitana, but the firſt galley is called *reale,* and the ſecond *parone.*

CAPITANATA, one of the 12 provinces of the kingdom of Naples, in Italy, bounded on the north by the Gulph of Venice, on the eaſt by the Terra di Barri, on the ſouth by the Baſilicata and the Farther Principato, and on the weſt by the county di Moliſe and a ſmall part of Hither Abruzzo. It is a level country, without trees; the ſoil ſandy, the air hot; the land, however, near the rivers is fertile in paſtures. The capital town is Manfredonia.

CAPITANEATE, in a general ſenſe, the ſame with capitania. Capitáneates, in Pruſſia, are a kind of noble feuds, or eſtates, which, beſides their revenue, raiſe their owners to the rank of nobility. They are otherwiſe called *ſtaroſties.*

CAPITANEI, or CATANEI, in Italy, was a denomination given to the dukes, marquiſſes, and counts, who were called *capitanei regis.* The ſame appellation was alſo given to perſons of inferior rank who were inveſted with fees, formerly diſtinguiſhed by the appellation *valvaſores majores.*

CAPITANEUS, in ancient law writers, denotes a tenant in capite, or chief.

CAPITANEUS *Eccleſiæ,* the ſame with advocate.

CAPITANIA, in geography, an appellation given to the 12 governments eſtabliſhed by the Portugueſe in the Braſils.

CAPITATION, a tax or impoſition raiſed on each perſon, in proportion to his labour, induſtry, office, rank, &c. It is a very ancient kind of tribute. The Latins call it *tributum,* by which taxes on perſons are diſtinguiſhed from taxes on merchandiſe, which were called *vectigalia.*

Capitations are ſeldom practiſed but in great exigencies of ſtate. In France the capitation was introduced by Louis XIV. in 1695; and is a tax very different from the *taille,* being levied from all perſons, whether they be ſubject to the taille or not. The clergy pay no capitation, but the princes of the blood are not exempted from it.

CAPITE, in law, (from *caput,* i. e. *rex;* whence *tenere in capite,* is to hold of the *king,* the *head* or lord paramount of all the lands in the kingdom): an ancient tenure of land, held immediately of the king, as of his crown, either by knight's ſervice, or by ſoccage. It is now aboliſhed. See TENURE.

CAPITE *Cenſi,* in antiquity, the loweſt rank of Roman citizens, who in public taxes were rated the leaſt of all, being ſuch as never were worth above 365 aſſes. They were ſuppoſed to have been thus called, becauſe

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* See *Crime* and *Puniſhment.*

they were rather counted and marſhalled by their heads than by their eſtates. The *capite cenſi* made part of the ſixth claſs of citizens, being below the *proletarii,* who formed the other moiety of that claſs. They were not enrolled in the army, as being judged not able to ſupport the expence of war; for in thoſe days the ſoldiers maintained themſelves. It does not appear, that before Caius Marius any of the Roman generals liſted the *capite cenſi* in their armies.

CAPITOL, Capitolium, in antiquity, a famous fort or caſtle, on the Mons Capitolinus at Rome, wherein was a temple dedicated to Jupiter, thence alſo denominated *Capitolinus,* in which the ſenate anciently aſſembled; and which ſtill ſerves as the city-hall, or town-houſe, for the meeting of the conſervators of the Roman people.—It had its name *capitol,* from *caput,* a man's head, ſaid to have been found freſh, and yet bleeding, upon digging the foundation of the temple built in honour of Jupiter. Arnobius adds, that the man's name was *Tolus,* whence *caput-tolium.*—The firſt foundations of the capitol were laid by Tarquin the Elder, in the year of Rome 139. His ſucceſſor Servius raiſed the walls; and Tarquin the Proud finiſhed it in the year 221. But it was not conſecrated till the third year after the expulſion of the kings, and eſtabliſhment of the conſulate. The ceremony of the dedication of the temple was performed by the conſul Horatius in 246.

The capitol conſiſted of three parts; a nave ſacred to Jupiter; and two wings, the one conſecrated to Juno, the other to Minerva: it was aſcended to by ſtairs; the frontiſpiece and ſides were ſurrounded with galleries, in which thoſe who were honoured with triumphs entertained the ſenate at a magnificent banquet, after the ſacrifices had been offered to the gods.

Both the inſide and outſide were inriched with an infinity of ornaments, the moſt diſtinguiſhed of which was the ſtatue of Jupiter, with his golden thunderbolt, his ſceptre, and crown. In the capitol alſo were a temple to Jupiter the guardian, and another to Juno, with the mint; and on the deſcent of the hill was the temple of Concord. This beautiful edifice contained the moſt ſacred depoſits of religion, ſuch as the ancylia, the books of the Sibyls, *&c.*

The capitol was burnt under Vitellius, and rebuilt under Veſpaſian. It was burnt a ſecond time by lightning under Titus, and reſtored by Domitian.

Anciently the name *capitol* was likewiſe applied to all the principal temples, in moſt of the colonies throughout the Roman empire; as at Conſtantinople, Jeruſalem, Carthage, Ravenna, Capua, *&c.*—That of Thoulouſe, has given the name of *capitouls* to its echevins or ſheriffs.

CAPITOLINE games, annual games inſtituted by Camillus, in honour of Jupiter Capitolinus, and in commemoration of the capitol's not being taken by the Gauls. Plutarch tells us, that a part of the ceremony conſiſted in the public criers putting up the Hetrurians to ſale by auction: they alſo took an old man, and tying a golden bulla about his neck, expoſed him to the public deriſion. Feſtus ſays they alſo dreſſed him in a pretexta—There was another kind of Capitoline games inſtituted by Domitian, wherein there were rewards and crowns beſtowed on the poets, champions, orators, hiſtorians, and muſicians. Theſe laſt Capitoline games were celebrated every five years, and became ſo famous, that inſtead of calculating time by luſtra, they began to count by Capitoline games, as the Greeks did by Olympiads. It appears, however, that this cuſtom was not of long continuance.

CAPITOLINUS, (Julius) an hiſtorian in the beginning of the fourth age under Diocleſian, to whom he inſcribed the Lives of Verus, Antoninus Pius, Clodius Balbinus, Macrinus, the Maximins, and the Gordians. He wrote other lives, which are moſt of them loſt.

CAPITOUL, or Capitol, an appellation given to the chief magiſtrates of Thoulouſe, who have the adminiſtration of juſtice and policy both civil and mercantile in the city. The capitouls at Thoulouſe are much the ſame with the echevins at Paris, and with the conſuls, bailiffs, burger-maſters, mayors, and aldermen, &c. in other cities. In the ancient acts they are called *conſules capitularii* or *capitolini,* and their body *capitulum.* From this laſt come the words *capitularii* and *capitouls.* The appellative *capitolini* aroſe hence, that they have the charge and cuſtody of the town-houſe which was anciently called *capitol.*

The office only laſts one year, and ennobles the bearers. In ſome ancient acts they are called *capitulum nobilium Tolosæ.* Thoſe who have borne it, ſtyle themſelves afterwards burgeſſes. They are called to all general councils, and have the *jus imaginum;* that is, when the year of their adminiſtration is expired, their pictures are drawn in the town-houſe: a cuſtom which they have retained from the ancient Romans, as may be ſeen in Sigonius.

CAPITOULATE, an appellation given to the ſeveral quarters or diſtricts of the city of Thoulouſe, each under the direction of a capitoul; much like the wards of London, under their aldermen. Thoulouſe is now divided into eight *capitoulates* or quarters, which are ſubdivided into *moulans,* each of which has its tithing-man, whoſe buſineſs is to inform the capitoul of what paſſes in his tithing, and to inform the inhabitants of the tithing of the orders of the capitoul.

CAPITULAR, or capitulary, denotes an act paſſed in a chapter, either of knights, canons, or religious.

The capitularia, or capitulars of Charlemagne, Charles the Bald, &c. are the laws, both eccleſiaſtical and civil, made by thoſe emperors in the general councils or aſſemblies of the people; which was the way in which the conſtitutions of moſt of the ancient princes were made; each perſon preſent, though a plebeian, ſetting his hand to them.

Some diſtinguiſh theſe from laws; and ſay, they were only ſupplements to laws. They had their name, capitulars, becauſe divided into capitula, chapters, or ſections. In theſe capitulars did the whole French juriſprudence anciently conſiſt. In proceſs of time, the name was changed for that of ordonnances.

Some diſtinguiſh three kinds of capitulars, according to the difference of their ſubject-matter: thoſe on eccleſiaſtical affairs, are really canons, extracted from councils; thoſe on ſecular affairs, real laws; thoſe relating to particular perſons, or occaſions, private regulations.

CAPITULATION, in military affairs, a treaty made between the inhabitants or garriſon of a place beſieged and the beſiegers, for the delivering up the place on certain conditions. The moſt honourable and ordinary terms of capitulation are, To march out at the breach with arms and baggage, drums beating, colours flying, a match lighted at both ends, and ſome pieces of cannon, waggons and convoys for their baggage, and for their ſick and wounded.

Capitulation, in the German polity, a contract which the emperor makes with the electors, in the name of all the princes and ſtates in the empire, before he is declared emperor, and which he ratifies before he is raiſed to that ſovereign dignity. The principal points which the emperor undertakes to obſerve are, 1. To defend the church and empire. 2. To obſerve the fundamental laws of the empire. And, 3. To maintain and preſerve the rights, privileges, and immunities of the electors, princes, and other ſtates of the empire, ſpecified in the capitulation. Theſe articles and capitulations are preſented to the emperor by the electors only, without the concurrence of the other ſtates who have complained from time to time of ſuch proceedings; and in the time of the Weſtphalian treaty, in 1648, it was propoſed to deliberate in the following diet, upon a way of making a perpetual capitulation; but the electors have always found means of eluding the execution of this article. In order, however, to give ſome ſatisfaction to their adverſaries, they have inſerted in the capitulations of the emperors, and in that of Francis I. in particular, a promiſe to uſe all their influence to bring the affair of a perpetual capitulation to a concluſion. Some German authors own, that this capitulation limits the emperor's power; but maintain that it does not weaken his ſovereignty: though the moſt part maintain that he is not abſolute, becauſe he receives the empire under conditions, which ſets bounds to an abſolute authority.

CAPITULUM, in the ancient military art, was a tranſverſe beam, wherein were holes through which paſſed the ſtrings whereby the arms of huge engines, as baliſtæ, catapultæ, and ſcorpions, were played or worked.

Capitulum, in eccleſiaſtical writers, denoted part of a chapter of the Bible read and explained. In which ſenſe they ſaid, *ire ad capitulum*, to go to ſuch a lecture. Afterwards the place or apartment where ſuch theological exerciſes were performed was denominated *domus capituli.*

CAPNICON, in antiquity, chimney-money, or a tax which the Roman emperors levied for ſmoke, and which of conſequence was due from all, even the pooreſt, who kept a fire. This was firſt invented by Nicephorus.

CAPNOMANCY, a kind of divination by means of ſmoke, uſed by the ancients in their ſacrifices. The word comes from καπνος, *ſmoke*, and μαντεια, *divination.* The general rule was, when the ſmoke was thin, and light, and roſe ſtraight up, it was a good omen: if the contrary, it was an ill one. There was alſo another ſpecies of capnomancy, conſiſting in the obſervation of the ſmoke riſing from poppy and jeſſamin-ſeed, caſt upon lighted coals.

CAPO fino, a large barren rock in the territory of the Genoeſe, which has a caſtle on its eaſtern peak. Near it is a ſmall harbour of the ſame name, 13 miles eaſt by ſouth of Genoa.

Capo d'Iſtria, a conſiderable town of Italy, in Iſtria, on the gulph of Trieſte, with a biſhop's ſee, and ſubject to the Venetians. The air is wholeſome and temperate; its principal revenue conſiſts in wine and ſalt. E. Long. 14. 0. N. Lat. 45. 48.

CAPON, a cock-chicken, gelded as ſoon as left by the dam, or as ſoon as he begins to crow. They are of uſe either to lead chickens, ducklings, pheaſants, &c. and defend them from the kites and buzzards; or to feed for the table, they being reckoned more delicate than either a cock or a hen.

CAPONIERE, or Capponiere, in fortification, a covered lodgement, ſunk four or five feet into the ground, encompaſſed with a little parapet about two feet high, ſerving to ſupport ſeveral planks covered with earth. The caponiere is large enough to contain 15 or 20 ſoldiers; and is uſually placed in the glacis on the extremity of the counterſcarp, and in dry moats; having little embraſures for the ſoldiers to fire through.

CAPPADOCIA, an ancient kingdom of Aſia, comprehending all that country which lies between mount Taurus and the Euxine ſea. It was divided by the Perſians into two ſatrapies or governments; by the Macedonians into two kingdoms, the one called *Cappadocia ad Taurum;* the other, *Cappadocia ad Pontum,* and commonly *Pontus;* for the hiſtory, &c. of which laſt, ſee the article Pontus.

Cappadocia Magna, or *Cappadocia* properly ſo called, lies between the 38th and 41ſt degrees of north latitude. It was bounded by Pontus on the north, Lycaonia and part of Armenia Major on the ſouth, Galatia on the weſt, and by Euphrates and part of Armenia Minor on the eaſt. The firſt king of Cappadocia we read of in hiſtory was Pharnaces, who was preferred to the crown by Cyrus king of Perſia, who gave him his ſiſter Atoſſa in marriage. This is all we find recorded of him, except that he was killed in a war with the Hyrcanians. After him came a ſucceſſion of eight kings, of whom we know ſcarce any thing but that they continued faithful to the Perſian intereſt. In the time of Alexander the Great, Cappadocia was governed by Ariarathes II. who, notwithſtanding the vaſt conqueſts and fame of the Macedonian monarch, continued unſhaken in his fidelity to the Perſians. Alexander was prevented by death from invading his dominions; but Perdiccas marching againſt him with a powerful and well diſciplined army, diſperſed his forces, and having taken Ariarathes himſelf priſoner, crucified him, with all thoſe of the royal blood whom he could get into his power. Diodorus tells us that he was killed in the battle. He is ſaid to have reigned 82 years. His ſon Ariarathes III. having eſcaped the general ſlaughter of the royal family, fled into Armenia, where he lay concealed, till the civil diſſenſions which aroſe among the Macedonians gave him a fair opportunity of recovering his paternal kingdom. Amyntas, at that time the governor of Cappadocia, oppoſed him: but being defeated in a pitched battle, the Macedonians were obliged to abandon all the ſtrong holds. Ariarathes, after a long and peaceable reign, left his kingdom to his ſon Ariaramnes II. He applied himſelf more to the arts of peace than war, in conſequence of which Cappadocia flouriſhed greatly during his reign. He was ſucceeded by his ſon Ariarathes IV.

who proved a very warlike prince, and having overcome Arſaces, founder of the Parthian monarchy, conſiderably enlarged his own dominions.

He was ſucceed by Ariarathes V. who marrying the daughter of Antiochus the Great, entered into an alliance with that prince againſt the Romans; but Antiochus being defeated, the king of Cappadocia was obliged to ſue for peace, which he obtained, after having paid 200 talents by way of fine, for taking up arms againſt the people of Rome. He afterwards aſſiſted the republic with men and money againſt Perſeus king of Macedon, on which account he was by the ſenate honoured with the title of the *friend and ally of the Roman people*. He left the kingdom in a very flouriſhing condition to his ſon Mithridates, who on his acceſſion took the name of Ariarathes VI.

This prince (ſurnamed *Philopater*, from the filial reſpect and love he ſhowed his father from his very infancy) immediately renewed the alliance with Rome. Out of mere good-nature he reſtored Mithrobuzanes ſon to Ladriades king of Leſſer Armenia to his father's kingdom, though he foreſaw that the Armenians would lay hold of that opportunity to join Artaxias, who was then on the point of invading Cappadocia. Theſe differences, however, were ſettled before they came to an open rupture, by the Roman legates; and Ariarathes ſeeing himſelf thus delivered from an impending war by the mediation of the republic, preſented the ſenate with a golden crown, and offered his ſervice wherever they thought proper to employ him. The ſenate in return ſent him a ſtaff, and chair of ivory; which were preſents uſually beſtowed on thoſe only whom they looked upon as attached to their intereſt. Not long before this, Demetrius Soter king of Syria had offered Ariarathes his ſiſter in marriage, the widow of Perſeus king of Macedon: but this offer the king of Cappadocia was obliged to decline for fear of offending the Romans; and his ſo doing was in the higheſt degree acceptable to the republic, who reckoned him among the chief of her allies. Demetrius, however, being greatly incenſed at the ſlight put upon his ſiſter, ſet up a pretender to the throne, one Orophernes, a ſuppoſititious, or, as others call him, a natural ſon of the deceaſed king. The Romans ordered Eumenes king of Pergamus to aſſiſt Ariarathes with all his forces: which he did, but to no purpoſe: for the confederates were overthrown by Demetrius, and Ariarathes was obliged to abandon the kingdom to his rival. This happened about 159 years before Chriſt, and the uſurper immediately diſpatched ambaſſadors to Rome with a golden crown. The ſenate declined accepting the preſent, till they heard his pretenſions to the kingdom; and this Orophernes, by ſuborned witneſſes, made appear ſo plain, that the ſenate decreed that Ariarathes and he ſhould reign as partners; but next year, Orophernes was driven out by Attalus brother to Eumenes, and his ſucceſſor to the kingdom of Pergamus.

Ariarathes, being thus reſtored, immediately demanded of the Priennians 400 talents of gold which Orophernes had depoſited with them. They honeſtly replied, that as they had been truſted with the money by Orophernes, they could deliver it to none but himſelf, or ſuch as came in his name. Upon this, the king entered their territories with an army, deſtroying all with fire and ſword. The Priennians, however, ſtill perſevered in their integrity; and though the city was beſieged by the united forces of Ariarathes and Attalus, not only made an obſtinate defence, but found means to reſtore the ſum to Orophernes. At laſt they applied to the Romans for aſſiſtance, who enjoined the two kings to raiſe the ſiege, under pain of being declared enemies to the republic. Ariarathes immediately obeyed; and marching his army into Aſſyria, joined Alexander Epiphanes againſt Demetrius Soter, by whom he had been formerly driven out of his kingdom. In the very firſt engagement Demetrius was ſlain, and his army entirely diſperſed, Ariarathes having on that occaſion given uncommon proofs of his courage and conduct. Some years after, war breaking out between the Romans and Ariſtonicus, who claimed the kingdom of Pergamus in right of his father, Ariarathes joined the former, and was ſlain in the ſame battle in which P. Craſſus proconſul of Aſia was taken, and the Roman army cut in pieces. He left ſix ſons by his wife Laodice, on whom the Romans beſtowed Lycaonia and Cilicia. But Laodice, fearing leſt her children when they came of age, ſhould take the government out of her hands, poiſoned five of them, the youngeſt only having eſcaped her cruelty by being conveyed out of the kingdom. The queen herſelf was ſoon after put to death by her ſubjects, who could not bear her cruel and tyrannical government.

Laodice was ſucceeded by Ariarathes VII. who, ſoon after his acceſſion, married another Laodice, daughter of Mithridates the great, hoping to find in that prince a powerful friend to ſupport him againſt Nicomedes king of Bithynia, who laid claim to part of Cappadocia. But Mithridates inſtead of aſſiſting, procured one Gordius to poiſon his unhappy ſon-in-law; and, on his death, ſeized the kingdom, under pretence of maintaining the rights of the Cappadocians againſt Nicomedes, till the children of Ariarathes were in a condition to govern the kingdom. The Cappadocians at firſt fancied themſelves obliged to their new protector; but, finding him unwilling to reſign the kingdom to the lawful heir, they roſe up in arms, and, driving out all the garriſons placed by Mithridates, placed on the throne Ariarathes VIII. eldeſt ſon of their deceaſed king.

The new prince found himſelf immediately engaged in a war with Nicomedes; but, being aſſiſted by Mithridates, not only drove him out of Cappadocia, but ſtripped him of a great part of his hereditary dominions. On the concluſion of the peace, Mithridates, ſeeking for ſome pretence to quarrel with Ariarathes, inſiſted upon his recalling Gordius, who had murdered his father; which being rejected with abhorrence, a war enſued. Mithridates took the field firſt, in hopes of over-running Cappadocia before Ariarathes could be in a condition to make head againſt them; but, contrary to his expectation, he was met on the frontiers by the king of Cappadocia with an army no way inferior to his own. Hereupon he invited Ariarathes to a conference; and, in ſight of both armies, ſtabbed him with a dagger, which he had concealed under his garment. This ſtruck ſuch terror into the Cappadocians, that they immediately diſperſed, and gave Mithridates an opportunity of poſſeſſing himſelf of the kingdom without the leaſt oppoſition. The Cappadocians, however, not able to endure the tyranny of his prefects, ſoon ſhook off the yoke; and recalling the king's brother, who had fled into the province of Aſia, proclaimed him king. He was ſcarce ſeated on the throne, however, before Mithridates invaded the kingdom at the head of a very numerous army, and having drawn Ariarathes to a battle, defeated his army with great ſlaughter, and obliged him to abandon the kingdom. The unhappy prince ſoon after died of grief; and Mithridates beſtowed the kingdom on his ſon, who was then but eight years old, giving him alſo the name of *Ariarathes*. But Nicomedes Philopater king of Bythynia, fearing leſt Mithridates, having now got poſſeſſion of the whole kingdom of Cappadocia, ſhould invade his territories, ſuborned a youth to paſs himſelf for the third ſon of Ariarathes, and to preſent to them a petition in order to be reſtored to his father's kingdom. With him he ſent to Rome Laodice, ſiſter of Mithridates, whom he had married after the death of her former huſband Ariarathes. Laodice declared before the ſenate that ſhe had three ſons by Ariarathes, and that the petitioner was one of them; but that ſhe had been obliged to keep him concealed, leſt he ſhould undergo the ſame fate with his brothers. The ſenate aſſured him that they would at all events reinſtate him in his kingdom. But, in the mean time, Mithridates having notice of theſe tranſactions, diſpatched Gordius to Rome, to undeceive the ſenate, and to perſuade them that the youth to whom he had reſigned the kingdom of Cappadocia was the lawful ſon of the late king, and grandſon to Ariarathes who had loſt his life in the ſervice of the Romans againſt Ariſtonicus. This unexpected embaſſy put the ſenate upon enquiring more narrowly into the matter, whereby the whole plot was diſcovered; upon which Mithridates was ordered to reſign Cappadocia, and the kingdom was declared free. The Cappadocians, however, in a ſhort time ſent ambaſſadors to Rome, acquainting the ſenate that they could not live without a king. This greatly ſurpriſed the Romans, who had ſuch an averſion to royal authority; but they gave them leave to elect a king of their own nation. As the family of Pharnaces was now extinct, the Cappadocians choſe Ariobarzanes; and their choice was approved by the ſenate, he having on all occaſions ſhewn himſelf a ſteady friend to the Romans.

Ariobarzanes had ſcarce taken poſſeſſion of his kingdom when he was driven out by Tigranes king of Armenia; who reſigned Cappadocia to the ſon of Mithridates, in purſuance of an alliance previouſly concluded between the two parties. Ariobarzanes fled to Rome; and, having engaged the ſenate in his cauſe, he returned into Aſia with Sylla, who was enjoined to reſtore him to his kingdom. This was eaſily performed by Sylla, who, with a ſmall body of troops, routed Gordius who came to meet him on the borders of Cappadocia at the head of a numerous army. Sylla, however, had ſcarce turned his back, when Ariobarzanes was again driven out by Ariarathes the ſon of Mithridates, on whom Tigranes had beſtowed the kingdom of Cappadocia. This obliged Sylla to return into Aſia, where he was attended with his uſual ſucceſs, and Ariobarzanes was again placed on the throne. After the death of Sylla, he was the third time forced by Mithridates to abandon his kingdom; but Pompey, having entirely defeated Mithridates near mount Stella, reſtored Ariobarzanes to his throne, and rewarded him for his ſervices during the war, with the provinces of Sophene, Gordiene, and great part of Cilicia. The king, however, being now advanced in years, and deſirous of ſpending the remainder of his life in eaſe, reſigned the crown to his ſon Ariobarzanes, in preſence of Pompey; and never afterwards troubled himſelf with affairs of ſtate.

Ariobarzanes II. proved no leſs faithful to the Romans than his father had been. On the breaking out of the civil war between Cæſar and Pompey, he ſided with the latter; but after the death of Pompey, he was received into favour by Cæſar, who even beſtowed upon him great part of Armenia. While Cæſar was engaged in a war with the Egyptians, Pharnaces king of Pontus invaded Cappadocia, and ſtripped Ariobarzanes of all his dominions; but Cæſar having defeated Pharnaces, reſtored the king of Cappadocia, and honoured him with new titles of friendſhip. After the murder of Cæſar, Ariobarzanes, having refuſed to join Brutus and Caſſius, was by them declared an enemy to the republic, and ſoon after taken priſoner and put to death. He was ſucceeded by his brother Ariobarzanes III. who was by Marc Anthony deprived both of his kingdom and life; and in him ended the family of Ariobarzanes.

Archelaus, the grandſon of that general of the ſame name who commanded againſt Sylla in the Mithridatic war, was by Marc Anthony placed on the throne of Cappadocia, though nowiſe related either to the family of Pharnaces or Ariobarzanes. His preferment was entirely owing to his mother Glaphyra, a woman of great beauty, but of looſe behaviour, who, in return for her compliance with the deſires of Anthony, obtained the kingdom of Cappadocia for her ſon. In the war between Auguſtus and Anthony, he joined the latter; but at the interceſſion of the Cappadocians, was pardoned by the emperor. He afterwards received from him Armenia the Leſſer, and Cilicia Trachæa, for having aſſiſted the Romans in clearing the ſeas of pirates who greatly infeſted the coaſts of Aſia. He contracted a ſtrict friendſhip with Herod the Great, king of Judæ; and even married his daughter Glaphyra to Alexander, Herod's ſon. In the reign of Tiberius, Archelaus was ſummoned to appear before the ſenate; for he had always been hated by that emperor, becauſe in his retirement at Rhodes he had paid him no ſort of reſpect. This had proceeded from no averſion in him to Tiberius, but from the warning given Archelaus by his friends at Rome. For Caius Cæſar, the preſumptive heir to the empire, was then alive, and had been ſent to compoſe the differences of the eaſt, whence the friendſhip of Tiberius was then looked upon as dangerous. But when he came to the empire, Tiberius, remembering the diſreſpect ſhown him by Archelaus, enticed the latter to Rome by means of letters from Livia, who promiſed him her ſon Tiberius's pardon, provided he came in perſon to implore it. Archelaus obeyed the ſummons, and, haſtened to Rome; where he was received by the emperor with great wrath and contempt, and ſoon after accuſed as a criminal in the ſenate. The crimes of which he was accuſed were mere fictions; but his concern at ſeeing himſelf treated as a malefactor was ſo great, that he died ſoon after of grief, or, as others ſay, laid violent

lent hands on himſelf. He is ſaid to have reigned 50 years.

On the death of Archelaus, the kingdom of Cappadocia was reduced to a Roman province, and governed by thoſe of the equeſtrian order. It continued ſubject to the Romans till the invaſion of the eaſtern empire by the Turks, to whom it is now ſubject, but has no diſtinguiſhing modern name. In what was anciently called *Cappadocia*, however, the Turks have four Beglerbeglics, called *Siwas*, *Trebizond*, *Maraſch*, and *Cogni*.

In the time of the Romans, the inhabitants of Cappadocia bore ſo bad a character, and were reputed ſo vicious and lewd, that, among the neighbouring nations, a wicked man was emphatically called a *Cappadocian*. In after ages, however, their lewd diſpoſition was ſo corrected and reſtrained by the pure doctrines of Chriſtianity, that no country whatever has produced greater champions of the Chriſtian religion, or given to the church prelates of more unblemiſhed characters.

We have now no ſyſtem of the Cappadocian laws, and ſcarce wherewithal to form any particular idea of them. As to their commerce, they carried on a conſiderable trade in horſes, great numbers of which were produced in their country; and we read of them in Scripture as frequenting the fairs of Tyre with this commodity. As Cappadocia abounded with mines of ſilver, braſs, iron, and allum, and afforded great ſtore of alabaſter, cryſtal, and jaſper, it is probable that they might ſupply the neighbouring countries with theſe commodities.

The religion of the ancient Cappadocians was much the ſame with that of the Perſians. At Comana there was a rich and ſtately temple dedicated to Bellona; whoſe battles the prieſts and their attendants uſed to repreſent on ſtated days, cutting and wounding each other as if ſeized with an enthuſiaſtic fury. No leſs famous and magnificent were the temples of Apollo Catanius, and of Jupiter: the laſt of which had 3000 ſacred ſervants, or religious votaries. The chief prieſt was next in rank to that of Comana; and, according to Strabo, had an yearly revenue of 15 talents. Diana Perſica was worſhipped in a city called *Caſtaballa*, where women devoted to the worſhip of that goddeſs, were reported to tread barefooted on burning coals, without receving any hurt. The temples of Diana at Dioſpolis, and of Anias at Zela, were likewiſe held in great veneration both by the Cappadocians and Armenians who flocked to them from all parts. In the latter were tendered all oaths in matters of conſequence; and the chief among the prieſts was no way inferior in dignity, power, and wealth, to any in the kingdom; having a royal attendance, and an unlimited authority over all the inferior ſervants and officers of the temple. The Romans, who willingly adopted all the ſuperſtitions and ſuperſtitious rites of the nations they conquered, greatly increaſed the revenues of this and other temples; conferring the prieſthood on ſuch as they thought moſt fit for carrying on their deſigns.—We are told that human ſacrifices were offered at Comana; and that this barbarous cuſtom was brought by Oreſtes and his ſiſter Iphigenia from Taurica Scythica, where men and women were immolated to Diana. But this cuſtom, if ever it obtained at Cappadocia, was aboliſhed in the times of the Romans.

CAPPANUS, a name given by ſome authors to a worm that adheres to and gnaws the bottoms of ſhips; to which it is extremely pernicious, eſpecially in the Eaſt and Weſt-Indies: to prevent this ſeveral ſhips have been lately ſheathed with copper; the firſt trial of which was made on a Britiſh frigate the Alarm.

CAPPARIS, in botany: A genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 25th order, *Putamineæ*. The calyx is tetraphyllous and coriaceous; their petals are four; the ſtamina are long; the fruit is a berry, carnous, unilocular and pedunculated, or furniſhed with a foot-ſtalk.

There are ſeven ſpecies. The ſpinoſa, or common caper, is a low ſhrub, generally growing out of the joints of old walls, the fiſſures of rocks, and amongſt rubbiſh, in moſt of the warm parts of Europe: it hath woody ſtalks, which ſend out many lateral ſlender branches, under each of theſe are placed two ſhort crooked ſpines, between which and the branches come out the footſtalks of the leaves, which are ſingle, ſhort, and ſuſtain a round ſmooth entire leaf. At the intermediate joints, between the branches, come out the flowers on long foot-ſtalks; before theſe expand, the bud with the impalement is gathered for pickling. Thoſe which are laſt expand in form of a ſingle roſe, having five large white petals, which are roundiſh and concave; in the middle are placed a great number of long ſtamina, ſurrounding a ſtyle which riſes above them, and crowned with an oval germen, which afterwards becomes a capſule filled with kidney-ſhaped ſeeds.

Culture. This plant is very difficultly preſerved in Britain: it delights to grow in crevices of rocks, old walls, &c. and always thrives beſt in an horizontal poſture; ſo that, when planted either in pots or in the full ground, they ſeldom thrive, though they may be kept alive for ſome years. They are propagated by ſeeds in the warm parts of Europe, but very ſeldom in Britain.

Uſes. The buds, pickled with vinegar, &c. are brought to Britain annually from Italy and the Mediterranean. They are ſuppoſed to excite appetite and aſſiſt digeſtion; and to be particularly uſeful as detergents and aperients in obſtructions of the liver and ſpleen.

CAPRA, or Goat, a genus of quadrupeds belonging to the order of pecora. The horns are hollow, turned upwards, erect, and ſcabrous. There are eight fore-teeth in the under jaw, and none in the upper; and they have no dog-teeth. This genus conſiſts of 14 ſpecies, viz.

Plates CXXI. CXXII. CXXIII. CXXIV.

I. The Hircus, or common goat, with arched carinated horns, and a long beard. It is a native of the eaſtern mountains.

The goat is an animal of more ſagacity than the ſheep. Inſtead of having an antipathy at mankind, they voluntarily mingle with them, and are eaſily tamed. Even in uninhabited countries, they betray no ſavage diſpoſitions. In the year 1698, an Engliſh veſſel having put in to the iſland of Bonaviſta, two negroes came aboard, and offered gratis to the captain as many goats as he pleaſed. The captain expreſſed his aſtoniſhment at this offer. But the negroes replied, that there were only 12 perſons on the iſland; that the goats had multiplied to ſuch a degree, that they were become extremely troubleſome; and that, inſtead of having any difficulty in catching them, they followed the men wherever they went, and were ſo obſtinately officious, that they could not get quit of them upon any account whatever.

Goats are ſenſible of careſſes and capable of a conſiderable degree of friendſhip. They are ſtronger, more agile, and leſs timid, than ſheep. They have a lively, capricious, and wandering diſpoſition; are fond of high and ſolitary places, and frequently ſleep upon the very points of rocks. They are more eaſily ſupported than any other animal of the ſame ſize; for there is hardly an herb, or the bark of a tree, which they will not eat with pleaſure. Neither are they liable to ſo many diſeaſes as ſheep: they can bear heat and cold with leſs inconvenience. The actions and movements of animals depend more upon the force and variety of their ſenſations than the ſtructure of their bodies: the natural inconſtancy or fancifulneſs of goats is accordingly expreſſed by the irregularity of their actions; they walk, ſtop ſhort, run, jump, ſhow, and hide themſelves, as it were by mere caprice, and without any other cauſe than what ariſes from the natural vivacity of their temper.

The buck will copulate when he is a year old, and the female when ſhe is ſeven months. But as this is rather premature, they are generally reſtrained till they be 18 months or two years. The buck is bald, beautiful, and vigorous; one is ſufficient to ſerve 150 females. A buck for propagation ſhould be large, handſome, and about two years of age; his neck ſhould be ſhort and fleſhy; his head ſlender; his ears pendent: his thighs thick; his limbs firm; his hair black, thick, and ſoft; and his beard ſhould be long and buſhy. The females are generally in ſeaſon from September to the end of November. At that time the males drive whole flocks of the females continually from place to place, and fill the whole atmoſphere around them with their ſtrong diſagreeable odour; which, though as diſagreeable as aſafætida itſelf, yet may be conducive to prevent many diſtempers, and to cure nervous and hyſterical ones. Horſes are ſuppoſed to be much refreſhed by it; on which account many people keep a he-goat in their ſtuds or ſtables.

Goats go with young four months and an half, and bring forth from the latter end of February to the latter end of April: having only two teats, they generally bring forth but one or two young; ſometimes three; and in good warm paſtures there have been inſtances, tho' rare, of their bringing forth four at a time. They continue fruitful till they are ſeven years of age; but a buck goat is ſeldom kept after he is five. Both young and old are affected by the weather; a rainy ſeaſon makes them thin, a dry ſunny one makes them fat and blithe: their exceſſive venery prevents their longevity; for in our climate they ſeldom live above 11 or 12 years.

Though the food of this animal coſts next to nothing, as it can ſupport itſelf even upon the moſt barren mountains, their produce is valuable. In Britain the whiteſt wigs are made of their hair; for which purpoſe that of the he-goat is moſt in requeſt; the whiteſt and cleareſt is ſelected from that which grows on the haunches, where it is longeſt and thickeſt: a good ſkin well haired is ſold for a guinea; though a ſkin of bad hue, and ſo yellow as to baffle the barber's ſkill to bleach, will not fetch above 18 d. or 2 s. The Welſh goats are far ſuperior in ſize, and in length and fineneſs of hair, to thoſe of other mountainous countries. Their uſual colour is white: thoſe of France and the Alps are ſhort-haired, reddiſh, and the horns ſmall. Bolſters made from the hair of a goat were in uſe in the days of Saul, as appears from 1 Samuel xix. 13. The ſpecies very probably was the Angora goat, which is only found in the Eaſt; and whoſe ſoft and ſilky hair ſupplied a moſt luxuriant couch.

The ſuet of the goat is in great eſteem as well as the hair. Many of the inhabitants of Caernarvonſhire ſuffer theſe animals to run wild on the rocks in winter as well as in ſummer; and kill them in October for the ſake of their fat, either by ſhooting them with bullets, or by running them down with dogs like deer. The goats killed for this purpoſe are about four or five years old. Their ſuet will make candles far ſuperior in whiteneſs and goodneſs to thoſe made from that of the ſheep or the ox, and accordingly brings a much greater price in the market; nor are the horns without their uſe, the country people making of them excellent handles for tucks and pen-knives. The ſkin is peculiarly well adapted for the glove manufactory, eſpecially that of the kid: abroad it is dreſſed and made into ſtockings, bedticks, bed-hangings, ſheets, and even ſhirts. In the army it covers the horſemen's arms, and carries the foot-ſoldier's proviſions. As it takes a dye better than any other ſkin, it was formerly much uſed for hangings in the houſes of people of fortune, being ſuſceptible of the richeſt colours, and when flowered and ornamented with gold and ſilver became an elegant and ſuperb furniture.

The fleſh is of great uſe to the inhabitants of thoſe countries which abound with goats; and affords them a cheap and plentiful proviſion in the winter-months, when the kids are brought to market. The haunches of the goat are frequently ſalted and dried, and ſupply all the uſes of bacon: this by the Welch is called *coch yr wden*, or hung veniſon. The meat of a ſplayed goat of ſix or ſeven years old (which is called *hyfr*) is reckoned the beſt; being generally very fat and ſweet. This makes an excellent paſty; goes under the name of *rock veniſon*; and is little inferior to that of the deer.

The milk of the goat is ſweet, nouriſhing, and medicinal. It is an excellent ſuccedaneum for aſs's milk; and has (with a tea-ſpoonful of hartſhorn drunk warm in bed in the morning, and at four in the afternoon, and repeated for ſome time) been a cure for phthiſical people before they were gone too far. In ſome of the mountainous parts of Scotland and Ireland, the milk is made into whey, which has done wonders in this and other caſes where coolers and reſtoratives are neceſſary; and to many of thoſe places there is as great a reſort of patients of all ranks, as there is in England to the Spas or baths. It is not ſupriſing that the milk of this animal is ſo ſalutary, as it browſes only on the tops, tendrils, and flowers, of the mountain ſhrubs, and medicinal herbs; rejecting the groſſer parts. The blood of the he-goat, dried, was formerly reckoned a ſpecific in pleuriſies, and is even taken notice of by Dr Mead for this purpoſe; but is now deſervedly neglected. Cheeſe made of goats milk is much valued in ſome mountainous countries, when kept to a proper age; but has a peculiar taſte and flavour.

a. The Angora goat is a variety that is found only in the tract that ſurrounds Angora and Beibazar, towns in Aſiatic Turkey, for the diſtance of three or four days journey. Strabo ſeems to have been acquainted with this kind; for ſpeaking of the river Halys, he ſays, that there are goats found near it that are not known in other parts. In the form of their body they differ from the common goat, being ſhorter; their legs too are ſhorter, their ſides broader and flatter, and their horns ſtraighter; but the moſt valuable characteriſtic is their hair, which is ſoft as ſilk, of a gloſſy ſilvery whiteneſs, and curled in locks of eight or nine inches in length. This hair is the baſis the fine Britiſh camblets, and imported to England in form of thread; for the Turks will not permit it to be exported raw, for a reaſon that does them honour; becauſe it ſupports a multitude of poor, who live by ſpinning it. The goat-herds of Angora and Beibazar are extremely careful of their flocks, frequently combing and waſhing them. It is obſerved, that if they change their climate and paſture, they loſe their beauty: we therefore ſuſpect that the deſign of Baron Alſtroemer, a patriotic Swede, turned out fruitleſs, who imported ſome into his own country, to propagate the breed for the ſake of their hair.

b. The *Capricorn* of Buffon is another variety, having ſhort horns, the ends turned forwards, their ſides annulated, and the rings more prominent before than behind.

II. The IBEX, or wild-goat, is the ſtock from whence the tame ſpecies ſprung. It has large knotty horns reclined upon its back, is of a yellowiſh colour, and its beard is black. The females are leſs, and have ſmaller horns, more like thoſe of a common ſhe-goat, and with few knobs on the upper ſurface: they bring one young one, ſeldom two, at a birth. They inhabit the higheſt Alps of the Griſſon's country and the Valais; are alſo found in Crete. They are very wild, and difficult to be ſhot, as they always keep on the higheſt points. Their chaſe is exceedingly dangerous: being very ſtrong, they often tumble the incautious huntſmen down the precipices, except he has time to lie down, and let the animals paſs over him. They are ſaid not to be long-lived.

III. The MAMBRINA, or Syrian goat, with reclined horns, pendant ears, and a beard. It is a native of the Eaſt. Their ears are of a vaſt length; from one to two feet; and ſometimes ſo troubleſome, that the owners cut off one to enable the animal to feed with more eaſe. Theſe animals ſupply Aleppo with milk.

IV. The RUPICAPRA, or chamois-goat, has erect and hooked horns. The body is of a duſky red colour; but the front, top of the head, gullet, and inſide of the ears, are white; the under part of the tail is blackiſh; and the upper lip is a little divided. It inhabits the Alps of Dauphine, Switzerland, and Italy; the Pyrenean mountains; Greece, and Crete: does not dwell ſo high in the hills as the ibex, and is found, in greater numbers.

The chamois is of the ſize of a domeſtic goat, and his hair is as ſhort as that of a hind. His vivacity is delightful, and his agility truly admirable. Theſe animals are very ſocial among themſelves: We find them going in pairs, or in little flocks of from three to twenty; and ſometimes we ſee from 60 to 100 of them diſperſed in different flocks along the declivity of the ſame mountain. The large males keep at a diſtance from the reſt except in the rutting ſeaſon, when they join the females, and beat off all the young. At this period, their ardour is ſtill ſtronger than that of the wild bucks. They bleat often, and run from one mountain to another. Their ſeaſon of love is in the month of October and November, and they bring forth in March and April. A young female takes the male at the age of 18 months. The females bring forth one, but rarely two at a time. The young follow their mothers till October, if not diſperſed by the hunters or the wolves. We are aſſured that they live between 20 and 30 years. Their fleſh is very good. A fat chamois goat will yield from 10 to 12 pounds of ſuet, which is harder and better than that of the goat. The blood of the chamois is extremely hot, and it is ſaid, to have qualities and virtues nearly equal to thoſe of the wild goat. The hunters ſometimes mix the blood of the wild and chamois goat: At other times they ſell the blood of the wild goats for that of the chamois. The voice of the chamois is a very low and almoſt imperceptible kind of bleating, reſembling that of a hoarſe domeſtic goat. It is by this bleating that they collect together, particulary the mothers and their young. But, when alarmed, or when they perceive their enemy, or any thing the nature of which they cannot diſtinguiſh, they advertiſe one another by a kind of whiſtling noiſe. The ſight of the chamois is very penetrating, and his ſenſe of ſmelling is acute. When the ſees a man diſtinctly, he ſtops for ſome time, and flies off when he makes a nearer approach. His ſenſe of hearing is equally acute as that of ſmelling; for he hears the ſmalleſt noiſe. When the wind blows in the direction between him and a man, he will perceive the ſcent at the diſtance of more than half a league. Hence, when he ſmells or hears any thing which he cannot ſee, he whiſtles or blows with ſuch force, that the rocks and foreſts re-echoe the ſound. If there are many of them near, they all take the alarm. This whiſtling is as long as the animal can blow without taking breath. It is firſt ſharp, and turns flat at the end. The chamois then ſtops for a moment, looks round on all ſides, and begins whiſtling afreſh, which he continues from time to time. His agitation is extreme. He ſtrikes the earth with his feet; he leaps upon the higheſt ſtones he can find; he again looks round, leaps from one eminence to another; and, when he diſcovers any thing, he flies off. The whiſtling of the male is ſharper than that of the female. This whiſtling is performed through the noſtrils, and conſiſts of a ſtrong blowing, ſimilar to the ſound which a man may make by fixing his tongue to the palate, with his teeth nearly ſhut, his lips open, and ſomewhat extended, and blowing long and with great force. The chamois feeds on the fineſt herbs. He ſelects the moſt delicate parts of plants, as the flowers and the tendereſt buds. He is very fond of ſome aromatic herbs, particularly of the carline thiſtle and genipay, which are the hotteſt plants that grow in the Alps. When he eats green herbs, he drinks very little. He is very fond of the leaves and tender buds of ſhrubs. He ruminates like the common goat. The food he uſes ſeems to announce the heat of his conſtitution. This animal is admired for his large round eyes, whoſe ſize correſponds with the vivacity of his diſpoſition. His head is adorned with two ſmall horns, from half a foot to nine inches in length. Their colour is a fine black, and they are placed on the front nearly between his eyes; and, inſtead of being reflected backward, like thoſe of other animals, they advance forward above the eyes, and bend backward at the points, which are extremely ſharp. He adjuſts his ears moſt beautifully to the points of his horns. Two tufts of black hair deſcend from his horns to the ſides of his face. The reſt of the head is of a yellowiſh white colour, which never changes. The horns of the chamois are uſed for the heads of canes. Thoſe of the female are ſmaller and leſs crooked. The ſkin of the chamois, when dreſſed, is very ſtrong, nervous, and ſupple, and makes excellent riding-breeches, gloves, and veſts. Garments of this kind laſt long, and are of great uſe to manufacturers. The chamois goats are ſo impatient of heat, that, in ſummer, they are only to be found under the ſhades of caverns in the rocks, among maſſes of congealed ſnow and ice, or in elevated foreſts on the northern declivities of the moſt ſcabrous mountains, where the rays of the ſun ſeldom penetrate. They paſture in the mornings and evenings, and ſeldom during the day. They traverſe the rocks and precipices with great facility, where the dogs dare not follow them. There is nothing more worthy of admiration than to ſee theſe animals climbing or deſcending inacceſſible rocks. They neither mount nor deſcend perpendicularly, but in an oblique line. When deſcending, particularly, they throw themſelves down acroſs a rock which is nearly perpendicular, and of 20 or 30 feet in height, without having a ſingle prop to ſupport their feet. In deſcending, they ſtrike their feet three or four times againſt the rock, till they arrive at a proper reſting-place below. The ſpring of their tendons is ſo great, that, when leaping about among the precipices, one would imagine they had wings inſtead of limbs. It has been alleged by ſome, but without foundation, that the chamois, in climbing and deſcending rocks, ſupports himſelf by his horns. It is by the ſtrength and agility of his limbs that the chamois is enabled to climb and deſcend rocks. His legs are very free and tall; thoſe behind are ſomewhat longer, and always crooked, which favours their ſpringing to a great diſtance; and, when they throw themſelves from a height, the hind legs receive the ſhock, and perform the office of two ſprings in breaking the fall. In great ſnows, and during the rigour of winter, the chamois goats inhabit the lower foreſts, and live upon pine leaves, the buds of trees, buſhes, and ſuch green or dry herbs as they can find by ſcratching off the ſnow with their feet. The foreſts that delight them moſt, are thoſe which are very full of rocks and precipices. The hunting of the chamois is very difficult and laborious. The mode moſt in uſe is to kill them by ſurpriſe. The hunters conceal themſelves behind rocks or large ſtones, taking care that the wind blows oppoſite to them, and, when a favourable opportunity occurs, ſhoot them with muſket-balls. They are likewiſe hunted in the ſame manner as ſtags and other animals, by poſting ſome of the hunters in narrow paſſages, while others beat about to raiſe the game. Men are preferable for this purpoſe to dogs; for dogs too quickly diſperſe the animals, who fly off ſuddenly to the diſtance of four or five leagues.

V. The DEPRESSA is an African goat, with ſmall depreſſed horns, bent inwards, lying on the head. It is about the ſize of a kid; and the hair is long and pendulous.

VI. The REVERSA is likewiſe an African goat, with erect horns, and curved a little forwards. It is about the ſize of a kid of a year old. It inhabits Juda or Whidaw in Africa.

VII. The GAZELLA has long, erect, cylindrical horns, annulated near the baſe. It inhabits Egypt, the Cape, Arabia, the Levant, and India, dwelling in the plains.

VIII. The CERVICAPRA, with plated cylindrical horns, inhabits Barbary. The hair near the horns is longer than in any other part of the body. The females want horns. Mr Haſſelqueſt gives the following account of this ſpecies: “ The cervicapra is larger ſwifter, and wilder, than the common rock-goat, and can ſcarcely be taken without a falcon. It is met with near Aleppo. I have ſeen a variety of this which is common in the Eaſt, and the horns appear different; perhaps it is a diſtinct ſpecies. This animal loves the ſmoke of tobacco; and, when caught alive, will approach the pipe of the huntſman, though otherwiſe more timid than any animal. This is perhaps the only creature, beſides man, that delights in the ſmell of a poiſonous and ſtinking plant. The Arabians hunt it with a falcon (*falco gentilis*, Lin.) I had an excellent opportunity of ſeeing this ſport near Nazareth in Galilee. An Arab, mounted on a ſwift courſer, held the falcon in his hand, as huntſmen commonly do: when he eſpied the rock-goat on the top of the mountain, he let looſe the falcon, which flew in a direct line like an arrow, and attacked the animal; fixing the talons of one of his feet into the cheek of the creature, and the other into its throat, extending his wings obliquely over the animal; ſpreading one towards one of its ears, and the other to the oppoſite hip. The animal, thus attacked, made a leap twice the height of a man, and freed himſelf from the falcon: but being wounded, and loſing his ſtrength and ſpeed, he was again attacked by the falcon; which fixed the talons of both its feet into the throat of the animal, and held it faſt, till the huntſman coming up, took it alive, and cut its throat; the falcon drinking the blood as a reward for his labour. A young falcon, which was learning, was likewiſe put to the throat of the goat: by this means are young falcons taught to fix their talons in the throat of the animal, as being the propereſt part; for ſhould the falcon fix them in the creature's hip, or ſome other part of the body, the huntſman would not only loſe his game, but his falcon alſo: for the animal, rouſed by the wound, which could not prove mortal, would run to the deſerts and the tops of the mountains, whither its enemy, keeping its hold, would be obliged to follow; and, being ſeparated from its maſter, muſt of courſe periſh.”

IX. The BEZOARTICA, or bezoar goat, is bearded, and has cylindrical, arched, and wholly annulated horns. It is a native of Perſia. The bezoar is found in one of its ſtomachs, called *abomaſus*. See BEZOAR and ABOMASUS.

X. The TARTARICA, or ſaiga of Buffon, has cylindrical, ſtraight, annulated horns; the points inclining inward, the ends ſmooth; the other part ſurrounded with very prominent annuli; of a pale yellow colour; and the greateſt part ſemipellucid; the cutting teeth are placed ſo looſe in their ſockets, as to move with the leaſt touch. The male is covered with rough hair like the he-goat, and has a very ſtrong ſmell; the female is ſmoother. The hair on the bottom of the ſides and the throat is long, and reſembles wool; that on the ſides of the neck and head is hoary; the back and ſides of a dirty white; the breaſt, belly, and inſide of the thighs, of a ſhining white. The females are deſtitute of horns. Theſe animals inhabit all the deſerts from the Danube and Dnieper to the river Irtiſh, but not beyond. Nor are they ever ſeen to the north of 54 or 55 degrees of latitude. They are found therefore in Poland, Moldavia, about Mount Caucaſcus, and the Caſpian Sea, and Siberia, in the dreary open deſerts, where ſalt-ſprings abound, feeding on the ſalt, the acrid and aromatic plants of thoſe countries, and grow in the ſummer-time very fat: but their fleſh acquires a taſte diſagreeable to many people, and is ſcarcely eatable, until it is ſuffered to grow cold after dreſſing. The females go with young the whole winter; and bring forth in the northern deſerts in May. They have but one at a time; which is ſingular, as the numbers of theſe animals are prodigious. The young are covered with a ſoft fleece, like new-dropt lambs, curled and waved. They are regularly migratory. In the rutting-ſeaſon, late in autumn, they collect in flocks of thouſands, and retire into the ſouthern deſerts. In the ſpring they divide into little flocks, and return northward at the ſame time as the wandering Tartars change their quarters.

They very ſeldom feed alone; the males feeding promiſcuouſly with the females and their young. They rarely lie down all at the ſame time: but, by a providential inſtinct, ſome are always keeping watch; and when they are tired, they ſeemingly give notice to ſuch as have taken their reſt, who ariſe inſtantly, and as it were relieve the centinels of the preceeding hours. They thus often preſerve themſelves from the attack of wolves, and from the ſurprize of the huntſmen. They are exceſſively ſwift, and will outrun the fleeteſt horſe or grey-hound; yet partly through fear (for they are the moſt timid of animals), and partly by the ſhortneſs of their breath, they are very ſoon taken. If they are but bit by a dog, they inſtantly fall down, nor will they even offer to riſe. In running they ſeem to incline on one ſide, and their courſe is ſo rapid that their feet ſeem ſcarcely to touch the ground. In a wild ſtate they ſeem to have no voice. When brought up tame, the young emit a ſhort ſort of bleating, like ſheep.

The males are moſt libidinous animals: the Tartars, who have ſufficient time to obſerve them, report that they will copulate twenty times together; and that this ability ariſes from their feeding on a certain herb, which has moſt invigorating powers. When taken young, they may eaſily be made tame; but if caught when at full age, are ſo wild and ſo obſtinate as to refuſe all food. When they die, their noſes are quite flaccid.

They are hunted for the ſake of their fleſh, horns, and ſkins, which are excellent for gloves, belts, &c. The huntſmen always approach them againſt the wind, leaſt they ſhould ſmell their enemy; they alſo avoid putting on red or white clothes, or any colours which might attract their notice. They are either ſhot, or taken by dogs; or by the black eagle, which is trained to this ſpecies of falconry. Their beſt ſeaſon is in September: at other times, the ſkins are penetrated by worms. The fat reſembles that of mutton; in taſte, like that of a buck: the head is reckoned the moſt delicate part.

XI. The AMMON, has ſemicircular, plain, white horns, and no beard. It is about the ſize of a ram, and is a native of Siberia.

XII. The ÆEGAGRUS of Pallas, or Caucaſan goat, has ſmooth black horns, ſharply ridged on their upper parts, and hollowed on their outward ſides. No veſtiges of knots or rings, but on the upper ſurface are ſome wavy riſings; bend much back, and are much hooked at the end, approaching a little at the points. On the chin is a great beard, duſky, mixed with cheſnut. The fore-part of the head is black, the ſides mixed with brown: the reſt of the animal grey, or grey mixed with ruſt-colour. Along the middle of the back, from the neck to the tail, is a black liſt; and the tail is black.

The female is either diſtitute of horns, or has very ſhort ones. In ſize it is ſuperior to the largeſt he-goats, but in form and agility reſembles a ſtag: yet Monardus compares it to the he-goat, and ſays that it has the feet of the goat. They inhabit the lower mountains of Caucaſus and Taurus, all Aſia Minor, and perhaps the mountains of India. They abound on the inhoſpitable hills of Laar and Khorazan in Perſia; and according to Monardus are alſo found in Africa. It is an animal of vaſt agility. Monardus was witneſs to the manner of its ſaving itſelf from injury by falling on its horns; for he ſaw that which he deſcribes leap from a high tower, precipitating itſelf on its horns; then ſpringing on its legs, and leaping about, without receiving the leaſt harm. This is one of the animals which yields the once-valued alexipharmic, the Bezoar-ſtone; which is a concretion formed of many coats, incruſting a nucleus of ſmall pebble, ſtones of fruits, bits of ſtraw, or buds of trees. The incruſting coats are created from the vegetable food of the animals, eſpecially the rich, dry, and hot herbs of the Perſian and Indian mountains. Its virtues are now exploded, and it is reckoned only an abſorbent, and that of the weakeſt kind.

XIII. GNOU, with ſcabrous horns, and thick at the baſe, bending forward cloſe to the head, then ſuddenly reverting upwards. The mouth is ſquare; the noſtrils covered with broad flaps. From the noſe, half way up the front, is a thick oblong-ſquare bruſh of long ſtiff black hairs reflected upwards, on each ſide of which the other hairs are long, and point cloſely down the cheek. Round the eyes are diſpoſed in a radiated form ſeveral ſtrong hairs. The neck is ſhort, and a little arched. On the top a ſtrong and upright mane, reaching from the horns beyond the ſhoulders. On the chin is a long white beard; and on the gullet a very long pendulous bunch of hair. On the breaſt, and between the fore-legs, the hairs are very long and black. The tail reaches to the firſt joint of the legs, and is full of hair like that of a horſe, and quite white. The body is thick; and covered with ſmooth ſhort hair of a ruſt brown colour tipt with white. The legs are long, elegant, and ſlender, like thoſe of a ſtag. On each foot is only a ſingle ſpurious or hind hoof.—It is a ſtrange compound of animals: having a vaſt head like that of an ox; body and tail, like a horſe; legs like a ſtag; and the ſinus lacrymalis of an antelope. The ordinary ſize of it is about that of a common galloway; the length of it being ſomewhat above five, and height of it rather more than four feet.—Theſe animals inhabit in great numbers the fine plains of the great Namacquas, far north of the Cape of Good Hope, extending from S. lat. 25. to 28. 42. where Africa ſeems at once to open its vaſt treaſures of hoofed quadrupeds. It is an exceedingly fierce animal: on the ſight of any body it uſually drops its head and puts itſelf into an attitude of offence; and will dart with its horns againſt the pales of the incloſure towards the perſons on the outſide; yet it will afterwards take the bread which is offered. It will often go upon its knees, run ſwiftly in that ſingular poſture, and furrow the ground with its horns and legs. The Hottentots call it *Gnou* from its voice. It has two notes, one reſembling the bellowing of an ox, the other more clear. It is called an ox by the Europeans.

XIV. The DORCAS, or antelope, has cylindrical annulated horns, bent backward, contorted, and ariſing from the front between the eyes. It is a native of Africa and Mexico. Theſe animals are of a moſt elegant and active make; of a reſtleſs and timid diſpoſition; extremely watchful; of great vivacity; remarkably ſwift; exceedingly agile; and moſt of their boundings ſo light, ſo elaſtic, as to ſtrike the ſpectator with aſtoniſhment. What is very ſingular, they will ſtop in the middle of their courſe, for a moment gaze at their purſuers, and then reſume their flight.

As the chaſe of theſe animals is a favourite diverſion with the eaſtern nations, from that may be collected proofs of the rapid ſpeed of the antelope tribe. The grey-hound, the fleeteſt of dogs, is unequal in the courſe; and the ſportſman is obliged to call in the aid of the falcon trained to the work, to ſeize on the animal and impede its motions, to give the dogs time to overtake it. In India and Perſia a ſort of leopard is made uſe of in the chaſe: this is an animal that takes its prey, not by ſwiftneſs of foot, but by the greatneſs of its ſprings, by motions ſimilar to that of the antelope; but ſhould the leopard fail in its firſt eſſay, the game eſcapes.

The fleetneſs of this animal was proverbial in the country it inhabited even in the earlieſt times: the ſpeed of Aſahel is beautifully compared to that of the tzebi; and the Gadites were ſaid to be as ſwift as the roes upon the mountains. The ſacred writers took their ſimiles from ſuch objects as were before the eyes of the people they addreſſed themſelves to. There is another inſtance drawn from the ſame ſubject: the diſciple raiſed to life at Joppa was ſuppoſed to have been called *Tabitha*, i. e. *Dorcas*, or the *Antelope*, from the beauty of her eyes; and this is ſtill a common compariſon in the eaſt: *Aine el Czazel*, or, "You have eyes of an Antelope," is the greateſt compliment that can be paid to a fine woman.

Some ſpecies of the antelopes form herds of 2000 or 3000, while others keep in ſmall troops of five or ſix. They generally reſide in hilly countries; though ſome inhabit plains: they often browſe like the goat, and feed on the tender ſhoots of trees, which give their fleſh an excellent flavour. This is to be underſtood of thoſe that are taken in the chaſe; for thoſe that are fattened in houſes are far leſs delicious. The fleſh of ſome ſpecies are ſaid to taſte of muſk, which perhaps depends on the qualities of the plants they feed on.

Mr Pennant makes the antelope a diſtinct genus of animals, forming a link between the goat and the deer; with the firſt of which they agree in the texture of the horns which have a core in them, and they never caſt them; with the laſt, in the elegance of their form, and great ſwiftneſs. He diſtinguiſhes ſeveral ſpecies, among which he ranks the *gazella*, the *cervicapra*, the *bezoartica*, and the *tartarica* of Linnæus, deſcribed above, VII. VIII. IX. X. with the *moſchus grimmia* of the ſame author. See MOSCHUS.

The other ſpecies of antelopes diſtiguiſhed by zoologiſts are:

1. Kevella of Pallas, or flat-horned antelope, has horns twelve inches long, flattened on their ſides, inclining firſt backwards, bending in the middle, and then reverting forwards, at their ends, and annulated with from fourteen to eighteen rings: the upper ſide of the body is reddiſh brown; the lower part and buttocks are white: the ſize equal to a ſmall roebuck. They inhabit Senegal; where they live in great flocks, are eaſily tamed and are excellent meat.

2. The corine antelope, with very ſlender horns, ſix inches long, ſurrounded with circular *rugæ*: on each ſide of the face is a white line: beneath that, is one of black: the neck, body, and flanks are tawny; belly and inſide of the thighs white, on the knees is a tuft of hair. It is leſs than a roebuck, and inhabits Senegal.

3. The nagor, or red antelope, with horns 5¼ inches long; one or two ſlight rings at the baſe: ears much longer than the horns: hair ſtiff and bright; in all parts of a reddiſh colour, paleſt on the cheſt: tail very ſhort. Inhabits Senegal and the Cape; where it is very frequent, and is a common food.

4. The dama or ſwift antelope (*le Nanguer*, Buff.), with round horns, eight inches long, reverting at their ends. The general colour is tawny; but this ſpecies varies in that particular. It inhabits Senegal; and is eaſily tamed. It is very ſwift: Ælian compares its flight to the rapidity of a whirlwind.

5. The elk-antelope of Sparman (Indian antelope of Pennant), has thick ſtraight horns, marked with two prominent ſpiral ribs near two-thirds of their length, ſmooth towards their end; ſome above two feet long. The head is of a reddiſh colour, bounded on the cheeks by a duſky line. The forehead is broad; the noſe pointed. On the forehead is a ſtripe of long looſe hairs; and on the lower part of the dewlap, a large tuft of black hair. Along the neck and back, from head to tail, is a black ſhort mane: the reſt of the body is of a bluiſh grey, tinged with red. The tail does not reach to the firſt joint of the leg; is covered with ſhort

cinereous hair; and the end tufted with long black hairs. The hoofs are ſhort, ſurrounded at their junction with the legs by a circle of black hairs. The height to the ſhoulders is five feet. It is thick bodied and ſtrongly made; but the legs are ſlender. It wants the *ſinus lachrymalis*. The females are horned like the males.—The Caffres call this ſpecies *empoſos* and *poſſo*. The Dutch of the Cape call it the *eland* or *elk*. M. de Buffon, by miſtake, calls this the *condous*, which he ought to have beſtowed on his *condoma*. It inhabits India, Congo, and the ſouthern parts of Africa. They live in herds; but the old males are often ſolitary. They grow very fat, eſpecially about the breaſt and heart: ſo that they are eaſily caught; and when purſued, will ſometimes fall dead in the chaſe. They are ſlow runners: when rouſed, always go againſt the wind, nor can the hunters (even if they front the herd) divert them from their courſe. The fleſh is fine grained, very delicious, and juicy. The hide is tough: the Hottentots make tobacco-pipes of the horns.

6. The cervine antelope, or *antelope bubalis* of Pallas, with horns bending outward and backward, almoſt cloſe at their baſe, and diſtant at their points; twiſted and annulated; very ſtrong and black: the head is large, and like that of an ox: the eyes are placed very high, and near to the horns: the form of the body is a mixture of the ſtag and heifer; height to the top of the ſhoulders four feet: the tail is rather more than a foot long, aſinine, and terminated with a tuft of hair: the colour a reddiſh brown; white about the rump, the inner ſide of the thighs, and lower part of the belly: a dark ſpace occupies the top of the back, the front of the upper part of the fore legs, and hinder part of the thighs. It inhabits Barbary, and probably other parts of Africa, being alſo found towards the Cape of Good Hope. It is the *bekker el waſh* of the Arabs, according to Dr Shaw; who ſays, that its young quickly grow tame, and herd with other cattle. Mr Foſkal mentions it among the Arabian animals of an uncertain genus, by the name of *bakar uaſch*. This is the bubalus of the ancients; not the buffalo, as later writers have ſuppoſed. The Dutch of the Cape call this ſpecies *hartebeeſt*. They go in great herds; few only are ſolitary. They gallop ſeemingly with a heavy pace, yet go ſwiftly. They drop on their knees to fight like the white-footed antelope or nil-ghau, and the boſch-bok, after-deſcribed. The fleſh is fine grained but dry.—Mr Sparman informs us, that in this animal there is a pore one line in diameter, an inch or an inch and a half below and before the internal angle of the eye. From this pore, which is the aperture of a caruncle that lies below, there is ſecreted a matter almoſt like ear-wax, which he obſerved the Hottentots kept in a piece of ſkin as a rare and excellent medicine; on the dried ſkin of the animal, this pore is ſcarcely to be diſcerned. This Mr Sparman ſuppoſes is the reaſon why ſo great and accurate a zoologiſt as M. Pallas (who deſcribes it in his *Spicilegia* under the denomination of *Antilope bubalis*) makes no mention of this pore, as he made his deſcriptions chiefly from the dried ſkins of this animal. The uſe of this pore, which is alſo found in the deer, is for affording freer reſpiration, a circumſtance ſo eſſential to beaſts of chaſe. See Cervus.

7. The ſpringer, with ſlender horns, annulated half way, and twice contorted. The ears very long and duſky. The face, cheeks, noſe, chin, and throat, are white. The whole upper ſide of the neck, part of the lower, the back, ſides, and outſide of the limbs, are of a pale yellowiſh brown. The cheſt, belly, and inſide of the limbs, are white; the ſides and belly divided by a broad band of cheſnut, which runs down part of the ſhoulders. The tail reaches to the firſt joint of the leg; the upper part white; the lower black, and furniſhed with long hair. The buttocks are white; and from the tail half way up the back is a ſtripe of white, expanſible at pleaſure. This elegant ſpecies weighs about fifty pounds, and is rather leſs than a roebuck. It inhabits the Cape of Good Hope, where it is called the *ſpring-bock*, from the prodigious leaps it takes on the ſight of any body. When alarmed, it has the power of expanding the white ſpace about the tail into the form of a circle, which returns to its linear form when the animal is tranquil. Theſe animals migrate annually from the interior parts in ſmall herds, and continue in the neighbourhood of the Cape for two or three months: then join companies, and go off in troops conſiſting of many thouſands, covering the great plains for ſeveral hours in their paſſage. They are attended in their migrations by numbers of lions, hyænas, and other wild beaſts, which make great deſtruction among them. They are excellent eating, and with other antelopes are the veniſon of the Cape. Mr Maſon* informs us, that they alſo make periodical migrations, in ſeven or eight years, in herds of many hundred thouſands, from the north, as he ſuppoſes from the interior parts of *Terra de Natal*. They are compelled to it by the exceſſive drought which happens in that region, when ſometimes there does not fall a drop of rain for two or three years. Theſe animals in their courſe deſolate Caffraria, ſpreading over the whole country, and not leaving a blade of graſs. Lions attend them; where one of thoſe beaſts of prey are, his place is known by the vaſt void viſible in the middle of the timorous herd.

8. The ſtriped antelope, has ſmooth horns, twiſted ſpirally, and compreſſed ſideways, with a ridge on one ſide following the wreaths: they conſiſt of three bends; and are ſometimes four feet and a half long meaſured in a ſtraight line. They are naturally of a duſky colour, and wrinkled; but are generally brought over highly poliſhed. The females are deſtitute of horns. In the upper jaw is a hard horny ſubſtance, diſpoſed in ridges. The length of the animal is nine feet; the legs are ſlender: the general colour is of a reddiſh caſt, mixed with grey; and from the tail, along the top of the back, to the ſhoulders, is a white ſtripe; from which are ſeven others, four pointing towards the thighs, and three towards the belly; but they vary in number of ſtripes. On the upper part of the neck is a ſhort mane: beneath the neck, from the throat to the breaſt, are ſome long hairs hanging down. It inhabits the Cape of Good Hope, where it is called *coedoes*, and is ſaid to leap to a moſt aſtoniſhing height. This ſpecies wants the *ſinus lachrymalis*.

9. The boſch-bok, or wood-goat of the Cape, a ſpecies of antelope, according to Mr Sparman, unknown to all the cultivators of natural hiſtory, whether ancient or modern, till he deſcribed it in the memoirs of the Swediſh academy for the year 1780, quarter 3d, by the name of *antilope ſylvatica*. This animal

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* *Phil. Tranſ.* vol. lxvi. p. 103.

has obtained the name it goes by, in conſequence of its being the only one among the gazels in Africa, which may be properly ſaid to live in the woods and groves. In ſize, the boſch-bok is ſomewhat above two feet and a half high. The horns are ten inches and a half long; the ears half the length of the horns, or five inches.—The horns are black, in ſome meaſure triangular, and at the ſame time wreathed, ſo that both the ſides and angles have ſomewhat of a ſpiral turn. At bottom they are rather rough, in conſequence of a ſet of almoſt innumerable wavy-rings; which, however, are not elevated much above the ſurface. At top they are conical and ſharp-pointed, and in that part as ſmooth as though they had been poliſhed. The teeth of this animal are like thoſe of other antelopes. It has no fore-teeth or *inciſores* except in the lower jaw, where it has eight.—There is no *porus ceriferus* in this, as there is in ſome other antelopes. The hairs on the head are very ſhort and fine; afterwards they become more rough and rugged, reſembling goats hair more than that of gazels or harts. Forwards on the neck, breaſt, ſides, and belly, they are an inch and a half or two inches long. On the ridge of the neck, and ſo on all along that of the back, they are three or four inches in length, ſo as to form a kind of mane there, terminating in a tail about a finger's breadth long. On the hind part of the thighs and buttocks likewiſe, the hairs are eight inches long; the legs and feet are ſlender, and covered with ſhort hairs; the fetlock-joints are ſmall; the noſe and under-lip are decorated with black-whiſkers about an inch long. The predominant colour in this animal is dark-brown, which occupies the principal part of the ſides, the back, the upper part of the tail, the upper part of the cheſt and fore-ribs, and the fore-part of the belly. A ſtill darker brown, bordering upon black, is diſcoverable on the outſide of the ſhoulders, and ſome part of the fore-ribs. The fore-part of the noſe, from the eyes to the muzzle, is of a ſoot colour. The ears are likewiſe as black as ſoot on the outſide, but on the inſide grey; and both outwards and inwards covered with hairs ſtill ſhorter than thoſe on the head; excepting half the fore-part of the lower edge, where the hairs are white and half an inch long. Divers ſmall white ſpots, from nine to twelve in all, are ſeen on each of the haunches and on the ſides near them. A narrow line of long white hairs extends from the neck all along the back and tail, in the midſt of the long brown hairs already deſcribed. From the chine of the back to the ſides run five white parallel ſtreaks, which, however, are only diſcoverable by a cloſe inſpection.

This creature does much miſchief to the vineyards and kitchen-gardens of the Cape coloniſts; and it ſhows a great deal of craft and artifice in avoiding the ſnares and traps ſet for it, as well as the ambuſcades of the ſportſmen. As the *boſch-bok* runs but ſlowly, it ſometimes happens that he is caught by dogs. When he ſees there is no other reſource, he puts himſelf in a poſture of defence; and when he is going to butt, kneels down, like the white-footed antelope and the hartbeeſt. The coloniſts are not very fond of hunting him in this manner, as the beaſt on this occaſion generally ſells his life at a very dear rate, by goring and killing ſome of their beſt and moſt ſpirited hounds. This creature's horns, which are its chief defence, ſometimes alſo prove its bane, by being entangled in the buſhes and ſmall branches of trees, which thus ſtop the beaſt in its flight. In ſome meaſure to avoid this, it carries its noſe horizontally and ſtraight forward while it runs; ſo that its horns lie, as it were, directly on its neck: notwithſtanding which, their horns are generally worn away a little on the fore-part, and thus acquire ſome degree of poliſh.—This ſpecies of antelope is monogamous, or keeps in pairs. It is ſwifter in woodlands than the dogs, which likewiſe ſooner loſe ſcent of him there. The female, which is without horns, and on that account runs about in the foreſt more free and unimpeded, does not ſuffer herſelf ſo eaſily to be hunted out of the woods, having there, as well as on the plains, a more certain defence againſt the dogs in her legs, than the male has in his horns, eſpecially as ſhe is not ſo bulky and heavy as the male. Her breaſt is ſaid to be very plump and fleſhy, but the fleſh in general is not very tender.

10. The leucoryx with the noſe thick and broad, like that of a cow; the ears ſomewhat ſlouching; body clumſy and thick: The horns long, very ſlightly incurvated, ſlender, annulated part of the way; black, pointed. The tail reaching to the firſt joint of the legs, and tufted. The colour is in all parts a ſnowy whiteneſs, except the middle of the face, ſides of the cheeks, and limbs, which are tinged with red.—This ſpecies is about the ſize of a Welch runt; and inhabits Gow Bahrein, an iſle in the gulph of Baſſora.

11. The picta, white-footed antelope, or nyl-ghau; with ſhort horns, bending a little forward; ears large, marked with two black ſtripes; a ſmall black mane on the neck, and half way down the back: a tuft of long black hairs on the fore-part of the neck; above that, a large ſpot of white; another between the fore-legs on the cheſt: one white ſpot on each fore-foot; two on each hind-foot: the tail is long, tufted with black hairs. The colour of the male is a dark grey. The female is of a pale brown colour; with a mane, tuft, and ſtriped ears, like the male; on each foot three tranſverſe bands of black and two of white: It is deſtitute of horns. The height to the top of the ſhoulders is four feet and an inch; the length from the bottom of the neck to the anus, four feet. The head is like that of a ſtag; the legs are delicate.—Theſe animals inhabit the diſtant and interior parts of India, remote from the ſettlements. They are brought down as curioſities to the Europeans, and have of late years been frequently imported into England. In the days of Aurenge Zebe, they abounded between Delhi and Lahor, on the way to Cachemire. They were called *nyl-ghau*, or *blue* or *grey bulls*; and were one of the objects of chaſe, with that mighty prince, during his journey. They were incloſed by his army of hunters within nets, which being drawn cloſer and cloſer, at length formed a ſmall precinct: into this the king, his omrahs, and hunters, entered, and killed the beaſts with arrows, ſpears or muſkets; and ſometimes in ſuch numbers, that Aurenge Zebe uſed to ſend quarters as preſents to all his great people. They are uſually very gentle and tame, will feed readily, and lick the hands which give them food. In confinement they will eat oats, but prefer graſs and hay; are very fond of wheaten bread; and when thirſty, they will drink

two gallons at a time. They are ſaid to be at times very vicious and fierce. When the males fight, they drop on their knees at a diſtance from one another, make their approaches in that attitude, and when they come near, ſpring and dart at each other. They will ofen, in a ſtate of confinement, fall into that poſture without doing any harm. They will, notwithſtanding, attack mankind unprovoked. A labourer, who was looking over ſome pales which incloſed a few of them, was alarmed by one of the males flying at him like lightning; but he was ſaved by the intervention of the woodwork, which it broke to pieces, and at the ſame time one of its horns.—They have bred in England, they are ſuppoſed to go nine months with young, and have ſometimes two at a birth.

12. The ſcripta, or harneſſed antelope (*leguib*, Buff.) has ſtraight horns nine inches long, pointing backwards, with two ſpiral ribs. The general colour is a deep tawny; but the ſides are moſt ſingularly marked with two tranſverſe bands of white, croſſed by two others from the back to the belly; the rump with three white lines pointing downwards on each ſide; and the thighs are ſpotted with white. The tail is ten inches long, covered with long rough hairs.—It inhabits the plains and woods of Senegal, living in large herds. It is frequent at the Cape, where it is called the *bonte-bok*, or *ſpotted goat*.

Capra-Saltans, in meteorology, a fiery meteor or exhalation ſometimes ſeen in the atmoſphere. It forms an inflected light, reſembling in ſome meaſure the caperings of a goat; whence it has its name.

CAPRALA, an iſle of Italy, in the Tuſcan ſea, to the north-eaſt of Corſica, on which it depends. It is pretty populous, and has a ſtrong caſtle for its defence. It is about 15 miles in circumference. E. Long. 11. 5. N. Lat. 43. 15.

CAPRARIA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *perſonatæ*. The calyx is quinquepartite; the corolla campanulated, quinquefid, with acute ſegments; the capſule bivalved, bilocular, and polyſpermous. There is but one ſpecies, the biflora, which is a native of the warm parts of America. Being a troubleſome weed, and without beauty, it is never cultivated, except in botanic gardens for the ſake of variety.

CAPRAROLA, one of the moſt magnificent palaces in Italy, ſeated on a hill, in Ronciglione, whoſe foot is watered by the river Tircia. It was built by cardinal Farneſe; and has five fronts, in the middle of which is a round court, though all the rooms are ſquare, and well proportioned. It is 27 miles north-weſt of Rome.

CAPREÆ. See Capri.

CAPREOLUS (Elias), an excellent civilian, and learned hiſtorian, born in Breſcia in Italy, wrote an hiſtory of Breſcia, and other works: died in 1519.

CAPRI, (anciently *Capreæ*), a city and iſland at the entrance of the gulph of Naples, E. Long. 14. 50. N. Lat. 40. 45.—The iſland is only four miles long and one broad; the city is a biſhop's ſee, ſituated on a high rock at the weſt end of the iſland. Capreæ was anciently famous for the retreat of the emperor Tiberius for ſeven years, during which he indulged himſelf in the moſt ſcandalous debaucheries*. Before Tiberius came hither, Capri had attracted the notice of Auguſtus as a moſt eligible retreat, though in ſight of populous cities, and almoſt in the centre of the empire. His ſucceſſor preferred it to every other reſidence; and in order to vary his pleaſures, and enjoy the advantages as well as avoid the inconveniences of each revolving ſeaſon, built twelve villas in different ſituations, dedicated to the twelve greater gods: the ruins of ſome of them are ſtill to be ſeen: at Santa Maria are extenſive vaults and reſervoirs; and on an adjoining brow are the remains of a light-houſe; two broken columns indicate the entrance of the principal court. According to Dion Caſſius, this iſland was wild and barren before the Cæſars took it under their immediate protection: at this day a large portion of its ſurface is uncultivated and impracticable; but every ſpot that will admit the hoe is induſtriouſly tilled, and richly laden with the choiceſt productions of agriculture. The odium attached to the memory of Tiberius proved fatal to his favourite abode; ſcarce was his death proclaimed at Rome, when the ſenate iſſued orders for the demolition of every fabric he had raiſed on the iſland, which by way of puniſhment was thenceforward deſtined to be a ſtate priſon. The wife and ſiſter of Commodus were baniſhed to its inhoſpitable rocks, which were ſoon ſtained with their blood. In the middle ages Capri became an appendage of the Amalfitan republic, and after the downfall of that ſtate, belonged to the duchy of Naples. There ſtood a pharos on this iſland, which, a few days before the death of Tiberius, was overthrown by an earthquake.

CAPRIATA, (Peter John) a civilian and hiſtorian, was born at Genoa. He wrote in Italian, the hiſtory of the wars of Italy; an Engliſh tranſlation of which was printed in London in 1663.

CAPRICORN, in aſtronomy, one of the 12 ſigns of the zodiac. See Astronomy, nº 404.

The ancients accounted Capricorn the tenth ſign; and when the ſun arrived thereat, it made the winter ſolſtice with regard to our hemiſphere: but the ſtars having advanced a whole ſign towards the eaſt, Capricorn is now rather the 11th ſign; and it is at the ſun's entry into Sagittary that the ſolſtice happens, though the ancient manner of ſpeaking is ſtill retained.

This ſign is repreſented on ancient monuments, medals, &c. as having the fore-part of a goat and the hind-part of a fiſh, which is the form of an Ægipan; ſometimes ſimply under the form of a goat.

Tropic of Capricorn, a leſſer circle of the ſphere, which is parallel to the equinoctial, and at 23° 30′ diſtance from it ſouthwards; paſſing through the beginning of Capricorn.

CAPRIFICATION, a method uſed in the Levant, for ripening the fruit of the domeſtic fig-tree, by means of inſects bred in that of the wild fig-tree.

The moſt ample and ſatisfactory account of this curious operation in gardening are thoſe of Tournefort and Pontedera: the former, in his Voyage to the Levant, and in a Memoir delivered to the academy of ſciences at Paris in 1705; the latter, in the *Anthologia*. The ſubſtance of Tournefort's account follows; "Of the thirty ſpecies or varieties of the domeſtic fig-tree which are cultivated in France, Spain, and Italy, there

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* See *Tiberius*.

Caprification.

are but two cultivated in the Archipelago. The firſt ſpecies is called *ornos,* from the old Greek *erinos,* which anſwers to *caprificus* in Latin, and ſignifies a wild fig-tree. The ſecond is the domeſtic or garden fig-tree. The former bears ſucceſſively, in the ſame year, three ſorts of fruit, called *fornites, cratitires,* and *orni,* which, though not good to eat, are found abſolutely neceſſary towards ripening thoſe of the garden-fig. Theſe fruits have a ſleek even ſkin; are of a deep green colour; and contain in their dry and mealy inſide ſeveral male and female flowers placed upon diſtinct foot-ſtalks, the former above the latter. The *fornites* appear in Auguſt, and continue to November without ripening: in theſe are bred ſmall worms, which turn to a ſort of gnats, nowhere to be ſeen but about theſe trees. In October and November, theſe gnats of themſelves make a puncture into the ſecond fruit, which is called *cratitires.* Theſe do not ſhew themſelves till towards the end of September. The *fornites,* gradually fall away after the gnats are gone; the *cratitires* on the contrary, remain on the tree till May, and encloſe the eggs depoſited by the gnats when they pricked them. In May, the third ſort of fruit called *orni,* begins to be produced by the wild fig-trees. This is much bigger than the other two: and when it grows to a certain ſize, and its bud begins to open, it is pricked in that part by the gnats of the *cratitires,* which are ſtrong enough to go from one fruit to another to depoſite their eggs. It ſometimes happens that the gnats of the *cratitires* are ſlow to come forth in certain parts, while the *orni* in thoſe very parts are diſpoſed to receive them. In this caſe, the huſbandman is obliged to look for the *cratitires* in another part, and fix them at the end of the branches of thoſe fig-trees whoſe *orni* are in a fit diſpoſition to be pricked by the gnats. If they miſs the opportunity the *orni* fall, and the gnats of the *cratitires* fly away. None but thoſe that are well acquainted with the culture know the critical moment of doing this; and in order to know it, their eye is perpetually fixed on the bud of the fig; for that part not only indicates the time that the prickers are to iſſue forth, but alſo when the fig is to be ſucceſsfully pricked: if the bud is too hard and compact, the gnat cannot lay its eggs; and the fig drops when the bud is too open.

“ The uſe of all theſe three ſorts of fruit is to ripen the fruit of the garden fig-tree, in the following manner. During the months of June and July, the peaſants take the *orni,* at the time their gnats are ready to break out, and carry them to the garden fig-trees: if they do not nick the moment, the *orni* fall; and the fruit of the domeſtic fig-tree, not ripening, will in a very little time fall in like manner. The peaſants are ſo well acquainted with theſe precious moments, that, every morning, in making their inſpection, they only transfer to their garden fig-trees ſuch *orni* as are well conditioned, otherwiſe they loſe their crop. In this caſe, however, they have one remedy, though an indifferent one; which is, to ſtrew over the garden fig-trees another plant in whoſe fruit their is alſo a ſpecies of gnats which anſwer the purpoſe in ſome meaſure.”

The caprification of the ancient Greeks and Romans, deſcribed by Theophraſtus, Plutarch, Pliny, and other authors of antiquity, correſponds in every circumſtance with what is practiſed at this day in the Archipelago and in Italy. Theſe all agree in declaring that the wild fig-tree, *caprificus,* never ripened its fruit; but was abſolutely neceſſary for ripening that of the garden or domeſtic fig, over which the huſbandmen ſuſpended its branches. The reaſon of this ſucceſs has been ſuppoſed to be, that by the punctures of theſe inſects the veſſels of the fruit are lacerated, and thereby a greater quantity of nutritious juice derived thither. Perhaps, too, in depoſiting their eggs, the gnats leave behind them ſome ſort of liquor proper to ferment gently with the milk of the figs, and to make their fleſh tender. The figs in Provence, and even at Paris, ripen much ſooner for having their buds pricked with a ſtraw dipped in olive-oil. Plums and pears likewiſe pricked by ſome inſects, ripen much the faſter for it; and the fleſh round ſuch puncture is better taſted than the reſt. It is not to be diſputed, that conſiderable changes happen to the contexture of fruits ſo pricked, juſt the ſame as to parts of animals pierced with any ſharp inſtrument. Others have ſuppoſed that theſe inſects penetrated the fruit of the tree to which they were brought, and gave a more free admiſſion to the air, and to the ſun. Linnæus explained the operation, by ſuppoſing that the inſects brought the farina from the wild fig, which contained male flowers only, to the domeſtic fig, which contained the female ones. Haſſelquiſt, from what he ſaw in Paleſtine, ſeemed to doubt of this mode of fructification. M. Bernard, in the Memoirs of the Society of Agriculture, oppoſes it more decidedly. He could never find the inſect in the cultivated fig; and, in reality, it appeared to leave the wild fig, after the ſtamina were mature and their pollen diſſipated: beſides, he adds, what they may have brought on their wing muſt be rubbed away, in the little aparture which they would form for themſelves. At Malta, where there are ſeven or eight varieties of the domeſtic fig, this operation is only performed on theſe which ripen lateſt: the former are of a proper ſize, fine flavour, and in great abundance without it; ſo that he thinks the caprification only haſtens the ripening. He examined the parts of fructification of the fig; and he obſerves, if this examination be made previous to the ripening, that round the eye of the the fig, and in the ſubſtance of its covering, may be ſeen triangular dentated leaves, preſſed one againſt another; and under theſe leaves are the ſtamina, whoſe pollen is deſtined for the impregnation of the grains, which fill the reſt of the fruit. Theſe male organs are much more numerous in the wild fig than in the domeſtic; and the ſtamina are found to contain a yellow duſt which may be collected when it is ripe. The wild figs, when ripe, are not ſucculent, and have no taſte, though the grains are diſpoſed in the ſame manner as in the other kind. The pith of the grain of the wild fruit ſerves as food to a ſpecies of the cynips, whoſe larva is white, till the moment of its transformation; and it is by an opening, in the direction of the piſtil, that the inſect penetrates the grain. From this account it is thought probable, that the inſect is only communicated by accident to the domeſtic fig, and that the flowers of this genus are ſometimes hermaphrodites. But the number of hermaphrodite flowers being fewer on the cultivated than on the wild fig, the ſeeds are fecundated more certainly and quickly by the caprification; and every botaniſt knows, that when the impregnation is completed, the flower ſoon withers; while if by any accident it is delayed, it continues in bloom much longer. This view of the ſubject, therefore,

fore, explains very completely the reaſon why, in Malta, the caprification is practiſed on the late kind of figs, becauſe it haſtens the formation and maturity of the fruit.

CAPRIMULGUS, Goat-sucker, or *Fern-owl*, in orinthology, a genus of birds belonging to the order of paſſeres. The beak is incurvated, ſmall, tapering, and depreſſed at the baſe; the mouth opens very wide.

1. The Europæus, with the tubes of the noſtrils hardly viſible. It feeds on moths, gnats, dorrs, or chaffers; from which Charleton calls it a *dorr-hawk*, its food being entirely of that ſpecies of beetle during the month of July, the period of that inſect's flight in the country. This bird migrates. It makes but a ſhort ſtay in Britain: appears the latter end of May; and diſappears, in the northern parts of Britain, the latter end of Auguſt; but, in the ſouthern, ſtays above a month later. It inhabits all parts of Britain from Cornwall to the county of Roſs. Mr Scopoli ſeems to credit the report of their ſucking the teats of goats, an error delivered down from the days of Ariſtotle. Its notes are moſt ſingular. The loudeſt ſo much reſembles that of a large ſpinning wheel, that the Welſh call this bird *aderyn y droell*, or the wheel-bird. It begins its ſong moſt punctually on the cloſe of the day, uſually ſitting on a bare bough, with the head lower than the tail, the lower jaw quivering with the efforts. The noiſe is ſo very violent, as to give a ſenſible vibration to any little building it chances to alight on and emit this ſpecies of note. The other is a ſharp ſqueak, which it repeats often; this ſeems a note of love, as it is obſerved to reiterate it when in purſuit of the female among the trees. It lays its eggs on the bare ground; uſually two: they are of a long form, of a whitiſh hue, prettily marbled with reddiſh brown. The length of this bird is 10½ inches; extent 22. Plumage, a beautiful mixture of white, black, aſh-colour, and ferruginous, diſpoſed in lines, bars, and ſpots. The male is diſtinguiſhed from the female by a great oval white ſpot near the end of the three firſt quill-feathers, and another on the outmoſt feathers of the tail. This is the only one of the genus which is found in Europe. A variety leſs in ſize, being only eight inches in length, inhabits Virginia, in ſummer: arrives there towards the middle of April, and frequents the mountainous parts, but will frequently approach the houſes in the evening, where it ſettles on a rail or poſt, and cries for ſeveral times together very loud, ſomewhat like the word *whiperwhip*, or *whip-poor-will*, the firſt and laſt ſyllables pronounced the loudeſt. After continuing in one place for ſome time, it flies to another, and does the ſame; ſometimes four or five cry all together: this noiſe it begins juſt after ſun-ſet, and continues at intervals till juſt before ſun-riſe. It does not catch inſects always on the wing; for it frequently ſits upon a convenient place, and leaps up after them as they fly by, and returns to the ſame ſpot again. It makes no neſt, but lays the eggs, which are two in number, and of a dull green with duſky ſpots and ſtreaks, on the bare ground in the open fields. Kalm ſays that the fleſh is good to eat. Another variety, larger, inhabits Virginia and Carolina; where it is called the *rain-bird*, becauſe it never appears in the day-time, except when the ſky, being obſcured with clouds, betokens rain. It is ſaid to lay the eggs on the ground, and that they are not unlike thoſe of the Lapwing.

2. The Americanus, has the tubes of the noſtrils very conſpicuous. It is a night bird, and is found in America.

There are ſeveral other ſpecies or varieties inhabiting different countries, and differently marked, but all nearly ſimilar in their manners.

CAPRIOLES, in the manege, leaps that a horſe makes in the ſame place without advancing, in ſuch a manner, that, when he is at the height of the leap, he jerks out with his hinder legs even and near. It is the moſt difficult of all the high manege. It differs from a croupade, in this, that, in a croupade, a horſe does not ſhow his ſhoes; and from a ballotade, becauſe in this he does not jerk out. To make a horſe work well at caprioles, he muſt be put between two pillars, and taught to raiſe firſt his fore-quarters, and then his hind-quarters while his fore ones are yet in the air; for which end you muſt give him the whip and the poinſon.

CAPSA, (anc. geog.) a large and ſtrong town of Numidia, ſituated amidſt vaſt deſarts, waſte, uncultivated, and full of ſerpents, where Jugurtha kept his treaſure. In his time it was taken and raſed by Marius the Roman general, who put to death all the citizens capable of bearing arms, and ſold the reſt for ſlaves. It was, however, afterwards rebuilt by the Romans, and ſtrongly fortified; but, on the decline of their empire, was taken and demoliſhed a ſecond time, by Occuba a famous Arab general. The walls of the citadel are ſtill remaining, and are monuments of the ancient glory and ſtrength of Capſa. They are 24 fathoms in height, and five in thickneſs, built of large ſquare ſtones, and have now acquired the ſolidity and firmneſs of a rock. The walls of the town were rebuilt by the inhabitants ſince their firſt demolition; but were afterwards deſtroyed by Jacob Almanzar, who ſent a governor and troops into the province. In Marmol's time Capſa was very populous, and abounded with ſtately moſques and other ſtructures of ſuperb and elegant workmanſhip: but at preſent it is occupied by a poor and indigent people, fleeced and oppreſſed by the Tuneſe government. In the very centre of the city ſtands an incloſed fountain, which both ſupplies the people with drink, and affords them an agreeable bath. The adjacent country is now cultivated, and produces ſeveral kinds of fruits; but the climate is unhealthy. The inhabitants are remarkable for their peeviſhneſs of temper. Both men and women dreſs handſomely except their feet, which they cover with coarſe ſhoes of bungling workmanſhip, and made of the rough ſkins of wild beaſts, equally inconvenient and unbecoming. E. Long. 9. 3. N. Lat. 33. 15.

CAPSARIUS, from *capſa*, ſatchel, in antiquity, a ſervant who attended the Roman youth to ſchool, carrying a ſatchel with their books in it, ſometimes alſo called librarius.

Capsarius was alſo an attendant at the baths, to whom perſons committed the keeping of their clothes.

Capsarius, (from *capſa*, "a cheſt,") among the Roman bankers, was he who had the care of the money-cheſt or coffer.

CAPSICUM, or Guinea-pepper: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The corolla is verticillated, and the fruit a ſapleſs berry.

Species. 1. The annuum, with oblong fruit, is the common long-podded capſicum commonly cultivated in the gardens. Of this there is one kind with red, and another with yellow fruit: and of theſe there are ſeveral varieties, differing only in the ſize and figure of their fruit. 2. The tetragonum, commonly called *bell-pepper*. The fruit of this is red, and is the only kind proper for pickling, the ſkin being tender; whereas thoſe of the other ſorts are thin and tough. The pods are from an inch to an inch and half or two inches long; are very large, ſwelling, and wrinkled, flatted at the top, where they are angular, and ſometimes ſtand erect, at others grow downward. 3. The ceraſiforme, with a round ſmooth fruit, doth not grow ſo tall as the other ſorts, but ſpreads near the ground; the leaves come out in cluſters, are of a ſhining green, and ſtand on long footſtalks. The fruit is of a beautiful red, and of the ſize of a cherry. 4. The pyramidale, is a native of Egypt, and hath much narrower leaves than the other ſorts. The pods always grow erect, and are produced in great plenty, ſo that the plants make a good appearance for three months in the winter. 5. The minimum, commonly called *bird-pepper*, riſes with a ſhrubby ſtalk four or five feet high; the leaves are of a lucid green; the fruit grows at the diviſion of the branches, ſtanding erect: theſe are ſmall, oval, and of a bright red; they are much more ſharp and biting than thoſe of the other ſorts. Beſides theſe ſpecies, botaniſts deſcribe as many more; viz. the cordiforme, with heart-ſhaped fruit; the anguloſum, with angular heart-ſhaped fruit; the olivaforme, with oval fruit; the conoide, commonly called *hen-pepper*, with a conical red fruit growing erect; and the fruteſcens, with ſmall pyramidal fruit growing erect; commonly called *Barbary pepper*. Theſe, however, have no remarkable properties different from the others.

Culture. The three firſt ſpecies are annual plants, and muſt be propagated by ſeeds ſown on a hot-bed in the ſpring, and treated in the ſame manner with other exotics; they will however bear the open air, after being inured to it by degrees. The plants of the ſecond ſort, whoſe fruit is uſed for pickling, ſhould be taken from the hot-bed, and planted in a rich ſpot of ground in a warm ſituation about a foot and an half aſunder. They muſt be ſhaded till they have taken root, and afterwards duly watered in dry weather, which will greatly promote their growth and cauſe them to be more fruitful, and likewiſe enlarge the ſize of the fruit. By this management, three or four crops of fruit for pickling may be obtained the ſame year. The other ſorts are more tender; and therefore muſt be planted in pots plunged in a moderate hot-bed, and ſheltered under a frame.

Uſes, &c. The ſecond ſort, as already obſerved, produces fruit fit for pickling; for which purpoſe they muſt be gathered before they arrive at their full ſize, while their rind is tender. They muſt be ſlit down on one ſide to get out the ſeeds, after which they ſhould be ſoaked two or three days in ſalt and water; when they are taken out of this and drained, boiling vinegar muſt be poured on them in a ſufficient quantity to cover them, and cloſely ſtopped down for two months; then they ſhould be boiled in the vinegar to make them green; but they want no addition of any ſpice, and are the wholeſomeſt and beſt pickle in the world. The tenth ſpecies is uſed for making what is called *cayan-butter*, or *pepper-pots*, by the inhabitants of America, and which they eſteem the beſt of all the ſpices. The following is a receipt for making of a pepper-pot: "Take of the ripe ſeeds of this ſort of capſicum, and dry them well in the ſun; then put them into an earthen or ſtone pot, mixing flour between every ſtratum of pods; and put them into an oven after the baking of bread, that they may be thoroughly dried: after which they muſt be well cleanſed from the flour; and if any of the ſtalks remain adhering to the pods, they ſhould be taken off, and the pods reduced to a fine powder; to every ounce of this add a pound of wheat-flour, and as much leaven as is ſufficient for the quantity intended. After this has been properly mixed and wrought, it ſhould be made into ſmall cakes, and baked in the ſame manner as common cakes of the ſame ſize: then cut them into ſmall parts, and bake them again, that they may be as dry and hard as biſcuit; which being powdered and ſifted, is to be kept for uſe." This is prodigiouſly hot and acrimonious, ſetting the mouth as it were on fire. It is by ſome recommended as a medicine for flatulencies; but it is greatly to be doubted whether all thoſe hot irritating medicines are not productive of more harm than good, in England at leaſt. If the ripe pods of capſicum are thrown into the fire, they will raiſe ſtrong and noiſome vapours, which occaſion vehement ſneezing, coughing, and often vomiting, in thoſe who are near the place, or in the room where they are burnt. Some perſons have mixed the powder of the pods with ſnuff, to give to others for diverſion: but where it is in quantity, there may be danger in uſing it; for it will occaſion ſuch violent fits of ſneezing, as may break the blood-veſſels of the head.

CAPSQUARES, ſtrong plates of iron which come over the trunnions of a gun, and keep it in the carriage. They are faſtened by a hinge to the prize-plate, that they may lift up and down, and form a part of an arch in the middle to receive a third-part of the thickneſs of the trunnions: for two-thirds are let into the carriage, and the other end is faſtened by two iron wedges called the *fore-locks* and *keys*.

CAPSTAN, or CAPSTERN, a ſtrong maſſy column of timber, formed like a truncated cone, and having its upper extremity pierced with a number of holes to receive the bars or levers. It is let perpendicularly down through the decks of a ſhip; and is fixed in ſuch a manner, that the men, by turning it horizontally with their bars, may perform any work which requires an extraordinary effort.

A capſtern is compoſed of ſeveral parts, where A is the barrel, *b* the whelps, *c* the drum-head, and *d* the ſpindle. Plate CXXVII. The whelps riſe out from the main body of the capſtern like buttreſſes, to enlarge the ſweep, ſo that a greater quantity of cable, or whatever rope encircles the barrel, may be wound about it at one turn, without adding much to the weight of the capſtern. The whelps reach downwards from the lower part of the drum-head to the deck. The drum-head is a broad, cylindrical piece of wood reſembling a mill-ſtone, and fixed immediately above the barrel and whelps. On the outſide of this piece are cut a number of ſquare holes parallel to the deck to receive the bars. The ſpindle or pivot *d*, which is ſhod with iron, is the axis

Capſtern.

Capſule ‖ Captain.

or foot upon which the capſtern reſts, and turns round in the ſaucer, which is a ſort of iron ſocket let into a wooden ſtock or ſtandard called the *ſtep*, reſting upon and bolted to the beams.

Beſides the different parts of the capſtern above explained, it is furniſhed with ſeveral appurtenances, as the *bars*, the *pins*, the *pawls*, the *ſwifter*, and the *ſaucer*, already deſcribed. The bars are long pieces of wood or arms, thruſt into a number of ſquared holes in the drum-head all round, in which they are as the radii of a circle, or the ſpokes in the knave of a wheel. They are uſed to heave the capſtern round, which is done by the men ſetting their breaſts againſt them, and walking about, like the machinery of a horſe-mill, till the operation is finiſhed.——The pins *e*, are little bolts of iron thruſt perpendicularly through the holes of the drum-head, and through a correſpondent hole in the end of the bar, made to receive the pins when the bars are fixed. They are uſed to confine the bars, and to prevent them from working out as the men heave, or when the ſhip labours. Every pin is faſtened to the drum-head with a ſmall iron chain; and that the bars may exactly fit their reſpective holes, they are all numbered.—The pawls *f*, n° 1. are ſituated on each ſide the capſtern, being two ſhort bars of iron, bolted at one end through the deck to the beams cloſe to the lower part of the whelps; the other end, which occaſionally turns round on the deck, being placed in the intervals of the whelps, as the capſtern turns round, prevents it from recoiling or turning back by any ſudden jerk of the cable, as the ſhip riſes on the ſea, which might greatly endanger the men who heave. There are alſo hanging pawls *gg*, n° 3. uſed for the ſame purpoſes, reaching from the deck above to the drum-head immediately below it. The ſwifter is a rope paſſed horizontally through holes in the outer end of the bars, and drawn very tight; the intent of this is to keep the men ſteady as they walk round when the ſhip rocks, and to give room for a greater number to aſſiſt by pulling upon the ſwifter itſelf.

The moſt frequent uſe of the capſtern is to heave in the cable, and thereby remove the ſhip or draw up the anchor. It is alſo uſed to wind up any weighty body, as the maſts, artillery, &c. In merchant-ſhips it is likewiſe frequently employed to diſcharge or take in the cargo, particularly when conſiſting of weighty materials that require a great exertion of mechanical powers to be removed.

There are commonly two capſterns in a man of war, the *main* and the *gear* capſtern; the former of which has two drum-heads, and may be called a *double one*. This is repreſented in n° 3. The latter is repreſented in n° 2.

Formerly the bars of the capſtern went entirely thro' the head of it, and conſequently were more than double the length of the preſent ones; the holes were therefore formed at different heights, as repreſented in n° 1. But this machine had ſeveral inconveniences, and has long been entirely diſuſed in the navy. Some of theſe ſort of capſterns, however, are ſtill retained in merchant-ſhips, and are uſually denominated *crabs*. The ſituation of the bars in a crab, as ready for heaving, is repreſented in n° 4.

To Rig the Capstern, is to fix the bars in their reſpective holes, and thruſt in the pins, in order to confine them.—*Surge the Capstern*, is the order to ſlacken the rope heaved round upon it, of which there are generally two turns and a half about the barrel at once, and ſometimes three turns.—*To Heave the Capstern*, is to go round with it heaving on the bars, and drawing in any rope of which the purchaſe is created.—*To Come-up the Capstern*, is to let go the rope upon which they have been heaving.—*To Pawl the Capstern*, is to fix the pawls to prevent it from recoiling during any pauſe of heaving.

CAPSULE, in a general ſenſe, denotes a receptacle or cover in form of a bag.

Capsule, among botaniſts, a dry hollow ſeed-veſſel or pericarpium, that cleaves or ſplits in ſome determinate manner. See Pericarpium.

This ſpecies of ſeed veſſel is frequently fleſhy and ſucculent, like a berry, before it has attained maturity; but, in ripening, becomes dry, and often ſo elaſtic as to dart the ſeeds from their departments with conſiderable velocity. This elaſticity is remarkably conſpicuous in wood-ſorrel; balſam, *impatiens*; African ſpiræa, *dioſma*; *fraxinella*; *juſticia*; *ruellia*; *barleria*; *lathræa*; and many others.—The general aptitude or diſpoſition of this ſpecies of ſeed-veſſel to cleave or ſeparate for the purpoſe of diſperſing its ſeeds, diſtinguiſhes it not leſs remarkably than its texture from the pulpy or ſucculent fruits of the apple, berry, and cherry kind. This opening of the capſule for diſcharging its ſeeds when the fruit is ripe, is either at the top, as in moſt plants; at the bottom, as in triglochin; at the ſide through a pore or ſmall hole, as in campanula and orchis; horizontally, as in plantain, amaranthus, and anagallis; or longitudinally, as in convolvulus. All fruit that is jointed opens at every one of the joints, each of which contains a ſingle ſeed. Capſules, in ſplitting, are divided, externally, into one or more pieces, called by Linnæus *valves*. The internal diviſions of the capſules are called *cells*, *locumenta*: theſe, in point of number, are exceedingly diverſified; ſome having only one cell, as the primroſe; and others many, as the water-lily. Hence a capſule is termed *unilocular*, *bilocular*, *trilocular*, &c. according as it has one, two, three, &c. cells or cavities.

Capsulæ Atrabiliariæ, called alſo *glandulæ renales*, and *renes ſuccenturiati*. See Anatomy, n° 100.

CAPTAIN, a military officer, whereof there are ſeveral kinds, according to their commands.

Captain of a Troop or Company, an inferior officer who commands a troop of horſe or a company of foot, under a colonel. The duty of this officer is to be careful to keep his company full of able bodied ſoldiers; to viſit their tents and lodgings, to ſee what is wanting; to pay them well; to cauſe them keep themſelves neat and clean in their clothes, and their arms bright. He has power in his own company of making ſerjeants, corporals, and lanſpeſades.

In the horſe and foot guards, the captains have the rank of colonels.

Captain-General, he who commands in chief.

Captain-Lieutenant, he who with the rank of captain, but the pay of lieutenant, commands a troop or company in the name and place of ſome other perſon who is diſpenſed with on account of his quality from performing the functions of his poſt.

Thus the colonel being uſually captain of the firſt company in his regiment, that company is commanded by his deputy under the title of *captain-lieutenant*.

So in England, as well as in France, the king, queen, dauphin, princes, &c. have uſually the title of captain of the guards, *gens d'armes*, &c. the real duty of which offices is performed by captain-lieutenants.

CAPTAIN Reformed, one who, upon the reduction of the forces, has his commiſſion and company ſuppreſſed; yet is continued captain, either as ſecond to another, or without any poſt or command at all.

CAPTAIN of a Ship of War, the officer who commands a ſhip of the line of battle, or a frigate carrying 20 or more cannon. The charge of a captain in the Britiſh navy is very comprehenſive, in as much as he is not only anſwerable for any bad conduct in the military government, navigation, and equipment of the ſhip he commands, but alſo for any neglect of duty or ill management in his inferior officers, whoſe ſeveral charges he is appointed to ſuperintend and regulate.

On his firſt receiving information of the condition and quality of the ſhip he is appointed to command, he muſt attend her conſtantly, and haſten the neceſſary preparations to fit her for ſea. So ſtrict, indeed, are the injunctions laid on him by the lord high admiral, or commiſſioners of the admiralty, that he is forbid to lie out of his ſhip, from his arrival on board to the day of his diſcharge, unleſs by particular leave from the admiralty, or from his commander in chief. He is enjoined to ſhew a laudable example of honour and virtue to the officers and men; and to diſcountenance all diſſolute, immoral, and diſorderly practices, and ſuch as are contrary to the rules of ſubordination and diſcipline; as well as to correct thoſe who are guilty of ſuch offences as are puniſhable according to the uſage of the ſea. He is ordered particularly to ſurvey all the military ſtores which are ſent on board, and to return whatever is deemed unfit for ſervice. His diligence and application are required to procure his complement of men; obſerving carefully to enter only ſuch as are fit for the neceſſary duty, that the government may not be put to unneceſſary expence. When his ſhip is fully manned, he is expected to keep the eſtabliſhed number of men complete, and ſuperintend the muſter himſelf if there is no clerk of the check at the port. When his ſhip is employed on a cruiſing ſtation, he is expected to keep the ſea the whole length of time previouſly appointed; but if he is compelled by ſome unexpected accident to return to port ſooner than the time limited, he ought to be very cautious in the choice of a good ſituation for anchoring, ordering the maſter or other careful officer to ſound and diſcover the depths of water and dangers of the coaſt. Previous to any poſſibility of an engagement with the enemy, he is to quarter the officers and men to the neceſſary ſtations according to their office and abilities, and to exerciſe them in the management of the artillery, that they may be more expert in time of battle. His ſtation in the time of an engagement is on the quarter-deck: at which time he is expected to take all opportunities of annoying his enemy, and improving every advantage over him; to exhibit an example of courage and fortitude to his officers and crew; and to place his ſhip oppoſite to his adverſary in ſuch a poſition as that every cannon ſhall do effectual execution. At the time of his arrival in port, after his return from abroad, he is to aſſemble his officers, and draw up a detail of the obſervations that have been made during the voyage, of the qualities of the ſhip as to her trim, ballaſt, ſtowage, manner of ſailing, for the information and direction of thoſe who may ſucceed him in the command: and this account is to be ſigned by himſelf and officers, and to be returned to the reſident commiſſioner of the navy at the port where the ſhip is diſcharged.

CAPTAIN of a Merchant-ſhip, he who has the direction of the ſhip, her crew, and lading, &c. In ſmall ſhips and ſhort voyages, he is more ordinarily called the *maſter*. In the Mediterranean, he is called the *patroon*.—The proprietor of the veſſel appoints the captain or maſter; and he is to form the crew, and chooſe and hire the pilots, mates, and ſeamen; though, when the proprietor and maſter reſide on the ſame ſpot, they generally act in concert together.

CAPTAIN Baſhaw, or *Capondan Baſhaw*, in the polity of the Turks, ſignifies the Turkiſh high admiral. He poſſeſſes the third office of the empire, and is inveſted with the ſame power at ſea that the vizir has on ſhore. Soliman II. inſtituted this office in favour of the famous Barbaroſſa, with abſolute authority over the officers of the marine and arſenal, whom he may puniſh, caſhier, or put to death, as ſoon as he is without the Dardanelles. He commands in chief in all the maritime countries, cities, caſtles, &c. and, at Conſtantinople, is the firſt magiſtrate of police in the villages on the ſide of the port, and the canal of the Black-Sea. The mark of his authority is a large Indian cane, which he carries in his hand, both in the arſenal and with the army.—The captain-baſhaw enjoys two ſorts of revenues; the one fixed, the other caſual. The firſt ariſe from a capitation of the iſlands in the Archipelago, and certain governments in Natolia and Galipoli. The latter conſiſt in the pay of the men who die during a campaign; in a fifth of all prizes made by the begs; in the profits accruing from the labour of the ſlaves, whom he hires as rowers to the grand ſignior; and in the contributions he exacts in all places where he paſſes.

CAPTION, in Scots law, a writ iſſuing under his majeſty's ſignet, in his majeſty's name, obtained at the inſtance of a creditor in civil debt, commanding meſſengers at arms and other officers of the law to apprehend and impriſon the perſon of the debtor until he pay the debt.—It is alſo the name of a writ iſſued by the court of Seſſion againſt the agents of the court, to return papers belonging to proceſſes or law-ſuits, or otherwiſe to go to priſon.

CAPTIVE, a ſlave, or a perſon taken from the enemy.

Formerly captives in war became the ſlaves of thoſe who took them; and though ſlavery, ſuch as obtained among the ancients, is now aboliſhed, ſome ſhadow of it ſtill remains in reſpect of priſoners of war, who are accounted the property of their captors, and have no right to liberty but by conceſſion from them.—The Romans uſed their captives with great ſeverity; their necks were expoſed to the ſoldiers to be trampled on, and their perſons afterwards ſold by public auction. Captives were frequently burnt on the funeral piles of the ancient warriors, as a ſacrifice to the infernal

fernal gods. Thoſe of royal or noble blood had their heads ſhaven, and their hair ſent to Rome to ſerve as decorations for female toys, &c. They were led in triumph loaded with chains through Rome, in the emperor's train, at leaſt as far as the foot of the Capitoline mount, for they were not permitted to aſcend the ſacred hill, but carried thence to priſon. Thoſe of the prime quality were honoured with golden chains on their hands and feet, and golden collars on their necks. If they made their eſcape, or killed themſelves, to avoid the ignominy of being carried in triumph, their images or effigies were frequently carried in their place.

CAPTIVITY, in a general ſenſe, the ſtate or condition of a captive.

Captivity, in ſacred hiſtory, a puniſhment which God inflicted upon his people for their vices and infidelities. The firſt of theſe captivities is that of Egypt, from which Moſes delivered them; after which, are reckoned ſix during the government of the judges; but the greateſt and moſt remarkable were thoſe of Judah and Iſrael, which happened under the kings of each of theſe kingdoms. It is generally believed, that the ten tribes of Iſrael never came back again after their diſperſion; and Joſephus and St Jerom are of this opinion: nevertheleſs, when we examine the writings of the prophets, we find the return of Iſrael from captivity pointed out in a manner almoſt as clear as that of the tribes of Benjamin and Judah: See Hoſea i. 10, 11. Amos ix. 14. The captivities of Judah are generally reckoned four; the fourth and laſt of which fell in the year of the world 3416, under Zedekiah: and from this period begins the 70 years captivity foretold by Jeremiah.

Since the deſtruction of the temple by the Romans, the Hebrews boaſt that they have always had their heads or particular princes, whom they call *princes of the captivity*, in the eaſt and weſt. The princes of the captivity in the eaſt governed the Jews that dwelt in Babylon, Aſſyria, and Perſia; and the princes of the captivity in the weſt governed thoſe who dwelt in Judæa, Egypt, Italy, and in other parts of the Roman empire. He who reſided in Judæa commonly took up his abode at Tiberias, and aſſumed the name of *Roſchabboth*, "head of the fathers or patriarchs." He preſided in aſſemblies, decided in caſes of conſcience, levied taxes for the expences of his viſits, and had officers under him who were diſpatched through the provinces for the execution of his orders. As to the princes of the captivity at Babylon, or the eaſt, we know neither the original nor ſucceſſion of them. It only appears that they were not in being before the end of the ſecond century.

CAPTURE, a prize, or prey; particularly that of a ſhip taken at ſea. Captures made at ſea were formerly held to be the property of the captors after a poſſeſſion of twenty-four hours; but the modern authorities require, that before the property can be changed, the goods muſt have been brought into port, and have continued a night *intra præſidia*, in a place of ſafe cuſtody, ſo that all hope of recovering them was loſt.

Capture alſo denotes an arreſt or ſeizure of a criminal, debtor, &c. at land.

CAPUA, (anc. geog.) a very ancient city of Italy, in Campania, and capital of that diſtrict. It is famous for the abode of Hannibal the Carthaginian general after the battle of Cannæ, and where Livy accuſes him, but unjuſtly, of having enervated himſelf with pleaſures*. It ſtill retains the name, and is the ſee of an archbiſhop. It is ſeated on the river Vulturno, in E. Long 15. 5. N. Lat. 41. 7. The hiſtory of Capua is thus ſhortly deduced by Mr Swinburne. "It was a ſettlement of the Oſci known before the foundation of Rome; as the amazing fertility of the land and a lucrative commerce poured immenſe wealth upon its inhabitants, it became one of the moſt extenſive and magnificent cities in the world. With riches exceſſive luxury crept in, and the Capuans grew inſolent; but by their effeminacy they ſoon loſt the power of repelling thoſe neighbouring nations which their inſolence had exaſperated: For this reaſon Capua was continually expoſed to the neceſſity of calling in foreign aid, and endangering its ſafety by the uncommon temptations it offered to needy auxiliaries. The Roman ſoldiers ſent to defend Capua were on the point of making it their prey, and often the voice of the Roman people was loud for a removal from the barren unwholeſome banks of the Tiber to the garden of Italy, near thoſe of the Vulturno. Through well-founded jealouſy of the ambition of Rome, or, as Livy and other partial writers term it, natural inconſtancy, the Capuans warmly eſpouſed the quarrel of Carthage: Hannibal made Capua his winter-quarters after the campaign of Cannæ; and there, if we are to believe hiſtorians, his rough and hitherto invincible ſoldiers were enervated by pleaſure and indolence.

"When through a failure of ſupplies from Carthage Hannibal was under a neceſſity of remaining in Brutium, and leaving the Capuans to defend themſelves, this city, which had been long inveſted, was ſurrendered at diſcretion to the conſuls Appius Claudius and Q. Fulvius Flaccus. The ſenators were put to death, the nobles impriſoned for life, and all the citizens ſold and diſperſed. Vibius, the chief of Hannibal's friends, avoided this ignominous fate, and eſcaped from the cruel vengeance of the Romans by a voluntary death. —When the mob inſiſted upon the gates being thrown open to the enemy, Vibius aſſembled his ſteady aſſociates, and ſat down with them to a ſuperb banquet, after which each of the gueſts ſwallowed a poiſonous draught, and expired in full poſſeſſion of their freedom. The buildings were ſpared by the victor; and Capua was left to be merely a harbour for the huſbandmen of the plain, a warehouſe for goods, and a granary for corn; but ſo advantageous a ſituation could not long be neglected; colonies were ſent to inhabit it, and in proceſs of time it regained a degree of importance.

"Genſeric the Vandal was more cruel than the Roman conquerors had been; for he maſſacred the inhabitants, and burnt the town to the ground. Narſes rebuilt it; but in 841 it was totally deſtroyed by an army of Saracens, and the inhabitants driven into the mountains. Some time after the retreat of theſe ſavage invaders, the Lombards ventured down again into the plain, but not deeming their force adequate to the defence of ſo large a circuit as the old city, they built themſelves a ſmaller one on the river, and called it Capua.—They choſe the ſite of Caſilinum, famous in the ſecond Punic

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* See *Carthage.*

nic war for the reſiſtance made by its garriſon againſt Hannibal. Since the foundation of the new city, old Capua has remained in ruins.

“ In 856 Landulph formed here an independent earldom diſmembered from the duchy of Benevento, and in the courſe of a few generations Capua acquired the title of a principality. In the 11th century, the Normans of Averſa expelled the Lombard race of princes, and Richard their chief became prince of Capua ; the grandſon of Tancred of Hauteville drove out the deſcendants of Richard, and united this ſtate to the reſt of his poſſeſſions.

“ Capua is at preſent a neat little city, fortified according to the rules of modern art, and may be conſidered as the key of the kingdom : though far removed from the frontier, it is the only fortification that really covers the approach to Naples.”

CAPUCHINS, religious of the order of St Francis in its ſtricteſt obſervance; deriving their name from *capuce*, or *capuchon*, a ſtuff cap, or cowl, wherewith they cover their heads. They are clothed with brown or grey ; always bare-footed ; are never to go in a coach, nor ever ſhave their beard.—The capuchins are a reform made from the order of minors, commonly called *cordeliers*, ſet on foot in the 16th century by Matthew Baſchi, a religious obſervant of the monaſtery of Monteſiaſcone ; who, being at Rome, was advertiſed ſeveral times from heaven, to practiſe the rule of St Francis to the letter. Upon this he made application to pope Clement in 1525 ; who gave him permiſſion to retire into a ſolitude, with as many others as choſe to embrace the ſtrict obſervance. In 1528, they obtained the pope's bull. In 1529, the order was brought into complete form ; Matthew was elected general, and the chapter made conſtitutions. In 1543, the right of preaching was taken from the capuchins by the pope : but in 1545 it was reſtored to them again with honour. In 1578, there were already 17 general chapters in the order of capuchins.

CAPUT, the head. See HEAD.

Caput baroniæ, the head of the barony, in ancient cuſtoms, denotes the ancient or chief ſeat or caſtle of a nobleman, where he made his uſual reſidence, and held his court ; ſometimes alſo called *caput honoris*, or the head of the honour. The Caput baroniæ could not be ſettled in dowry ; nor could it be divided among the daughters, in caſe there were no ſon to inherit ; but was to deſcend entire to the eldeſt daughter, *cæteris filiabus aliunde ſatisfactis*.

Caput gallinaginis, in anatomy, is a kind of ſeptum, or ſpongious border, at the extremities or apertures of each of the *veſiculæ ſeminales* ; ſerving to prevent the ſeed coming from one ſide, from ruſhing upon, and ſo ſtopping, the diſcharge of the other.

Caput lupinum. Anciently an outlawed felon was ſaid to have *caput lupinum*, and might be knocked on the head like a *wolf*, by any one that ſhould meet him ; becauſe, having renounced all law, he was to be dealt with as in a ſtate of nature, when every one that ſhould find him might ſlay him : yet now, to avoid ſuch inhumanity, it is holden that no man is intitled to kill him wantonly and wilfully ; but in ſo doing he is guilty of murder, unleſs it is done in the endeavour to apprehend him.

Caput Mortuum, a Latin name given to fixed and exhauſted reſiduums remaining in retorts after diſtillations. As theſe reſiduums are very different, according to the ſubſtances diſtilled, and the degree of heat employed, they are by the more accurate modern chemiſts particularly ſpecified by adding a term denoting their qualities ; as *earthy reſiduum, charry reſiduum, ſaline reſiduum*, &c.

CARABINE, a fire-arm ſhorter than a muſket, carrying a ball of 24 in the pound, borne by the light horſe, hanging at a belt over the left ſhoulder. The barrel is two feet and an half long ; and is ſometimes furrowed ſpirally within, which is ſaid to add to the range of the piece.

CARABINEERS, regiments of light horſe, carrying longer carabines than the reſt, and ſometimes uſed on foot.

CARABUS, in zoology, a genus of inſects belonging to the order of coleoptera, or the beetle kind. The feelers are briſtly ; the breaſt is ſhaped like a heart, and marginated ; and the elytra are likewiſe marginated. There are 34 ſpecies of this genus, moſtly diſtinguiſhed by their colour. The moſt remarkable is the crepitans, or bombardier, with the breaſt, head, and legs, ferruginous or iron-coloured, and the elytra black. It keeps itſelf concealed among ſtones, and ſeems to make little uſe of its wings : when it moves, it is by a ſort of jump ; and whenever it is touched, one is ſurpriſed to hear a noiſe reſembling the diſcharge of a muſket, in miniature, during which a blue ſmoke may be perceived to proceed from its anus. The inſect may be made at any time to play off its artillery, by ſcratching its back with a needle. If we may believe Rolander, who firſt made theſe obſervations, it can give 20 diſcharges ſucceſſively. A bladder placed near the anus is the arſenal whence it derives its ſtore, and this is its chief defence againſt an enemy, although the ſmoke emitted ſeems to be altogether inoffenſive, except it be by cauſing a fright, or concealing its courſe. Its chief enemy is another ſpecies of the ſame genus, but four times larger : when purſued and fatigued, the bombardier has recourſe to this ſtratagem, by lying down in the path of the large carabus, which advances with open mouth and claws to ſeize it ; but, on this diſcharge of the artillery, ſuddenly draws back, and remains a while confuſed : during which the bombardier conceals himſelf in ſome neighbouring crevice ; and if not happy enough to find one, the large carabus returns to the attack, takes the inſect by the head, and tears it off.

Plate CXXV.

CARACALLA, (M. Antoninus Baſſianus), emperor after his father Severus in 211, put the phyſicians to death for not diſpatching his father as he would have had them. He killed his brother Geta ; and put Papinianus to death, becauſe he would not defend nor excuſe his parricide. In ſhort, it is ſaid that 20,000 perſons were maſſacred by his order. He married Julia, his father's widow. Going to Alexandria, he ſlew the inhabitants, and applied to the magicians and aſtrologers. At laſt, going from Edeſſa to Meſopotamia, one of his captains ſlew him, by order of Macrinus, who ſucceeded him. He died after he had reigned ſomewhat more than ſix years.

CARACALLA, in antiquity, a long garment, having a ſort of capuchin, or hood a-top, and reaching to the heels ; worn equally among the Romans by the men and

and the women, in the city and the camp. Spartian and Xiphilian repreſent the emperor Caracalla as the inventor of this garment, and hence ſuppoſe the appellation *Caracalla* was firſt given him. Others, with more probability, make the caracalla originally a Gallic habit, and only brought to Rome by the emperor abovementioned, who firſt enjoined the ſoldiery to wear it. The people called it *antoninian*, from the ſame prince, who had borrowed the name of Antoninus. The caracalla was a ſort of caſſock, or ſurtout. Salmaſius, Scaliger, and after them Du-Cange, even take the name *caſaque* to have been formed from that of *caraque*, for *caracalla*. This is certain from St Jerom, that the caracalla, with a retrenchment of the capuchin, became an eccleſiaſtical garment. It is deſcribed as made of ſeveral pieces cut and ſewed together, and hanging down to the feet; but it is more than probable there were ſome made ſhorter, eſpecially out of Rome, otherwiſe we do not ſee how it could have fitted the ſoldiers purpoſes.

CARACCAS, a diſtrict of Terra Firma in South America, belonging to the Spaniards. The coaſt is rocky and mountainous, interſperſed with ſmall fertile valleys; ſubjected at certain ſeaſons of the year to dry north-weſt winds, but bleſſed in general with a clear air and wholeſome climate. A very great illicit trade is carried on by the Engliſh and Dutch with this province, notwithſtanding all the vigilance of the Spaniards, who have ſcouts perpetually employed, and breaſt-works raiſed in all the valleys. A vaſt number of cacao-trees are cultivated in this province; and it is reckoned that the crop of cacao produced here amounts to more than 100,000 fanegas of 110 pounds each. The country of Santa Fe conſumes 20,000; Mexico a little more; the Canaries a ſmall cargo; and Europe from 50 to 60,000. The cultivation of the plant employs 10 or 12,000 negroes. Such of them as have obtained their liberty have built a little town called *Nirva*, into which they will not admit any white people. The chief town is likewiſe called *Caraccas*, and is ſituated in N. Lat. 10. 10. Dampier ſays it ſtands at a conſiderable diſtance from the ſea; is large, wealthy, and populous; and extremely difficult of acceſs, by reaſon of the ſteep and craggy hills over which an enemy muſt take his route. The commerce of this town, to which the bay of Guaira at two leagues diſtance ſerves for a harbour, was for a long time open to all the ſubjects of the Spaniſh monarchy, and is ſtill ſo to the Americans; but the Europeans are not ſo well treated. In 1728 a company was formed at St Sebaſtian, which obtained an excluſive right of maintaining connections with this part of the new world. Four or five ſhips, which they diſpatch every year, ſail from thence, but they return to Cadiz.

CARACCI, (Lewis, Auguſtin, and Hannibal), three celebrated painters of the Lombard ſchool, all of Bologna. Lewis was born in 1555; and was couſin-german to Auguſtin and Hannibal who were brothers, the ſons of a taylor, who was yet careful to give them a liberal education. They were both diſciples of their couſin Lewis. Auguſtin gained a knowledge of mathematics, natural philoſophy, muſic, poetry, and moſt of the liberal arts; but, though painting was his principal purſuit, he learned the art of engraving from Cornelius Cort, and ſurpaſſed all the maſters of his time. Hannibal, again, never deviated from his pencil. —Theſe three painters, at length, having reaped all the advantages they could by contemplation and practice, formed a plan of aſſociation, continued always together, and laid the foundation of that celebrated ſchool which has ever ſince been known by the name of *Caracci's academy*. Hither all the young ſtudents, who had a view of becoming maſters, reſorted to be inſtructed in the rudiments of painting; and here the Caracci taught freely, and without reſerve, all that came. Lewis's charge was to make a collection of antique ſtatues and bas-reliefs. They had deſigns of the beſt maſters, and a collection of curious books on all ſubjects relating to their art; and they had a ſkilful anatomiſt always ready to teach what belonged to the knitting and motions of the muſcles, *&c.* There were often diſputations in the academy; and not only painters, but men of learned profeſſions, propoſed queſtions, which were always decided by Lewis. Every body was well received; and though ſtated hours were allotted to treat of different matters, yet improvements might be made at all hours by the antiquities and the deſigns which were to be ſeen.

The fame of the Caracci reaching Rome, the cardinal Farneſe ſent for Hannibal thither, to paint the gallery of his palace. Hannibal was the more willing to go, becauſe he had a great deſire to ſee Raphael's works, with the antique ſtatues and bas-reliefs. The guſto which he took there from the ancient ſculpture, made him change his Bolognian manner for one more learned but leſs natural in the deſign and in the colouring. Auguſtin followed Hannibal, to aſſiſt him in his undertaking of the Farneſe gallery; but the brothers not rightly agreeing, Farneſe ſent Auguſtin to the court of the duke of Parma, where he died in the year 1602, being only 45 years of age. His moſt celebrated piece of painting is that of the communion of St Jerom, in Bologna.

In the mean while, Hannibal continued working in the Farneſe gallery at Rome; and, after inconceivable pains and care, finiſhed the paintings in the perfection in which they are now to be ſeen. He hoped that the cardinal would have rewarded him in ſome proportion to the excellence of his work, and the time it took him up, which was eight years; but he was diſappointed. The cardinal, influenced by an ignorant Spaniard his domeſtic, gave him but a little above 200l. though it is certain he deſerved more than twice as many thouſands. When the money was brought him, he was ſo ſurpriſed at the injuſtice done him that he could not ſpeak a word to the perſon who brought it. This confirmed him in a melancholy to which his temper naturally inclined, and made him reſolve never more to touch his pencil; which reſolution he had undoubtedly kept, if his neceſſities had not compelled him to break it. It is ſaid that his melancholy gained ſo much upon him, that at certain times it deprived him of the uſe of his ſenſes. It did not, however, put a ſtop to his amours; and his debauches at Naples, whither he had retired for the recovery of his health, brought a diſtemper upon him of which he died in 1609, when he was 49 years of age. His veneration for Raphael was ſo great, that it was his deathbed requeſt to be buried in the ſame tomb with him; which was accordingly done, in the pantheon or rotunda at Rome. There are extant ſeveral prints of the bleſſed Virgin, and ſome other ſubjects etched by the hand of this incomparable artiſt. He is ſaid to have been a friendly, plain, honeſt, and open-hearted man: very communicative to his ſcholars: and ſo extremely kind to them, that he generally kept his money in the ſame box with his colours, where they might have recourſe to either as they had occaſion.

While Hannibal Caracci worked at Rome, Lewis was courted from all parts of Lombardy, eſpecially by the clergy, to make pictures in their churches; and we may judge of his capacity and facility, by the great number of pictures he made, and by the preference that was given him to other painters. In the midſt of theſe employments Hannibal ſolicited him to come and aſſiſt him in the Farneſe gallery: and ſo earneſtly, that he could not avoid complying with his requeſt. He went to Rome; corrected ſeveral things in that gallery; painted a figure or two himſelf; and then returned to Bologna, where he died in 1619, aged 64.

CARACOL, in the manege, the half turn which an horſeman makes, either to the right or left—In the army, the horſe always makes a caracol after each diſcharge, in order to paſs the rear of the ſquadron.

CARACOL, in architecture, denotes a ſtair-caſe in a helix or ſpiral form.

CARACOLI, a kind of metal of which the Caribbees, or natives of the Leſſer Antilles, make a ſort of ornament in the form of a creſcent, which they alſo call *caracoli*.—This metal comes from the main land: and the common opinion is, that it is a compound of ſilver, copper, and gold, ſomething like the Corinthian braſs among the ancients. Theſe metals are ſo perfectly mixed and incorporated together, that the compound which reſults from them, it is ſaid, has a colour that never alters, how long ſoever it remains in the ſea or under ground. It is ſomewhat brittle; and they who work at it are obliged to mix a large proportion of gold with it, to make the compound more tough and malleable.

CARACT, or CARAT, the name of that weight which expreſſes the degree of fineneſs that gold is of. The word is alſo written, *carract*, *carrat*, *karract*, and *karrat*. Its origin is conteſted: But the moſt probable opinion is that of Kennet, who derives it from *carecta*, a term which anciently denoted any weight, and came not till of later days to to be appropriated to that which expreſſes the fineneſs of gold and the gravity of diamonds.

Theſe carats are not real determinate weights, but only imaginary. The whole maſs, be the weight what it will, is conceived to be divided into 24 carats; and as many 24th parts as it contains of pure gold, it is called *gold of ſo many carats*, or *ſo many carats fine.* Thus, gold of 18 carats is a mixt, of which 18 parts is pure gold, and the other ſix an inferior metal, &c. This is the common way of reckoning in Europe, and at the gold mines in the Spaniſh Weſt Indies, but with ſome variation in the ſubdiviſion of the carat: among us, it is divided into four grains; among the Germans, into 12 parts; and by the French, according to Mr Helot, into 32. The Chineſe reckon by a different diviſion called *touches*, of which the higheſt number, or that which denotes pure gold, is 100; ſo that 100 touches correſpond to our 24 carats, &c.

CARACT is alſo a certain weight which goldſmiths and jewellers uſe wherewith to weigh precious ſtones and pearls.—In this ſenſe, the word is by ſome ſuppoſed to be derived from the Greek *κερατιον*, a fruit which the Latins call *ſiliqua*, and we *carob bean*; each of which may weigh about four grains of wheat, whence the Latin *ſiliqua* has been uſed for a weight of four grains. This caract weighs four grains, but they are ſomething lighter than the grains of other weights. Each of theſe grains is ſubdivided in $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, &c.

CARACTACUS, a renowned king of the ancient Britiſh people called *Silures*, inhabiting South Wales. Having valiantly defended his country ſeven years againſt the Romans, he was at length defeated; and flying to Cartiſmunda, queen of the Brigantes (inhabitants of Yorkſhire), was by her treacherouſly delivered up to the Romans, and led in triumph to the emperor Claudius then at York; where his noble behaviour, and heroic but pathetic ſpeech, obtained him not only his liberty, but the eſteem of the emperor, A. D. 52.

CARAGROUTH, in commerce, a ſilver coin of the empire, weighing nine drachms. It goes at Conſtantinople for 120 aſpers. There are four ſorts of them, which are all equally current and of the ſame value.

CARAITES, in the eccleſiaſtical hiſtory of the Jews, a religious ſect among that people, whereof there are ſtill ſome ſubſiſting in Poland, Ruſſia, Conſtantinople, Cairo, and other places of the Levant, whoſe diſtinguiſhing tenet and practice it is, to adhere cloſely to the words and letter of the ſcripture, excluſive of allegories, traditions, and the like.

Leo of Modena, rabbin of Venice, obſerves, that of all the hereſies among that people, before the deſtruction of the temple, there is none now left but that of the *Caraim*, a name derived from *Micra*, which ſignifies the pure text of the Bible; becauſe of their keeping to the Pentateuch, obſerving it to the letter, and rejecting all interpretations, paraphraſes, and conſtitutions of the rabbins. Aben Ezra, and ſome other rabbins, treat the Caraites as Sadducees; but Leo de Juda calls them, more accurately, Sadducees reformed; becauſe they believe the immortality of the ſoul, paradiſe, hell, reſurrection, &c. which the ancient Sadducees denied. He adds, however, that they were doubtleſs originally real Sadducees, and ſprung from among them.

M. Simon, with more probability, ſuppoſes them to have riſen hence; that the more knowing among the Jews oppoſing the dreams and reveries of the rabbins, and uſing the pure texts of ſcripture to refute their groundleſs traditions, had the name of *Caraim* given them; which ſignifies as much as the barbarous Latin, *Scripturarii*; i. e. people attached to the text of ſcripture. The other Jews give them the odious name Sadducees, from their agreement with thoſe ſectaries on the head of traditions. Scaliger, Voſſius, and Spanheim, rank the Caraites among the Sabeans, Magi, Manichees, and Muſſulmans, but by miſtake: Wolfgang, Fabricius, &c. ſay the Sadducees and Eſſeni were called Caraites, in oppoſition to the Phariſees: others take them for the doctors of the law ſo often mentioned in the goſpel; but theſe are all conjectures. Joſephus and Philo make no mention of them; which ſhows them to be more modern than either of thoſe authors. In all probability, this ſect was not formed till after the collection of the ſecond part of the Talmud, or the Gemara; perhaps not till after the compiling of the Miſchna in the third century. The Caraites themſelves pretend to be the remains of the ten tribes led captive by Shalmaneſer. Wolfius, from the Memoirs of Mardacheus, a Caraite, refers their origin to a maſſacre among the Jewiſh doctors, under Alexander Jannæus, their king, about 100 years before Chriſt: becauſe Simeon, ſon of Schetach, and the queen's brother, making his eſcape into Egypt, there forged his pretended traditions; and, at his return to Jeruſalem, publiſhed his viſions; interpolating the law after his own fancy, and ſupporting his novelties on the notices which God, he ſaid, had communicated by the mouth of Moſes, whoſe depoſitary he was: he gained many followers; and was oppoſed by others, who maintained, that all which God had revealed to Moſes was written. Hence the Jews became divided into two ſects, the Caraites and Traditionaries: among the firſt, Juda, ſon of Tabbai, diſtinguiſhed himſelf; among the latter, Hillel. Wolfius, reckons not only the Sadducees, but alſo the Scribes, in the number of Caraites. But the addreſs of the Phariſees prevailed againſt them all; and the number of Caraites decreaſed: Anan, indeed, in the eighth century, retrieved their credit a little; and rabbi Schalomon in the ninth. They ſucceeded pretty well till the fourteenth; but ſince that time they have been declining.

The Caraites are but little known; their works coming only into very few hands, even among the greateſt Hebraiſts. Buxtorf never ſaw more than one; Selden two; but Mr Trigland ſays, he has recovered enough to ſpeak of them with aſſurance. He aſſerts, that ſoon after the prophets had ceaſed, the Jews became divided on the ſubject of works, and ſupererogation: ſome maintaining their neceſſity from tradition; whilſt others keeping cloſe to the written law, ſet them aſide; and it was from theſe laſt that Caraitiſm commenced. He adds, that after the return from the Babyloniſh captivity, the obſervation of the law being to be reeſtabliſhed, there were ſeveral practices found proper for that end; and theſe once introduced, were looked upon as eſſential, and appointed by Moſes; which was the origin of Phariſaiſm; as a contrary party, continuing to keep cloſe to the letter, founded Caraitiſm.

The modern Caraites, Leo of Modena obſerves, have their ſynagogues and ceremonies; they pretend to be the ſole proper Jews, or obſervers of the laws of Moſes; calling the reſt by the term *Rabbanim*, or *followers of the Rabbins:* theſe hate the Caraites mortally; refuſing to ally or even converſe with them, and treating them as *mamzerim*, or baſtards; becauſe of their rejecting the conſtitutions of the rabbins relating to marriages, repudiations, purifications of women, &c. This averſion is ſo great, that if a Caraite would become a rabbiniſt, he would never be received by the other Jews.

The Caraites, however, do not abſolutely reject all kind of traditions; but only ſuch as do not appear well-grounded. Selden, who is very expreſs on this point, in his Uxor Hebraica, obſerves, that beſides the mere text, they have certain interpretations, which they call hereditary, and which are proper traditions. Their theology only ſeems to differ from that of the other Jews, in that it is purer, and clearer of ſuperſtition: they give no credit to the explications of the Cabbaliſts, chimerical allegories, nor to any conſtitutions of the Talmud, but what are conformable to the ſcripture, and may be drawn from it by juſt and neceſſary conſequences.

Peringer obſerves of the Caraites in Lithuania, that they are very different, both in aſpect, language, and manners, from the rabbiniſts, wherewith that country abounds. Their mother tongue is the Turkiſh; and this they uſe in their ſchools and ſynagogues. In viſage they reſemble the Mahometan Tartars. Their ſynagogues are placed north and ſouth; and the reaſon they give for it is, that Shalmaneſer brought them northward: ſo that in praying, to look to Jeruſalem, they muſt turn to the ſouth. He adds, that they admit all the books of the Old Teſtament; contrary to the opinion of many of the learned, who hold that they reject all but the Pentateuch.

Caleb, a Caraite, reduces the difference between them and the rabbiniſts to three points: 1. In that they deny the oral law to come from Moſes, and reject the Cabbala. 2. In that they abhor the Talmud. 3. In that they obſerve the feaſts, as the ſabbaths, &c. much more rigorouſly than the rabbins do. To this may be added, that they extend the degrees of affinity, wherein marriage is prohibited, almoſt to infinity.

CARAMANIA, a conſiderable province of Turkey, in Aſia, in the ſouth part of Natolia. Bajazet united this province to his empire about the year 1488, and ſince that time it has continued in the poſſeſſion of the Turks. Satalia was the capital city, but is now much decayed.

CARAMANTA, a town of South America, and capital of a province of the ſame name in Terra Firma, and in the audience of Santa Fe. W. Long. 72. 35. N. Lat. 5. 18. The province of Caramanta is extended on both ſides the river Cauca; and is bounded on the north by the diſtrict of Carthagena, on the eaſt by New Grenada, on the ſouth by Popayan, and on the weſt by Popayan and by the audience of Panama. It is a valley ſurrounded on every ſide by very high mountains.

CARANGA, an inconſiderable iſland near Bombay in the Eaſt Indies. It affords nothing but ſome rice, fowls, and goats, for that market.

CARANNA, or KARANNA, a very ſcarce gum which comes from New Spain. It is ſaid to poſſeſs many extraordinary medical virtues, but the preſent practice takes no notice of it.

CARANUS, the firſt king of Macedon, and the ſeventh of the race of the Heraclides. See MACEDONIA.

CARARA, a weight at Leghorn, and in other parts of Italy, uſed in the ſale of wool and cod-fiſh, equivalent to 60 pounds of that country.

CARAT. See CARACT.

CARAVAGGIO, (Michael Angelo da). See ANGELO.

CARAVAN, or KARAVANNE, in the eaſt, ſignifies a company or aſſembly of travellers and pilgrims, and more particularly of merchants, who, for their greater ſecurity, and in order to aſſiſt each other, march in a body through the deſerts, and other dangerous places, which are infeſted with Arabs or robbers.

There

There are four regular caravans which go yearly to Mecca; the firſt from Damaſcus, compoſed of the pilgrims from Europe and Aſia; the ſecond from Cairo, for the Mahometans of Barbary; the third from Zibith, a place near the mouth of the Red Sea, where thoſe of Arabia and India meet; the fourth from Babylon, where the Perſians aſſemble. Moſt of the inland commerce of the Eaſt is carried on by caravans. The late czar Peter the Great eſtabliſhed a trade between Ruſſia and China by means of a caravan. M. Bougnon, geographer to the duke of Lorrain, has given a treatiſe of the caravans of merchants in Aſia; wherein he ſhows of what they are compoſed, how many ſorts there are, the ſeveral uſes of the different ſorts of animals in them; the prices given for them, the officers and men appointed to conduct them, and the pay of each, with their manner of marching, halting, fighting retreating, &c. Caravans of this kind are large convoys of armed men, merchants, and travellers, with divers ſorts of animals for the carriage of their proviſions. There are commonly four chief officers of a caravan, viz. the caravan bachi, or chief; the captain-guide; captain of reſt; and captain of diſtribution. The firſt has abſolute command over all the reſt: the ſecond is abſolute in the march: the office of the third only commences when the caravan ſtops and makes a ſtay: to the fourth it belongs to diſpoſe of every part of the corps, in caſe of an attack or battle; he has alſo the inſpection over the diſtribution of proviſions, which is made under him by ſeveral diſtributors, who give ſecurity to the maſter of the caravan, and have each of them a certain number of perſons, elephants, dromedaries, &c. to take care of at their own peril. The treaſurer of the caravan makes a fifth officer, who has under him ſeveral agents and interpreters, who keep journals of all that paſſes, for the ſatisfaction of thoſe concerned in fitting out the caravan.

Any dealer is at liberty to form a company, in order to make a caravan. He in whoſe name it is raiſed, is conſidered as the caravan bachi, or chief of the caravan, unleſs he appoint ſome other in his place. If there are ſeveral merchants equally concerned, they elect a caravan bachi; after which, they appoint officers to conduct the caravan and decide all controverſies that may ariſe during the journey.

There are alſo ſea caravans; eſtabliſhed on the ſame footing, and for the ſame purpoſes: ſuch is the caravan of veſſels from Conſtantinople to Alexandria.

CARAVANSERA, or Karavansera, a place appointed for receiving and loading the caravans.

It is commonly a large ſquare building, in the middle of which there is a very ſpacious court; and under the arches or piazzas that ſurround it there runs a bank raiſed ſome feet above the ground, where the merchants, and thoſe who travel with them in any capacity, take up their lodgings as well as they can; the beaſts of burden being tied to the foot of the bank. Over the gates that lead into the court, there are ſometimes little rooms, which the keepers of the caravanſeras let out at a very high price to ſuch as have a mind to be private.

The caravanſeras in the Eaſt are ſomething of the nature of the inns in Europe; only that you meet with little accommodation either for man or beaſt, but are obliged to carry almoſt every thing with you: there is never a caravanſera without a well, or ſpring of water. Theſe buildings are chiefly owing to the charity of the Mahometans; they are eſteemed ſacred dwellings, where it is not permitted to inſult any perſon, or to pillage any of the effects that are depoſited there. There are alſo caravanſeras where moſt things may be had for money; and as the profits of theſe are conſiderable, the magiſtrates of the cities to whoſe juriſdiction they belong, take care to ſtore them well. There is an inſpector, who, at the departure of each caravan, fixes the price of the night's lodging, from which there is no appeal.

CARAVANSERASKIER, the ſteward or keeper of a Caravansera. He keeps an account of all the merchandiſes that are ſold upon truſt, and demands the payments of the ſums due to the merchants for what has been ſold in the caravanſera, on the ſeller's paying two per cent.

CARAVEL; thus they call a ſmall veſſel on the coaſt of France, which goes to fiſh for herring on the banks. They are commonly from 25 to 30 tons burden. Thoſe which are deſigned for the ſame fiſhery in the Britiſh channel are called by the French *trinquarts*: theſe are from 12 to 15 tons burden.

CARAWAY, in botany. See Carum.

CARBONADE, or Carbonado, in cookery; fleſh, fowl, or the like, ſeaſoned and broiled on the coals.

CARBUNCLE, in natural hiſtory, a very elegant gem, whoſe colour is deep red, with an admixture of ſcarlet.

This gem was known among the ancients by the name of *anthrax*. It is uſually found pure and faultleſs, and is of the ſame degree of hardneſs with the ſapphire: it is naturally of an angular figure; and is found adhering, by its baſe, to a heavy and ferruginous ſtone of the emery kind: its uſual ſize is near a quarter of an inch in length, and two thirds of that in diameter in its thickeſt parts: when held up againſt the ſun, it looſes its deep tinge, and becomes exactly of the colour of a burning charcoal, whence the propriety of the name which the ancients gave it. It bears the fire unaltered, not parting with its colour, nor becoming at all the paler by it. It is found only in the Eaſt Indies, ſo far as is yet known; and there but very rarely.

Carbuncle, or *Anthrax*, in medicine, an inflammation which ariſes, in time of the plague, with a veſicle or bliſter almoſt like that produced by burning.

Carbuncle, in heraldry, a charge or bearing, conſiſting of eight radii, four whereof make a common croſs, and the other four a ſaltier.

Some call theſe radii *buttons*, or ſtaves, becauſe round, and enriched with buttons, or pearled like pilgrim's ſtaves, and frequently tipped or terminated with flower-de-luces; others blazon them, royal ſceptres, placed in ſaltier, pale and feſſe.

CARCASSE, or Carcus, in the art of war, an iron caſe, or hollow capacity, about the bigneſs of a bomb, of an oval figure, made of ribs of iron, filled with combuſtible matters, as meal-powder, ſaltpetre, ſulphur, broken glaſs, ſhavings of horn, turpentine, tallow, &c. It has two or three apertures out of which the fire is to blaze; and the deſign of it is to be thrown out of a mortar to ſet houſes on fire, and do other execution. It has the name *carcaſſe*; becauſe the circles which paſs from one ring or plate to the other ſeem to repreſent the ribs of a human carcaſe.

CARCASSONNE, an ancient city of France, in Lower Languedoc, with a biſhop's ſee. It is divided into the upper and lower town. They are both ſurrounded with walls: and though their ſituations are different they are both watered by the river Aude. The upper town is ſeated on a hill, with a caſtle that commands it, as well the lower town. It is ſtrong, not only by its ſituation on a craggy rock, but alſo by ſeveral large towers which are joined to its walls, and which render it of difficult acceſs. The cathedral church is remarkable for nothing but its antiquity. The lower town is large, and built after the modern taſte. The ſtreets are very ſtraight, and lead to a large ſquare in the middle, from whence may be ſeen the four gates of the town. There is here a manufacture of cloth. The neighbouring country is full of olive-trees; and in the mountains there is a fine marble, commonly called *marble of Languedoc*. E. Long 2. 25. N. Lat. 43. 11.

This place bore a conſiderable ſhare in that celebrated cruſade undertaken againſt the Albigenſes in the beginning of the 13th century, and which forms one of the moſt aſtoniſhing inſtances of ſuperſtition and of atrocious barbarity to be found in the annals of the world. When the royal power was nearly annihilated, during the reigns of the laſt kings of the Carlovingian race in France, moſt of the cities of Languedoc erected themſelves into little independent ſtates, governed by their own princes. Carcaſſonne was then under the dominion of viſcounts. At the time when Pope Innocent III. patronized and commanded the proſecution of hoſtilities againſt the Albigenſes for the crime of hereſy, Raymond the reigning viſcount was included in that proſcription. Simon de Montfort, general of the army of the church, inveſted the city of Carcaſſonne in 1209. The inhabitants terrified at the fate of ſeveral other places where the moſt dreadful maſſacres had been committed, demanded leave to capitulate; but this act of mercy was only extended to them under a condition equally cruel, incredible, and unparalleled in hiſtory, if we were not compelled to believe it by the unanimous teſtimony of all the cotemporary writers. The people found in the place were all obliged, without diſtinction of rank or ſex, to evacuate it in a ſtate of nudity; and Agnes the viſcounteſs was not exempted, though young and beautiful, from this ignominious and ſhocking puniſhment. "On les fit ſortir tout nuds de la ville de Carcaſſonne (ſays an ancient author) afin qu'ils receuſſent de la honte, en montrant ces parties du corps que la purité de la langue n'exprime point, deſquelles ils avoient abuſé, et s'en étoient ſervis dans des crimes execrables." It ſeems by this imputation that the Albigeois were accuſed by their enemies of ſome enormities, probably unjuſt, and ſimilar to thoſe which religious enmity and prejudice have attributed to the followers of Zinzendorf in the preſent century.

CARCERES, in the ancient Circenſian games, were incloſures in the circus, wherein the horſes were reſtrained till the ſignal was given for ſtarting, when, by an admirable contrivance, they all at once flew open.

CARCHEMISH, (anc geog.) a town lying upon the Euphrates, and belonging to the Aſſyrians. Necho king of Egypt took it from the king of Aſſyria, 2 Chr. xxxv. 20. Necho left a garriſon in it, which was taken and cut to pieces, in the fourth year of Jehoiachan king of Judah, by Nebuchadnezzar king of Babylon, 2 Kings xxiii. 29. Iſaiah (x. 9.) ſpeaks of Carchemiſh, and ſeems to ſay that Tiglath-pileſer made a conqueſt of it, perhaps from the Egyptians. This is thought to be the ſame city with that called Circeſium by the Greeks and Latins.

CARCINOMA, in medicine; the ſame with CANCER.

CARD, among artificers, an inſtrument conſiſting of a block of wood, beſet with ſharp teeth, ſerving to arrange the hairs of wool, flax, hemp, and the like: there are different kinds of them, as hand-cards, ſtock-cards, &c. They are made as follows:

A piece of thick leather, of the ſize intended for the card, is ſtrained in a frame for that purpoſe; and then pricked full of holes, into which the teeth or pieces of iron wire are inſerted. After which the leather is nailed by the edges to a flat piece of wood, in the form of an oblong ſquare, about a foot in length and half a foot in breadth, with a handle placed in the middle of one of the longer ſides.

The teeth are made in the following manner. The wire being drawn of the ſize intended, a ſkain or number of wires are cut into proper lengths by means of a gauge, and then doubled in a tool contrived for that purpoſe: after which they are bent into the proper direction by means of another tool; and then placed in the leather as mentioned above.

CARDS, among gameſters, little pieces of fine thin paſteboard of an oblong figure, of ſeveral ſizes; but moſt commonly, in Britain, three inches and an half long and two and an half broad, on which are painted ſeveral points and figures.

The moulds and blocks for making cards are exactly like thoſe that were uſed for the firſt printed books. They lay a ſheet of wet or moiſt paper on the block, which is firſt ſlightly done over with a ſort of ink made of lamp-black diluted in water, and mixed with ſome ſtarch to give it a body. They afterwards rub it off with a round liſt. The court-cards are coloured by means of ſeveral patterns, ſtyled *ſtane-files*. They conſiſt of papers cut through with a penknife; and in theſe apertures they apply ſeverally the various colours, as red, black, &c. Theſe patterns are painted with oil-colours, that the bruſhes may not wear them out; and when the pattern is laid on the paſteboard, they ſlightly paſs over it a bruſh full of colour, which, leaving it within the openings, forms the face or figure of the card.

Among ſharper, divers ſorts of falſe and fraudulent cards have been contrived; as, 1. *Marked* cards, where the aces, kings, queens, knaves, are marked on the corners of the backs with ſpots of different number and order, either with clear water, or water tinged with pale Indian ink, that thoſe in the ſecret may diſtinguiſh them. Aces are marked with ſingle ſpots on two corners oppoſite diagonally; kings with two ſpots at the ſame corners; knaves with the ſame number tranſverſed. 2. *Breef* cards, thoſe which are longer or broader than the reſt; chiefly uſed at whiſt and piquet. The broad cards are uſually for kings, queens, knaves, and aces; the long for the reſt. Their deſign is to direct the cutting to enable him in the ſecret to cut the cards diſadvantageouſly to his adverſary, and draw the perſon unacquainted with the fraud to cut them favourably for the ſharper. As the pack is placed either endwiſe or ſidewiſe to him that is to cut, the long or broad cards naturally lead him to cut to them. Breef cards are ſometimes made thus by the manufacturer; but, in defect of theſe, ſharpers pare all but the breefs with a penknife or razor. 3. *Corner bend,* denotes four cards turned down finely at one corner, to ſerve as a ſignal to cut by. 4. *Middle bend,* or Kingſton-bridge, is where the tricks are bent two different ways, which cauſes an opening or arch in the middle, to direct likewiſe the cutting.

Cards were invented about the year 1390, to divert Charles VI. of France, who had fallen into a melancholy diſpoſition. The inventor propoſed, by the figures of the four ſuits or colours, as the Fench call them, to repreſent the four claſſes of men in the kingdom. By *cœurs* (hearts) are meant the *gens de choeur,* choir-men, or eccleſiaſtics; and therefore the Spaniards, who certainly received the uſe of cards from the French, have *copas,* or chalices, inſtead of hearts. The nobility, or prime military part of the kingdom, are repreſented by the ends or points of lances or pikes; and our ignorance of the meaning or reſemblance of the figure induced us to call them *ſpades:* The Spaniards have *eſpadas,* ſwords, in lieu of pikes, which are of ſimilar import. By diamonds are deſigned the order of citizens, merchants, or tradeſmen, *carreaux,* (ſquare ſtones, tiles, or the like): The Spaniards have a coin, *dineros,* which anſwers to it; and the Dutch call the French word *carreaux* "*ſtreneen,*" ſtones and diamonds, from the form. *Trefle,* the trefoil-leaf, or clover-graſs (corruptly called *clubs*), alludes to the huſbandmen and peaſants. But how this ſuit came to be called *clubs* is not eaſily explained; unleſs, borrowing the game from the Spaniards, who have *baſtos* (ſtaves or clubs) inſtead of the trefoil, we give the Spaniſh ſignification to the French figure.

The hiſtory of the four kings, which the French, in drollery, ſometimes call the *cards,* are David, Alexander, Cæſar, and Charles; which names were then, and ſtill are, on the French cards. Theſe reſpectable names repreſent the four celebrated monarchies of the Jews, Greeks, Romans, and Franks under Charlemagne. By the queens are intended Argine, Eſther, Judith, and Pallas (names retained in the French cards), typical of birth, piety, fortitude, and wiſdom, the qualifications reſiding in each perſon. *Argine* is an anagram for *regina,* queen by deſcent. By the knaves were deſigned the ſervants to knights (for *knave* originally meant only *ſervant);* but French pages and valets, now indiſcreminately uſed by various orders of perſons, were formerly only allowed to perſons of quality, eſquires *(eſcuires),* ſhield or armour bearers. Others fancy that the knights themſelves were deſigned by thoſe cards; becauſe Hogier and Lahire, two names on the French cards, were famous knights at the time cards were ſuppoſed to have been invented.

Deceptions with CARDS. See LEGERDEMAIN, ſect. I.

CARDAMINE, in botany: A genus of the ſiliquoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ.* The ſiliqua parts aſunder with a ſpring, and the valves roll ſpirally backward; the ſtigma is entire, and the calyx a little gaping. Of this there are 15 ſpecies; but the moſt remarkable is the pratenſis, with a large purpliſh flower. This grows naturally in many parts of Britain, and is alſo called *cuckow-flower.* There are four varieties, viz. the ſingle, with purple and white flowers, which are frequently intermixed in the meadows; and the double, of both colours. The ſingle ſorts are not admitted into gardens; but the double deſerve a place, as making a pretty appearance during the time they are in flower. They will thrive in a moiſt ſhady border: and are propagated by parting their roots, which is beſt performed in autumn. They delight in a ſoft loamy ſoil, not too ſtiff. By ſome the plant is reckoned antiſcorbutic.

CARDAMOM, in the Materia Medica. See AMOMUM.

CARDAN, (Jerom) one of the moſt extraordinary geniuſes of his age, was born at Pavia on the 24th of September 1501. As his mother was not married, ſhe tried every method to procure an abortion, but without effect. She was three days in labour, and they were at laſt obliged to cut the child from her. He was born with his head covered with black curled hair. When he was four years old, he was carried to Milan; his father being an advocate in that city. At the age of 20, he went to ſtudy in the univerſity of that city; and two years afterwards he explained Euclid. In 1524, he went to Padua; and the ſame year he was admitted to the degree of maſter of arts: in the end of the following year, he took the degree of doctor of phyſic. He married about the year 1531. For ten years before, his impotency had hindered him from having knowledge of a woman; which was a great mortification to him. He attributed it to the evil influences of the planet under which he was born. When he enumerates, as he frequently does, the greateſt misfortunes of his life, this ten years impotency is always one. At the age of 32, he became profeſſor of mathematics at Milan. In 1539, he was admitted member of the college of phyſicians at Milan; in 1543, he read public lectures of medicine in that city, and at Pavia the year following; but diſcontinued them becauſe he could not get payment of his ſalary, and returned to Milan. In 1552, he went into Scotland, having been ſent for by the archbiſhop of St Andrew's, who had in vain applied to the French king's phyſicians, and afterwards to thoſe of the emperor of Germany. This prelate, then 43 years old, had for ten years been afflicted with a ſhortneſs of breath, which returned every eight days for the two laſt years. He began to recover from the moment that Cardan preſcribed for him. Cardan took his leave of him at the end of ſix weeks and three days, leaving him preſcriptions which in two years wrought a complete cure.

Cardan's journey to Scotland gave him an opportunity of viſiting ſeveral countries. He croſſed France in going thither; and returned through Germany, and the Low Countries, along the banks of the Rhine. It was on this occaſion he went to London, and calculated king Edward's nativity. This tour took up about four months: after which, coming back to Milan, he continued there till the beginning of October 1552;

and

and then went to Pavia, from whence he was invited to Bologna in 1562. He taught in this laſt city till the year 1570; at which time he was thrown into priſon; but ſome months after he was ſent home to his own houſe. He left Bologna in 1571: and went to Rome, where he lived for ſome time without any public employment. He was, however, admitted a member of the college of phyſicians, and received a penſion from the pope. He died at Rome on the 21ſt of September 1575, according to Thuanus. This account might be ſufficient to ſhow the reader that Cardan was of a very fickle temper; but he will have a much better idea of his ſingular and odd turn of mind by examining what he himſelf has written concerning his own good and bad qualities. He paid himſelf congratulatory compliments for not having a friend in this world; but that, in requittal, he was attended by an aerial ſpirit, emaned partly from Saturn and partly from mercury, who was the conſtant guide of his actions, and teacher of every duty to which he was bound. He declared, too, that he was ſo irregular in his manner of walking the ſtreets, as induced all beholders to point at him as a fool. Sometimes he walked very ſlowly, like a man abſorbed in profound meditation; then all on a ſudden quickened his ſteps, accompanying them with very abſurd attitudes. In Bologna, his delight was to be drawn about in a mean vehicle with three wheels. When nature did not viſit him with any pain, he would procure to himſelf that diſagreeable ſenſation by biting his lips ſo wantonly, or pulling his fingers to ſuch a vehement degree, as ſometimes to force the tears from his eyes: and the reaſon he aſſigned for ſo doing, was to moderate certain impetuous ſallies of the mind, the violence of which was to him by far more inſupportable than pain itſelf; and that the ſure conſequence of ſuch a ſevere diſcipline was the enjoying the pleaſure of health. He ſays elſewhere, that, in his greateſt tortures of ſoul, he uſed to whip his legs with rods, and bite his left arm; that it was a great relief to him to weep, but that very often he could not; that nothing gave him more pleaſure than to talk of things which made the whole company uneaſy; that he ſpoke on all ſubjects, in ſeaſon and out of ſeaſon: and he was ſo fond of games of chance, as to ſpend whole days in them, to the great prejudice of his family and reputation, for he even ſtaked his furniture and his wife's jewels.

Cardanus makes no ſcruple of owning that he was revengeful, envious, treacherous, a dealer in the black art, a backbiter, a calumniator, and addicted to all the foul and deteſtable exceſſes that can be imagined: yet, notwithſtanding (as one would think) ſo humbling a declaration, there was never perhaps a vainer mortal, or one that with leſs ceremony expreſſed the high opinion he had of himſelf, than Cardanus was known to do, as will appear by the following proofs. "I have been admired by many nations: an infinite number of panegyrics, both in proſe and verſe, have been compoſed to celebrate my fame. I was born to releaſe the world from the manifold errors under which it groaned. What I have found out could not be diſcovered either by my predeceſſors or my cotemporaries; and that is the reaſon why thoſe authors who write any thing worthy of being remembered, ſcruple not to own that they are indebted to me for it. I have compoſed a book on the dialectic art, in which there is neither one ſuperfluous letter nor one deficient. I finiſhed it in ſeven days, which ſeems a prodigy. Yet where is there a perſon to be found, that can boaſt of his having become maſter of its doctrine in a year? And he that ſhall have comprehended it in that time, muſt appear to have been inſtructed by a familiar dæmon."

The ſame capriciouſneſs obſervable in his outward conduct is to be obſerved in the compoſition of his works. We have a multitude of his treatiſes in which the reader is ſtopped almoſt every moment by the obſcurity of his text, or his digreſſions from the point in hand. In his arithmetical performances there are ſeveral diſcourſes on the motions of the planets, on the creation, and on the tower of Babel. In his dialectic work, we find his judgment on hiſtorians and the writers of epiſtles. The only apology which he makes for the frequency of his digreſſions is, that they were purpoſely done for the ſooner filling up of his ſheet, his bargain with the bookſeller being at ſo much per ſheet; and that he worked as much for his daily ſupport as for the acquiſition of glory. The Lyons edition of his works, printed in 1663, conſiſts of ten volumes in folio.

It was Cardanus who revived in latter times all the ſecret philoſophy of the Cabbala or Cabbaliſts, which filled the world with ſpirits; a likeneſs to whom, he aſſerted we might attain by purifying ourſelves with philoſophy. He choſe for himſelf, however, notwithſtanding ſuch reveries, this fine device, *Tempus mea poſſeſſio, tempus meus ager:* "Time is my ſole poſſeſſion, and the only fund I have to improve."

In fact, when we conſider the tranſcendent qualities of Cardan's mind, we cannot deny his having cultivated it with every ſpecies of knowledge, and his having made a greater progreſs in philoſophy, in the medical art, in aſtronomy, in mathematics, &c. than the greateſt part of his cotemporaries who had applied their minds but to one of thoſe ſciences.

Scaliger affirms, that Cardan, having fixed the time of his death, abſtained from food, that his prediction might be fulfilled, and that his continuance to live might not diſcredit his art. Cardan's father, who was a doctor of medicine, and a profeſſor of civil and canon law, died in the ſame manner, in the year 1524, having abſtained from all ſuſtenance for nine days. His ſon tells us, that he had white eyes, and could ſee in the night time.

CARDASS, a ſort of card, proper for carding flocks of ſilk, to make cappadine of it. It is alſo the name which the French give to thoſe flocks of ſilk.

Cardasses, is alſo the name which, in the cloth manufactories of Languedoc, they give to a ſort of large card, which is uſed for carding the dyed wool, deſigned for making cloth of mixed colours.

CARDERS, in the woollen manufactory, are perſons who prepare wool, &c. for ſpinning, &c.

Carders, ſpinners, weavers, fullers, ſheermen, and dyers, in England, not performing their duty in their occupations, ſhall yield to the party grieved double damages; to be committed until payment. One juſtice to hear and determine complaints.

Carders, combers, ſorters, ſpinners, or weavers, conveying away, embezzling, or detaining any wool or yarn, delivered by the clothier, or any other perſon, ſhall give the party grieved ſuch ſatisfaction, as two juſtices, mayor, &c. ſhall think fit: if not able or willing to make ſatisfaction, for the firſt offence to be whipped, or ſet in the ſtocks in ſome market-town, or in any other town where the offence is committed: the ſecond offence to incur the like, or ſuch further puniſhment by whipping, &c. as juſtices ſhall think proper. Conviction by one witneſs on oath, or confeſſion.

CARDI, (Ludovico). See Civoli.

CARDIAC, in a general ſenſe, ſignifies all medicines beneficial to the heart, whether internally or externally applied. The word comes from the Greek word καρδια, *cor;* the heart being reputed the immediate ſeat of their operation.

Cardiacs, in a more particular ſenſe, denote medicines which raiſe the ſpirits, and give preſent ſtrength and cheerfulneſs; theſe amount to the ſame with what are popularly called *cordials.* Cardiacs are medicines anciently ſuppoſed to exert themſelves immediately in comforting and ſtrengthening the heart: but the modern phyſicians rather ſuppoſe them to produce the effect by putting the blood into a gentle fermentation, whereby the ſprings, before decayed, are repaired and invigorated, and the tone and elaſticity of the fibres of the veſſels reſtored; the conſequence of which is a more eaſy and briſk circulation.

CARDIALGIA, in medicine, a violent ſenſation of heat or acrimony felt towards the upper or left orifice of the ſtomach, though ſeemingly at the heart; ſometimes accompanied with palpitations of the heart, fainting, and a propenſity to vomit: better known by the name of *cardiac paſſion,* or *heart-burn.* See (*Index ſubjoined to*) Medicine.

CARDIFF, a town of Glamorganſhire, in South Wales, ſeated on the river Tave, in a rich and fruitful ſoil. It is a large, compact, well built town, having a caſtle, a wall, and four gates, built by Robert Fitz-Hamon, a Norman, about the year 1100. It is governed by the conſtable of the caſtle, 12 aldermen, 12 burgeſſes, &c. and ſends one member to parliament. Here the aſſizes and ſeſſions are held, beſides ſeveral courts. There is a handſome bridge over the river, to which ſmall veſſels come to take in their lading. It has now only one church, St Mary's having been long ſince thrown down by the undermining of the river. The caſtle, though much decayed, makes a grand appearance even at this time; and the walls of the town are very ſtrong and thick. The church has a fine tower-ſteeple, and the town-hall is a good ſtructure. The magiſtrates are elected every year by the majority of the burgeſſes. W. Long. 3. 20. N. Lat. 51. 30. Cardiff gives title of Britiſh Baron to the family of Bute in Scotland.

CARDIGAN, the capital town of Cardiganſhire, in South Wales, is ſeated near the mouth of the river Teivy, on the Iriſh channel. It is indifferently large and well built, containing three wards, one church, and the county-goal. It is governed by a mayor, 13 aldermen, 13 common-council-men, &c. Here are the ruins of a caſtle which was built by Gilbert de Clare, about the year 1160. It ſends one member to parliament; and has two markets, held on Tueſdays and Saturdays. W. Long. 4. 38. N. Lat. 52. 15.

CARDIGANSHIRE, a county of South Wales, bounded on the North by Merionethſhire and Montgomeryſhire, on the eaſt by Radnorſhire and Brecknockſhire, on the weſt by the Iriſh Sea, and on the ſouth by Caermarthenſhire. Its length from North-weſt to ſouth-eaſt is about 44 miles, and its breadth near 20. The air, as in other parts of Wales, varies with the ſoil, which in the ſouthern and weſtern parts is more upon a level than this principality generally is, which renders the air mild and temperate. But as the northern and eaſtern parts are mountainous, they are conſequently more barren and bleak. However, there are cattle bred in all parts; but they have neither wood nor coals of their own for fuel: they have rich lead mines, and fiſh in plenty, with fowls both tame and wild. The principal rivers are the Teivy, the Ridol, and the Iſtwith. This county hath five market-towns, viz. Cardigan, Aberiſtwith, Llanbadarnvawn, Llanbedar, and Tregaron, with 77 pariſhes; and was formerly computed to have upward of 3000 houſes, and 520,000 acres of land. It ſends two members to parliament; one for the county, and one for Cardigan.

CARDINAL, in a general ſenſe, an appellation given to things on account of their pre-eminence. The word is formed of the Latin *cardo, a hinge;* it being on theſe fundamental points that all the reſt of the ſame kind are ſuppoſed to turn. Thus, juſtice, prudence, temperance, and fortitude, are called the four *cardinal virtues,* as being the baſis of all the reſt.

Cardinal Flower, in botany. See Lobelia.

Cardinal Points, in coſmography, are the four interſections of the horizon with the meridian, and the prime vertical circle. Of theſe, two, viz. the interſections of the horizon and meridian, are called *North* and *South,* with regard to the poles they are directed to. The other two, viz. the interſections of the horizon, and firſt vertical, are called *Eaſt* and *Weſt.*

The cardinal points, therefore, coincide with the four cardinal regions of the heavens; and are 90° diſtant from each other. The intermediate points are called *collateral points.*

Cardinal Points, in aſtrology, are the riſing and ſetting of the ſun, the zenith, and nadir.

Cardinal Signs, in aſtronomy, are Aries, Libra, Cancer, and Capricorn.

Cardinal Winds, are thoſe that blow from the cardinal points.

Cardinal Numbers, in grammar, are the numbers one, two, three, &c. which are indeclinable; in oppoſition to the ordinal numbers, firſt, ſecond, third, fourth, &c.

Cardinal, an eccleſiaſtical prince in the Romiſh church, being one who has a voice in the conclave at the election of a pope. Some ſay the cardinals were ſo called from the Latin *incardinatio,* which ſignifies the adoption in any church made of a prieſt of a foreign church, driven thence by misfortune; and add, that the uſe of the word commenced at Rome and Ravenna; the revenues of the churches of which cities being very great, they became the common refuge of the unhappy prieſts of all other churches.

The cardinals compoſe the pope's council or ſenate: in the Vatican is a conſtitution of pope John, which regulates the rights and titles of the *cardinals;* and

which

which declares, that as the pope repreſents Moſes, ſo the cardinals repreſent the ſeventy elders, who, under the pontifical authority, decide private and particular differences.

Cardinals, in their firſt inſtitution, were only the principal prieſts, or incumbents of the pariſhes of Rome. In the primitive church, the chief prieſt of a pariſh, who immediately followed the biſhop, was called *preſbyter cardinalis*, to diſtinguiſh him from the other petty prieſts, who had no church nor preferment; the term was firſt applied to them in the year 150; others ſay, under pope Silveſter, in the year 300. Theſe cardinal prieſts were alone allowed to baptize, and adminiſter the euchariſt. When the cardinal prieſts became biſhops, their cardinalate became vacant; they being then ſuppoſed to be raiſed to a higher dignity.—Under pope Gregory, cardinal prieſts, and cardinal deacons, were only ſuch prieſts or deacons as had a church or chapel under their particular care: and this was the original uſe of the word. Leo IV. in the council of Rome, held in 853, calls them *preſbyteros ſui cardinis*; and their churches, *parochias cardinales*.

The cardinals continued on this footing till the eleventh century: but as the grandeur and ſtate of his holineſs became then exceedingly augmented, he would have his council of cardinals make a better figure than the ancient prieſts had done. It is true, they ſtill preſerved their ancient title; but the thing expreſſed by it was no more. It was a good while, however, before they had the precedence over biſhops, or got the election of the pope into their hands: but when they were once poſſeſſed of thoſe privileges, they ſoon had the red hat and purple; and growing ſtill in authority, they became at length ſuperior to the biſhops, by the ſole quality of being cardinals.

Du-Cange obſerves, that originally there were three kinds of churches: the firſt or genuine churches were properly called *pariſhes*; the ſecond, *deaconries*, which were chapels joined to hoſpitals, and ſerved by deacons; the third were ſimple *oratories*, where private maſſes were ſaid, and were diſcharged by local and reſident chaplains. He adds, that, to diſtinguiſh the principal or pariſh churches from the chapels and oratories, the name *cardinales* was given to them. Accordingly, pariſh churches gave titles to cardinal prieſts; and ſome chapels alſo, at length, gave the title of *cardinal deacons*.

Others obſerve, that the term *cardinal* was given not only to prieſts, but alſo to biſhops and deacons who were attached to certain churches, to diſtinguiſh them from thoſe who only ſerved them *en paſſant*, and by commiſſion. Titular churches, or benefices, were a kind of pariſhes, i. e. churches aſſigned each to a cardinal prieſt; with ſome ſtated diſtrict depending on it, and a font for adminiſtering of baptiſm, in caſes where the biſhop himſelf could not adminiſter it. Theſe cardinals were ſubordinate to the biſhops; and accordingly, in councils, particularly that held at Rome in 868, ſubſcribed after them.

It was not, however, only at Rome, that prieſts bore this name; for we find there were cardinal prieſts in France: thus, the curate of the pariſh of St John de Vignes is called in old charters the *cardinal prieſt* of that pariſh.

The title of *cardinal* is alſo given to ſome biſhops, *quatenus* biſhops; e. g. to thoſe of Mentz and Milan: the archbiſhop of Bourges is alſo, in ancient writings, called *cardinal*; and the church of Bourges, a *cardinal church*. The abbot of Vendome calls himſelf *cardinalis natus*.

The cardinals are divided into three claſſes or orders; containing ſix biſhops, fifty prieſts, and fourteen deacons; making in all ſeventy: which conſtitute what they call the *ſacred college*. The cardinal biſhops, who are, as it were, the pope's vicars, bear the titles of the biſhoprics aſſigned to them; the reſt take ſuch titles as are given them: the number of cardinal biſhops has been fixed; but that of cardinal prieſts and deacons, and conſequently the ſacred college itſelf, is always fluctuating. Till the year 1125, the college only conſiſted of fifty-two or fifty-three: the council of Conſtance reduced them to twenty-four; but Sixtus IV. without any regard to that reſtriction, raiſed them again to fifty-three, and Leo to ſixty-five. Thus, as the number of cardinal prieſts was anciently fixed to twenty-eight, new titles were to be eſtabliſhed, in proportion as new cardinals were created. As for the cardinal deacons, they were originally no more than ſeven for the fourteen quarters of Rome; but they were afterwards increaſed to nineteen, and after that were again diminiſhed.

According to Onuphrius, it was pope Pius IV. who firſt enacted, in 1562, that the pope ſhould be choſen only by the ſenate of cardinals; whereas, till that time, the election was by all the clergy of Rome. Some ſay, the election of the pope reſted in the cardinals, excluſive of the clergy, in the time of Alexander III. in 1160. Others go higher ſtill, and ſay, that Nicholas II. having been elected at Sienna, in 1058, by the cardinals alone, occaſioned the right of election to be taken from the clergy and people of Rome; only leaving them that of confirming him by their conſent; which was at length, however, taken from them. See his decree for this purpoſe, iſſued in the Roman council of 1059, in Hardouin's Acta Conciliorum, tom. vi. pt. i. p. 1165. Whence it appears, that the cardinals who had the right of ſuffrage in the election of his ſucceſſors, were divided by this pontiff into *cardinal biſhops* and *cardinal clerks*: meaning by the former the ſeven biſhops who belonged to the city and territory of Rome; and by the latter, the *cardinal preſbyters*, or miniſters of the twenty-eight Roman pariſhes, or principal churches. To theſe were added, in proceſs of time, under Alexander III. and other pontiffs, new members, in order to appeaſe the tumults occaſioned by the edict of Nicholas II.

At the creation of a new cardinal, the pope performs the ceremony of opening and ſhutting his mouth; which is done in a private conſiſtory. The ſhutting his mouth implies the depriving him of the liberty of giving his opinion in congregations; and the opening his mouth, which is performed 15 days after, ſignifies the taking off this reſtraint. However, if the pope happens to die during the time a cardinal's mouth is ſhut, he can neither give his voice in the election of a new pope, nor be himſelf advanced to that dignity.

The dreſs of the cardinal is a red ſoutanne, a rocket, a ſhort purple mantle, and a red hat.

The cardinals began to wear the red hat at the council of Lyons, in 1243. The decree of pope Urban VIII. whereby it is appointed, that the cardinals be addreſſed under the title of *eminence*, is of the year 1630; till then, they were called *illuſtriſſimi*.

When cardinals are ſent to the courts of Princes, it is in quality of legates *a latere*; and when they are appointed governors of towns, their government is called by the name of *legation*.

Cardinal has alſo been applied to ſecular officers. Thus, the prime miniſters in the court of the emperor Theodoſius, are called *cardinales*. Caſſiodorus, lib. vii. formul. 31. makes mention of the cardinal prince of the city of Rome; and in the liſt of officers of the duke of Bretagne, in 1147, we meet with one Raoul de Thorel, cardinal of Quillart, chancellor, and ſervant of the viſcount de Rohan: which ſhows it to have been an inferior quality.

CARDIOID, in the higher geometry, an algebraical curve, ſo called from its reſemblance to an heart.

CARDIOSPERMUM, in botany: A genus of the trigynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 39th order, *Trihilatæ*. The calyx is tetraphyllous, the petals four, the nectarium tetraphyllous and unequal; the capſules three, grown together, and inflated. There are two ſpecies, both natives of the Eaſt and Weſt Indies; but have no great beauty, or any other remarkable property.

CARDIUM, or Cockle, in zoology, a genus of inſects belonging to the order of vermes teſtaceæ. The ſhells conſiſts of two equal valves, and the ſides are equal. There are 21 ſpecies of this genus. Common on all ſandy coaſts, lodged a little beneath the ſand; their place marked by a depreſſed ſpot. They are wholeſome and delicious food.

CARDONA, a handſome town of Spain, in Catalonia, with a ſtrong caſtle, and the title of a duchy. Near it is an inexhauſtible mountain of ſalt of ſeveral colours, as red, white, carnation, and green: but when waſhed, it becomes white. There are alſo vineyards which produce excellent wine, and very lofty pine-trees. It is ſeated on an eminence, near the river Cardenero. E. Long. 1. 26. N. Lat. 41. 42.

CARDUUS, in botany: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The calyx is ovate, imbricated with prickly ſcales, and the receptacle hairy. Of this genus there are 26 ſpecies, ten of which are natives of Britain, and being troubleſome weeds require no deſcription. Some few of the exotic kinds are propagated in gardens for the ſake of variety; but even theſe have neither beauty nor any other property to recommend them.

Carduus Benedictus. See Cnicus.

CAREENING, in the ſea-language, the bringing a ſhip to lie down on one ſide, in order to trim and caulk the other ſide.

A ſhip is ſaid to be brought to the careen, when, the moſt of her lading being taken out, ſhe is hulled down on one ſide, by a ſmall veſſel, as low as neceſſary; and there kept by the weight of the ballaſt, ordnance, &c. as well as by ropes, leſt her maſts ſhould be ſtrained too much; in order that her ſides and bottom may be trimmed, ſeams caulked, or any thing that is faulty under water mended. Hence, when a ſhip lies on one ſide when ſhe ſails, ſhe is ſaid to ſail on the careen.

CAREER, in the manege, a place incloſed with a barrier, wherein they run the ring.

The word is alſo uſed for the race or courſe of the horſe itſelf, provided it do not exceed 200 paces.

In the ancient circus, the career was the ſpace the bigæ, or quadrigæ, were to run at full ſpeed, to gain the prize. See Circus.

Career, in falconry, is a flight or tour of the bird, about 120 yards. If ſhe mounts more, it is called a *double career*; if leſs, a *ſemi-career*.

CARELIA, the eaſtern province of Finland; divided into Swediſh Carelia, and Muſcovite Carelia. The capital of the latter is Povenza, and of the former Weiburg.

CARELSCROON, a ſea-port town of Sweden, in Blekingia, or Bleking, on the Baltic Sea, with a very good harbour defended by two forts. It was built in 1679, and is very populous, with arſenals for the marine: the houſe of the director-general of the admiralty is in this town, and here the Swedee lay up their royal navy. E. Long. 15. 5. N. Lat. 56. 15.

CARENTAN, a town of France in Lower Normandy, and in the Contentin, with an ancient caſtle. W. Long. 1. 14. N. Lat. 49. 20.

CARET, among grammarians, a character marked thus ‸, ſignifying that ſomething is added on the margin, or interlined, which ought to come in where the caret ſtands.

CAREW, (George) born in Devonſhire in 1557, an eminent commander in Ireland, was made preſident of Munſter by queen Elizabeth; when, joining his forces with the earl of Thomond, he reduced the Iriſh inſurgents, and brought the earl of Deſmond to his trial. King James made him governor of Guernſey, and created him a baron. As he was a valiant commander, he was no leſs a polite ſcholar; and wrote *Pacata Hibernia*, a hiſtory of the late wars in Ireland, printed after his death, in 1633. He made ſeveral collections for a hiſtory of Henry V. which are digeſted into Speed's Hiſtory of Great Britain. Beſides theſe, he collected materials of Iriſh hiſtory in four large MSS. volumes now in the Bodleian library, Oxford.

Carew, (Thomas) deſcended from the family of Carew in Glouceſterſhire, was gentleman of the privy chamber to Charles I. who always eſteemed him one of the moſt celebrated wits of his court. He was much reſpected by the poets of his time, particularly by Ben Johnſon and Sir William Davenant; and left behind him ſeveral poems, and a maſque called *Cœlum Britannicum*, performed at Whitehall on Shrove Tueſday night, 1633, by the king, and ſeveral of his nobles with their ſons. Carew was aſſiſted in the contrivance by Inigo Jones, and the muſic was ſet by Mr Henry Lawes of the king's chapel. He died in the prime of life, about the year 1639.

Carew, (Richard) author of the "Survey of Cornwall," was the eldeſt ſon of Thomas Carew of Eaſt Anthony, and was born in 1555. When very young, he became a gentleman commoner of Chriſt-church college, Oxford; and at 14 years of age had the honour of diſputing, extempore, with the afterwards famous

mous Sir Philip Sydney, in the preſence of the earls of Leiceſter, Warwick, and other nobility. After ſpending three years at the univerſity, he removed to the Middle Temple, where he reſided the ſame length of time, and then travelled into foreign parts. Not long after his return to England, he married, in 1577, Juliana Arundel, of Trerice. In 1581, Mr Carew was made juſtice of the peace, and in 1586 was appointed high-ſheriff of the county of Cornwall; about which time he was likewiſe queen's deputy for the militia. In 1589, he was elected a member of the college of Antiquaries, a diſtinction to which he was intitled by his literary abilities and purſuits. What particularly engaged his attention was his native county, his "Survey" of which was publiſhed, in 4to, at London, in 1602. It hath been twice reprinted, firſt in 1723, and next in 1769. Of this work Cambden hath ſpoken in high terms, and acknowledges his obligations to the author. In the preſent improved ſtate of topographical knowledge, and ſince Dr Borlaſe's excellent publications relative to the county of Cornwall, the value of Carew's "Survey" muſt have been greatly diminiſhed. Mr Gough remarks, that the hiſtory and monuments of this county were faintly touched by Carew; but it is added, that he was a perſon extremely capable of deſcribing them, if the infancy of thoſe ſtudies at that time had afforded light and materials. Another work of our author was a tranſlation from the Italian, intitled, "The Examination of Men's Wits. In which, by diſcovering the variety of natures, is ſhowed for what profeſſion each one is apt, and how far he ſhall profit therein." This was publiſhed at London in 1594, and afterwards in 1604; and tho' Richard Carew's name is prefixed to it, hath been principally aſcribed by ſome perſons to his father. According to Wood, Carew wrote alſo, "The true and ready Way to learn the Latin Tongue," in anſwer to a query, whether the ordinary method of teaching the Latin by the rules of grammar be the beſt mode of inſtructing youths in that language? This tract is involved in Mr Hartlib's book upon the ſame ſubject, and with the ſame title. It is certain that Carew was a gentleman of conſiderable abilities and literature, and that he was held in great eſtimation by ſome of the moſt eminent ſcholars of his time. He was particularly intimate with Sir Henry Spelman, who extols him for his ingenuity, virtue, and learning.

Carew, (George) brother to the ſubject of the laſt article, was educated in the univerſity of Oxford, after which he ſtudied the law in the inns of court, and then travelled to foreign countries for farther improvement. On his return to his native country, he was called to the bar, and after ſome time was appointed ſecretary to Sir Chriſtopher Hatton lord chancellor of England. This was by the eſpecial recommendation of queen Elizabeth herſelf, who gave him a prothonotaryſhip in the chancery, and conferred upon him the honour of knighthood. In 1597, Sir George Carew, who was then a maſter in chancery, was ſent ambaſſador to the king of Poland. In the next reign, he was one of the commiſſioners for treating with the Scotch concerning an union between the two kingdoms; after which he was appointed ambaſſador to the court of France, where he continued from the latter end of the year 1605 till 1609. During his reſidence in that country, he formed an intimacy with Thuanus, to whom he communicated an account of the tranſactions in Poland whilſt he was employed there, which was of great ſervice to that admirable author in drawing up the 21ſt book of his hiſtory. After Sir George Carew's return from France, he was advanced to the important poſt of maſter of the court of Wards, which honourable ſituation he did not long live to enjoy; for it appears from a letter written by Thuanus to Cambden in the ſpring of 1613, that he was then lately deceaſed. Sir George Carew married Thomaſine, daughter of Sir Francis Godolphin, great grandfather of the lord treaſurer Godolphin, and had by her two ſons and three daughters. When Sir George Carew returned, in 1609, from his French embaſſy, he drew up, and addreſſed to James I. "A Relation of the State of France, with the characters of Henry IV. and the principal Perſons of that Court." The characters are drawn from perſonal knowledge and cloſe obſervation, and might be of ſervice to a general hiſtorian of that period. The compoſition is perſpicuous and manly, and entirely free from the pedantry which prevailed in the reign of James I. but this is the leſs ſurpriſing, as Sir George Carew's taſte had been formed in a better æra, that of queen Elizabeth. The valuable tract we are ſpeaking of lay for a long time in MS. till happily falling into the hands of the earl of Hardwicke, it was communicated by him to Dr Birch, who publiſhed it, in 1749, at the end of his "Hiſtorical View of the Negociations between the Courts of England, France, and Bruſſels, from 1592 to 1617." That intelligent and induſtrious writer juſtly obſerves, that it is a model upon which ambaſſadors may form and digeſt their notions and repreſentations; and the late celebrated poet Mr Gray hath ſpoken of it as an excellent performance.

CAREY, (Harry) a man diſtinguiſhed by both poetry and muſic, but perhaps more ſo by a certain facetiouſneſs, which made him agreeable to every body. He publiſhed in 1720 a little collection of poems; and in 1732, ſix cantatas, written and compoſed by himſelf. He alſo compoſed ſundry ſongs for modern comedies, particularly thoſe in the "Provoked Huſband:" he wrote a farce called "The Contrivances," in which were ſeveral little ſongs to very pretty airs of his own compoſition: he alſo made two or three little dramas for Goodman's-fields theatre, which were very favourably received. In 1729, he publiſhed by ſubſcription his poems much enlarged: with the addition of one intitled "Namby Pamby," in which Ambroſe Philips is ridiculed. Carey's talents, ſays his hiſtorian, lay in humour and unmalevolent ſatire: to ridicule the rant and bombaſt of modern tragedies he wrote one, to which he gave the ſtrange title of "Chrononhotonthologos," acted in 1734. He alſo wrote a farce called "The Honeſt Yorkſhireman." Carey was a thorough Engliſhman, and had an unſurmountable averſion to the Italian opera and the ſingers in it: he wrote a burleſque opera on the ſubject of the "Dragon of Wantley;" and afterwards a ſequel to it, intitled, "The Dragoneſs;" both which were eſteemed a true burleſque upon the Italian opera. His qualities being of the entertaining kind, he was led into more expences than his finances could bear, and thus was frequently in diſtreſs. His friends however were always ready to aſſiſt him by their little ſubſcriptions to his works: and encouraged by theſe, he republiſhed, in 1740, all the ſongs he had ever compoſed, in a collection, intitled, "The Muſical Century, in 100 Engliſh Ballads, &c." and, in 1743, his dramatic works, in a ſmall volume, 4to. With all his mirth and good-humour, he ſeems to have been at times deeply affected with the malevolence of ſome of his own profeſſion, who, for reaſons that no one can gueſs at, were his enemies: and this, with the preſſure of his circumſtances, is ſuppoſed to have occaſioned his untimely end; for, about 1744, in a fit of deſperation, he laid violent hands on himſelf, and, at his houſe in Warner-ſtreet, Cold-bath Fields, put a period to a life, which, ſays Sir John Hawkins, had been led without reproach. It is to be noted, and it is ſomewhat ſingular in ſuch a character, that in all his ſongs and poems on wine, love, and ſuch kind of ſubjects, he ſeems to have manifeſted an inviolable regard for decency and good manners.

CARGADORS, a name which the Dutch give to thoſe brokers whoſe buſineſs is to find freight for ſhips outward bound, and to give notice to the merchants, who have commodities to ſend by ſea, of the ſhips that are ready to ſail, and of the places for which they are bound.

CARGAPOL, or KARGAPOL, the capital of a territory of the ſame name, in the province of Dwina, in Muſcovy: E. Long. 36°. N. Lat. 63°.

CARGO denotes all the merchandiſes and effects which are laden on board a ſhip.

*Super-*CARGO, a perſon employed by merchants to go a voyage, overſee the cargo, and diſpoſe of it to the beſt advantage.

CARIA, (anc. geog.) a country of the Hither Aſia; whoſe limits are extended by ſome, while they are contracted by others. Mela, Pliny, extend the maritime Caria from Jaſus and Halicarnaſſus, to Calynda, and the borders of Lycia. The inland Caria Ptolemy extends to the Meander and beyond. *Car, Cariates, Cariatis, Cariſſa,* and *Caris,* and *Caira,* are the gentilitious names: *Carias* and *Caricus* the epithets. *In Care periculum,* was a proverbial ſaying on a thing expoſed to danger, but of no great value. The *Cares* being the Swiſs of thoſe days, were hired and placed in the front of the battle, (Cicero.) *Cum Care Cariſſa,* denoted the behaviour of clowns. The Cares came originally from the iſlands to the continent, being formerly ſubject to Minos, and called *Leleges:* this the Cretans affirm, and the Cares deny, making themſelves aborigines. They are of a common original with the Myſi and Lydi, having a common temple, of a very ancient ſtanding, at Melaſſa, a town of Caria, called *Jovis Carii Delubrum,* (Herodotus.) Homer calls the Carians, barbarians in language.

CARIATI, a town of Italy, in the kingdom of Naples, and province of Hither Calabria, with a biſhop's ſee, and the title of a principality. It is two miles from the gulf of Taranto, and 37 north-eaſt of Coſenza. E. Long. 17. 19. N. Lat. 30. 38.

CARIBBEE ISLANDS, a cluſter of iſlands ſituated in the Atlantic ocean between 59 and 63 degrees of weſt longitude, and between 11 and 18 degrees of north latitude. They lie in the form of a bow or ſemicircle, ſtretching almoſt from the coaſt of Florida north, to near the river Oroonoque. Thoſe that lie neareſt the eaſt have been called the *Windward Iſlands,* the others the *Leeward,* on account of the winds blowing generally from the eaſtern point in thoſe quarters. Abbe Raynal conjectures them to be the tops of very high mountains formerly belonging to the continent, which have been changed into iſlands by ſome revolution that has laid the flat country under water. The direction of the Caribbee iſlands, beginning from Tobago, is nearly north and N. N. W. This direction is continued forming a line ſomewhat curved towards the north weſt, and ending at Antigua. In this place the line becomes at once curved; and extending itſelf in a ſtraight direction to the weſt and north weſt, meets in its courſe with Porte-Rico, St Domingo, and Cuba, known by the name of the *Leeward Iſlands,* which are ſeparated from each other by channels of various breadths. Some of theſe are ſix, others 15 or 20 leagues broad: but in all of them the ſoundings are from 100 to 120 or 150 fathoms. Between Grenada and St Vincent's there is alſo a ſmall archipelago of 30 leagues, in which the ſoundings are not above ten fathom. The mountains in the Caribbee iſlands run in the ſame direction as the iſlands themſelves. The direction is ſo regular, that if we were to conſider the tops of theſe mountains only, independent of their baſes, they might be looked upon as a chain of hills belonging to the continent, of which Martinico would be the moſt northweſterly promontory. The ſprings of water which flow from the mountains in the Windward Iſlands, run all in the weſtern parts of theſe iſlands. The whole eaſtern coaſt is without any running water. No ſprings come down there from the mountains: and indeed they would have there been uſeleſs; for after having run over a very ſhort tract of land, and with great rapidity, they would have fallen into the ſea. In Porto Rico, St Domingo, and Cuba, there are a few rivers that diſcharge themſelves on the northern ſide, and whoſe ſources riſe in the mountains running from eaſt to weſt, that is, thro' the whole length of theſe iſlands. From the other ſide of the mountains facing the ſouth, where the ſea, flowing with great impetuoſity, leaves behind it marks of its inundations, ſeveral rivers flow down, the mouths of which are capable of receiving the largeſt ſhips. The ſoil of the Caribbees conſiſts moſtly of a layer of clay or gravel of different thickneſs; under which is a bed of ſtone or rock. The nature of ſome of thoſe ſoils is better adapted to vegetables than others. In thoſe places where the clay is drier and more friable, and mixes with the leaves and remains of plants, a layer of earth is formed of greater depth than where the clay is moiſter. The ſand or gravel has different properties according to its peculiar nature: wherever it is leſs hard, leſs compact, and leſs porous, ſmall pieces ſeparate themſelves from it, which, though dry, preſerve a certain degree of coolneſs uſeful to vegetation. This ſoil is called in America a *pumice-ſtone* ſoil. Whereever the clay and gravel do not go through ſuch modifications, the ſoil becomes barren, as ſoon as the layer formed by the decompoſition of the original plants is deſtroyed.—By a treaty concluded in January 1660;

ribbee.

between the French and Engliſh, the Caribs were confined to the iſlands of St Vincent's and Dominica, where all the ſcattered body of this people were united, and at that time did not exceed in number 6000 men. See St Vincent's and Dominica.

As the Caribbee iſlands are all between the tropics, their inhabitants are expoſed, allowing for the varieties reſulting from difference of ſituation and ſoil, to a perpetual heat, which generally increaſes from the riſing of the ſun till an hour after noon, and then declines in proportion as the ſun declines. The variations of the temperature of the air ſeem to depend rather on the wind than on the changes of the ſeaſons. In thoſe places where the wind does not blow, the air is exceſſively hot, and none but the eaſterly winds contribute to temper and refreſh it: thoſe that blow from the ſouth and weſt afford little relief; but they are much leſs frequent and leſs regular than that which blows from the eaſt. The branches of the trees expoſed to the influence of the latter are forced round towards the weſt: but their roots are ſtronger, and more extended under the ground, towards the eaſt than towards the weſt; and hence they are eaſily thrown down by ſtrong weſt winds or hurricanes from that quarter. The eaſterly wind is ſcarce felt in the Caribbee iſlands before 9 or 10 o'clock in the morning, increaſes in proportion as the ſun riſes above the horizon, and decreaſes as it declines. Towards the evening it ceaſes entirely to blow on the coaſts, but not on the open ſea. It has alſo been obſerved, that it blows with more force, and more regularity, in the dog-days than at any other time of the year.

The rain alſo contributes to the temperature of the Caribbee iſlands, though not equally in them all. In thoſe places where the eaſterly wind meets with nothing to oppoſe its progreſs, it diſpels the clouds as they begin to riſe, and cauſes them to break either in the woods or upon the mountains. But whenever the ſtorms are too violent, or the blowing of the eaſterly wind is interrupted by the changeable and temporary effect of the ſoutherly and weſterly ones, it then begins to rain. In the other Caribbee iſlands, where this wind does not generally blow, the rains are ſo frequent and plentiful, eſpecially in the winter ſeaſon, which laſts from the middle of July to the middle of October, that, according to the moſt accurate obſervations, as much rain falls in one week, as in our climates in a year. Inſtead of thoſe mild refreſhing ſhowers which fall in the European climates, the rains of the Caribbee iſlands are torrents, the ſound of which might be miſtaken for hail, were not that almoſt totally unknown under ſo burning a ſky. Theſe ſhowers indeed refreſh the air; but they occaſion a dampneſs, the effects of which are not leſs diſagreeable than fatal. The dead muſt be interred within a few hours after they have expired. Meat will not keep ſweet above 24 hours. The fruits decay, whether they are gathered ripe or before their maturity. The bread muſt be made up into buiſcuits, to prevent its growing mouldy. Common wines turn ſour, and iron turns ruſty, in a day's time. The ſeeds can only be preſerved by conſtant attention and care, till the proper ſeaſon returns for ſowing them. When the Caribbee iſlands were firſt diſcovered, the corn that was conveyed there for the ſupport of the Europeans, was ſo ſoon damaged, that it became neceſſary to ſend it out in the ears. This neceſſary precaution ſo much enhanced the price of it, that few were able to purchaſe it. Flour was then ſubſtituted in lieu of corn; which lowered indeed the expences of tranſport, but had this inconvenience, that it was ſooner damaged. It was imagined by a merchant, that if the flour were entirely ſeparated from the bran, it would have the double advantage of being cheaper and keeping longer. He cauſed it therefore to be ſifted, and put the fineſt flour into ſtrong caſks, and beat it cloſe together with iron hammers, till it became ſo cloſe a body that the air could ſcarcely penetrate it. This method was found to anſwer the purpoſe: and if, by it, the flour cannot be preſerved as long as in dry and temperate climates, it may be kept for ſix months, a year, or longer, according to the degree of care taken in the preparation.

Caribbee
‖
Carica.

However troubleſome theſe effects of the rain may be, it is attended with ſome others ſtill more formidable; namely, frequent and dreadful earthquakes. Theſe happening generally during the time or towards the end of the rainy ſeaſon, and when the tides are higheſt, ſome ingenious naturaliſts have ſuppoſed that there might be connection between them. The waters of the ſky and of the ſea undermine, dig up, and ravage the earth in ſeveral different ways. Among the various ſhocks to which the Caribbee iſlands are expoſed from the fury of the boiſterous ocean, there is one diſtinguiſhed by the name of *raz de maree*, or *whirlpool*. It conſtantly happens once, twice, or thrice from July to October, and always on the weſtern coaſts, becauſe it takes place after the time of the weſterly or ſoutherly winds, or while they blow. The waves, which, at a diſtance ſeem to advance gently within 400 or 500 yards, ſuddenly ſwell againſt the ſhore, as if acted upon in an oblique direction by ſome ſuperior force, and break with the greateſt impetuoſity. The ſhips which are then upon the coaſt, or in the roads beyond it, unable either to keep their anchors or to put out to ſea, are daſhed to pieces againſt the land, and all on board moſt commonly periſh. The hurricane is another terrible phenomenon in theſe iſlands, by which incredible damage is occaſioned; but happily it occurs not often.

The produce of the Caribbee iſlands is exceedingly valuable to the Europeans, conſiſting of ſugar, rum, molaſſes, indigo, &c. a particular account of which is given under the names of the reſpective iſlands as they occur in the order of the alphabet.

CARIBBIANA, or Caribiana, the north eaſt coaſt of Terra Firma, in South America, otherwiſe called *New Andalusia*.

CARICA, the papaw: A genus of the decandria order, belonging to the diœcia claſs of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The calyx of the male almoſt none; the corolla is quinquefid and funnel-ſhaped; the filaments in the tube of the corolla, a longer and ſhorter one alternately. The calyx of the female quinquedentated; the corolla is pentapetalous, with five ſtigmata; the fruit an unilocular and polyſpermous berry.

Species. 1. The papaya riſes with a thick, ſoft, herbaceous ſtem, to the height of 18 or 20 feet, naked till within two or three feet of the top. The leaves come out on every ſide, upon very long footſtalks.

Thoſe which are ſituated undermoſt are almoſt horizontal, but thoſe on the top are erect : theſe leaves in full grown plants are very large, and divided into many lobs deeply ſinuated. The ſtem of the plant, and alſo the footſtalks of the leaves, are hollow. The flowers of the male plant are produced from between the leaves on the upper part of the plant. They have footſtalks near two feet long ; at the end of which the flowers ſtand in looſe cluſters, each having a ſeparate ſhort footſtalk : theſe are of a pure white, and have an agreeable odour. The flowers of the female papaya alſo come out from between the leaves towards the upper part of the plant, upon very ſhort footſtalks, ſitting cloſe to the ſtem : they are large, and bell-ſhaped, compoſed of ſix petals, and are commonly yellow ; when theſe fall away, the germen ſwells to a large fleſhy fruit, of the ſize of a ſmall melon. Theſe fruits are of different forms : ſome angular, and compreſſed at both ends ; others oval, or globular ; and ſome pyramidal. The fruit, and all the other parts of the tree abound with a milky acrid juice, which is applied for killing of ring-worms. When the roundiſh fruit are nearly ripe, the inhabitants of India boil and eat them with their meat as we do turnips. They have ſomewhat the flavour of a pompion. Previous to boiling they ſoak them for ſome time in ſalt and water, to extract the corroſive juice ; unleſs the meat they are to be boiled with ſhould be very ſalt and old, and then this juice being in them will make it as tender as a chicken. But they moſtly pickle the long fruit, and thus they make no bad ſuccedaneum for mango. The buds of the female flowers are gathered, and made into a ſweet-meat ; and the inhabitants are ſuch good managers of the produce of this tree, that they boil the ſhells of the ripe fruit into a repaſt, and the inſides are eaten with ſugar in the manner of melons.—The ſtem being hollow, has given birth to a proverb in the Weſt-India iſlands ; where, in ſpeaking of a diſſembling perſon, they ſay he is as hollow as a *Popo*.

2. The proſopoſa, differs from the other in having a branching ſtalk, the lobes of the leaves entire, the flower of a roſe colour, and the fruit ſhaped like a pear, and of a ſweeter flavour than the papaya.

Culture, &c. Theſe plants being natives of hot countries, cannot be preſerved in Britain unleſs conſtantly kept in a warm ſtove, which ſhould be of a proper height to contain them. They are eaſily propagated by ſeeds which are annually brought in plenty from the Weſt-Indies, though the ſeeds of the European plants ripen well. The ſeeds ſhould be ſown in a hot-bed early in the ſpring : when the plants are near two inches high, they ſhould be removed into ſeparate ſmall pots, and each plunged into a hot-bed of tanners bark, carefully ſhading them from the ſun till they have taken root ; after which, they are to be treated in the ſame manner as other tender exotics. When they are removed into other pots, care muſt be taken as much as poſſible to preſerve the ball of earth about them, becauſe wherever their roots are laid bare they ſeldom ſurvive. When they are grown to a large ſize, they make a noble appearance with their ſtrong upright ſtems, garniſhed on every ſide near the top with large ſhining leaves, ſpreading out near three feet all round the ſtem : the flowers of the male ſort coming out in cluſters on every ſide, and the fruit of the female growing round the ſtalks between the leaves, are ſo different from any thing of European production, as well to entitle theſe plants to a place in the gardens of the curious. The fruit of the firſt ſpecies is by the inhabitants of the Caribbee iſlands eaten with pepper and ſugar as melons, but is much inferior to a melon in its native country ; but thoſe which have ripened in Britain were deteſtable : the only uſe to which Mr Miller ſays he has known them put was, when they were about half grown, to ſoak them in ſalt water to get out the acrid juice, and then pickle them for onangos, to which they are a good ſubſtitute.

CARICATURA, in painting, denotes the concealment of real beauties, and the exaggeration of blemiſhes, but ſtill ſo as to preſerve a reſemblance of the object. The word is Italian ; formed of *carica*, a load, burden, or the like.

CARICOUS, an epithet given to ſuch tumours as reſemble the figure of a fig. They are frequently found in the piles.

CARIES, the corruption or mortification of a bone. See MEDICINE and SURGERY, *Index*.

CARIGNAN, a fortified town of Piedmont, ſituated on the river Po, about ſeven miles ſouth of Turin. E. Long. 7. 25. N. Lat. 44. 30. It was taken in 1544 by the French ; who demoliſhed the fortifications, but ſpared the caſtle. It was alſo taken, and retaken, in 1691.

CARILLONS, a ſpecies of chimes frequent in the low countries, particularly at Ghent and Antwerp, and played on a number of bells in a belfrey, forming a complete ſeries or ſcale of tones and ſemitones, like thoſe on the harpſichord and organ. There are petals communicating with the great bells, upon which the *carilloneur* with his feet plays the baſe to ſprightly airs, performed with the two hands upon the upper ſpecies of keys. Theſe keys are projecting ſticks, wide enough aſunder to be ſtruck with violence and velocity by either of the hands edgeways, without the danger of hitting the neighbouring key. The player is provided with a thick leather covering for the little finger of each hand, to guard againſt the violence of the ſtroke. Theſe carillons are heard through a large town.

CARINA, a Latin term, properly ſignifying the *keel* of a ſhip ; or that long piece of timber running along the bottom of the ſhip from head to ſtern, upon which the whole ſtructure is built or framed.

CARINA is alſo frequently uſed for the whole capacity or bulk of a ſhip ; containing the hull or all the ſpace below the deck. Hence the word is alſo ſometimes uſed by a figure for the whole ſhip.

CARINA is alſo uſed in the ancient architecture. The Romans gave the name *carina* to all buildings in form of a ſhip, as we ſtill give the name *nave* to the middle or principal vault of Gothic churches ; becauſe it has that figure.

CARINA, among anatomiſts, is uſed to denote the *ſpina dorſi* ; as likewiſe for the fibrous rudiments or embryo of a chick appearing in an incubated egg. The carina conſiſts of the entire *vertebræ*, as they appear after ten or twelve days incubation. It is thus called, becauſe crooked in form of the keel of a ſhip—Botaniſts

niſts alſo, for the like reaſon, uſe the word *carina*, to expreſs the lower petalum of a papilionaceous flower.

Carinæ were alſo weepers, or women hired among the ancient Romans to weep at funerals; they were thus called from *Caria*, the country whence moſt of them came.

CARINOLA, an epiſcopal town of Italy, in the kingdom of Naples, and Terra di Lavoro. E. Long. 15. 5. N. Lat. 41. 15.

CARINTHIA, a duchy of Germany, in the circle of Auſtria, bounded by the archbiſhopric of Saltzburg on the north, and by Carniola and the Venetian territories on the ſouth, on the weſt by Tyrol, and on the eaſt by Stiria. A part of this country was anciently called *Carnia*, and the inhabitants *Carni;* but the former afterwards obtained the name of *Carinthia*, and the latter *Carantani* or *Carinthi*. The air of this country is cold, and the ſoil in general mountainous and barren; but there are ſome fruitful dales and valleys in it, which produce wheat and other grain. The lakes, brooks, and rivers, which are very numerous, abound with fiſh, and the mountains yield lead and iron, and in many places are covered with woods. The river Drave, which runs acroſs the country, is the moſt conſiderable in Carinthia. The inhabitants are partly deſcended of the ancient Germans, and partly of the Sclavonians or Wends. The ſtates are conſtituted as in Auſtria, and their aſſemblies are held at Clagenfurt. The archbiſhop of Saltzburg, and the biſhop of Bamberg, have conſiderable territories in this country. Chriſtianity was planted here in the 7th century. The only profeſſion tolerated at preſent is the Roman Catholic. The biſhops are thoſe of Gurk and Lavant, who are ſubject to the archbiſhop of Saltzburg. This duchy was formerly a part of Bavaria. In the year 1282, the emperor Rodolph I. gave it to Maynad count of Tyrol, on condition that when his male iſſue failed, it ſhould revert to the houſe of Auſtria; which happened in 1331. Carinthia has its particular governor or *land-captain*, as he is called; and contributes annually towards the expence of the military eſtabliſhment 637,695 florins. Only one regiment of foot is uſually quartered in it.

CARIPI, a kind of cavalry in the Turkiſh army. The caripi, to the number of about 1000, are not ſlaves, nor bred up in the ſeraglio, like the reſt; but are generally Moors or renegado Chriſtians, who having followed adventures, being poor, and having their fortune to ſeek by their dexterity and courage, have arrived at the rank of horſe-guards to the Grand Signior.

CARISSA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. It has two many-ſeeded berries.

CARITAS.—The *poculum caritatis*, or grace-cup, was an extraordinary allowance of wine or other liquors, wherein the religious at feſtivals drank in commemoration of their founder and benefactors.

CARISBROOK-castle, a caſtle ſituated in the middle of the iſle of Wight, where king Charles I. was impriſoned. W Long. 1. 30. N. Lat. 50. 40.

CARISTO, an epiſcopal city of Greece, in the eaſtern part of the iſland of Negropont, near Cape Loro. E. Long. 24. 15. N. Lat. 38. 6.

CARKE, denotes the 30th part of a Sarplar of wool.

CARLE. See Churl.

CARLETON, (Sir Dudley) was born in Oxfordſhire, 1573, and bred in Chriſt-church college. He went as ſecretary to Sir Ralph Winwood into the Low Countries, when king James reſigned the cautionary towns to the States; and was afterwards employed for 20 years as ambaſſador to Venice, Savoy, and the United Provinces. King Charles created him viſcount Dorcheſter, and appointed him one of his principal ſecretaries of ſtate; in which office he died in 1631. He was eſteemed a good ſtateſman, though an honeſt man; and publiſhed ſeveral political works.

CARLINA, the carline thistle: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The calyx is radiated with long coloured marginal ſcales. There are ſeven ſpecies, only one of which is a native of Britain, viz. the vulgaris. The others are natives of the ſouth of France or Italy; and are very eaſily propagated in Britain by ſeeds, which muſt be ſown on a bed of freſh undunged earth, where they are to remain, as they do not bear tranſplanting. When the plants appear above ground, they ſhould be carefully weeded, and afterwards thinned, leaving them about ten inches or a foot aſunder. The ſecond year moſt of them will flower; but, unleſs the ſeaſon proves dry, they rarely produce good ſeeds in Britain, and ſome of the plants decay ſoon after they have flowered, ſo that it is pretty difficult to maintain them there. The roots are uſed in medicine, and for that purpoſe are imported from thoſe countries where the plants grow naturally. As we receive them, they are about an inch thick, externally of a ruſty brown colour, corroded, as it were on the ſurface, and perforated with numerous ſmall holes appearing on the ſurface as if worm-eaten. They have a ſtrong ſmell, and a ſubacrid, bitteriſh, weakly, aromatic taſte. They are looked upon to be warm alexipharmics and diaphoretics. Frederic Hoffman the elder relates that he has obſerved a decoction of them in broth to occaſion vomiting. They have been for ſome time greatly eſteemed among foreign phyſicians; but never were much in uſe in Britain. The preſent practice has entirely rejected them, nor are they often to be met with in the ſhops.

CARLINE, or caroline thistle. See Carlina. It is ſaid to have been diſcovered by an angel to Charlemagne, to cure his army of the plague; whence its denomination.

Carline, or *Caroline*, a ſilver coin current in the Neapolitan dominions, and worth about 8d. of our money.

Carlines, or Carlings, in a ſhip, two pieces of timber lying fore and aft, along from one beam to another, directly over the keel; ſerving as a foundation for the whole body of the ſhip. On theſe the ledges reſt, whereon the planks of the deck and other matters of carpentry are made faſt. The carlines have their ends let into the beams called *culver-tail-wiſe*.

Carline-Knees, are timbers going athwart the ſhip, from the ſides to the hatch-way, ſerving to ſuſtain the deck on both ſides.

CARLINGFORD, a port-town of Ireland, ſeated on Carlingford bay, in the county of Louth, and province of Leinſter, 22 miles north of Drogheda. W. Long. 6. 24. N. Lat. 54. 5.

CARLISLE, the capital city of the county of Cumberland, ſeated on the ſouth of the river Eden, and between the Petterel on the eaſt, and the Caude on the weſt. It is ſurrounded by a ſtrong ſtone-wall, and has a pretty large caſtle in the weſtern part of it, as alſo a citadel in the eaſtern part, built by Henry VIII. It flouriſhed in the time of the Romans, as appears from the antiquities that are to be met with here, and the Roman coins that have been dug up. At the departure of the Romans this city was ruined by the Scots and Picts; and was not rebuilt till the year 680, by Egfrid, who encompaſſed it with a wall, and repaired the church. In the 8th and 9th centuries, the whole country was again ruined, and the city laid deſolate by the incurſions of the Norwegians and Danes. In this condition it remained till the time of William Rufus; who repaired the walls and the caſtle, and cauſed the houſes to be rebuilt. It was fortified by Henry I. as a barrier againſt Scotland; he alſo placed a garriſon in it, and made it an epiſcopal ſee. It was twice taken by the Scots, and afterwards burnt accidentally in the reign of Richard II. The cathedral, the ſuburbs, and 1500 houſes, were deſtroyed at that time. It is at preſent in a good condition; and has three gates, the Engliſh on the ſouth, the Scotch on the north, and the Iriſh on the weſt. It has two pariſhes, and as many churches, St Cuthbert and St Mary's, the laſt of which is the cathedral, and is ſeparated from the town by a wall of its own. The eaſtern part, which is the neweſt, is a curious piece of workmanſhip. The choir with the aiſles is 71 feet broad; and has a ſtately eaſt window 48 feet high and 30 broad, adorned with curious pillars. The roof is elegantly vaulted with wood; and is embelliſhed with the arms of England and France quartered; as alſo with Piercy's, Lucy's, Warren's, Moubray's, and many others. In the choir are the monuments of three biſhops who are buried there. The ſee was erected in 1133 by king Henry I. and made ſuffragan to the archbiſhop of York. The cathedral church here had been founded a ſhort time before by Walter, deputy in theſe parts for king William Rufus, and by him dedicated to the Virgin Mary. He likewiſe built a monaſtery, and filled it with canons regular of St Auguſtine. This foundation continued till the diſſolution of monaſteries, when its lands were added to the ſee, and the maintenance of a dean, &c. placed here in their room. The church was almoſt ruined by the uſurper Cromwell and his ſoldiers; and has never ſince recovered its former beauty, although repaired after the reſtoration. This dioceſe contains the greateſt part of the counties of Cumberland and Weſtmoreland, in which are only 93 pariſhes; but theſe (as all the northern are) exceeding large; and of them are 18 impropriations. Here is one archdeacon, *viz.* of Carliſle. The ſee is valued in the king's books at L. 530 : 4 : 11½, but is computed to be worth annually L. 2800. The clergy's tenth amounts only to L. 161 : 1 : 7½. To this cathedral belong a biſhop, a dean, a chancellor, an archdeacon, four prebendaries, eight minor canons, &c. and other inferior officers and ſervants.

The Picts wall, which was built acroſs the country from Newcaſtle, terminates near this place. Carliſle was a fortified place, and ſtill has its governor and lieutenant-governor, but no garriſon. It was taken by the rebels Nov. 15, 1745; and was retaken by the duke of Cumberland on the 10th of December following, and deprived of its gates. It is governed by a mayor, twelve aldermen, two bailiffs, &c. and has a conſiderable market on Saturdays. The manufactures of Carliſle are chiefly of printed linens, for which near 3000 l. per annum is paid in duties. It is alſo noted for a great manufacture of whips, in which a great number of children are employed.—Salmons appear in the Eden in numbers, ſo early as the months of December and January; and the London and even Newcaſtle markets are ſupplied with early fiſh from this river; but it is remarkable, that they do not viſit the Eſk in any quantity till April; notwithſtanding the mouths of the two rivers are at a ſmall diſtance from each other.—Carliſle ſends two members to parliament, and gives title of Earl to a branch of the Howard family.

CARLOCK, in commerce, a ſort of iſinglaſs, made with the ſturgeon's bladder, imported from Archangel. The chief uſe of it is for clarifying wine, but it is alſo uſed by the dyers. The beſt carlock comes from Aſtracan, where a great quantity of ſturgeon is caught.

CARLOSTAD, or CARLSTAD, a town of Sweden, in Wermeland, ſeated on the lake Warmer, in E. Lon. 14. 4. N. Lat. 59. 16.

CARLOSTAD, or *Carlſtadt*, a town of Hungary, capital of Croatia, and the uſual reſidence of the governors of the province. It is ſeated on the river Kulph, in E. Long. 16. 5. N. Lat. 45. 34.

CARLOWITZ, a ſmall town of Hungary, in Sclavonia, remarkable for a peace concluded here between the Turks and Chriſtians, in 1669. It is ſeated on the weſt ſide of the Danube, in E. Long. 19. 5. N. Lat. 45. 25.

CARLSCRONA, or CARLSCROON, a ſea-port town in the Baltic, belonging to Sweden. It derives its origin and name from Charles XI. who firſt laid the foundations of a new town in 1680, and removed the fleet from Stockholm to this place, on account of its advantageous ſituation in the centre of the Swediſh ſeas, and the ſuperior ſecurity of its harbour. The greateſt part of Carlſcrona ſtands upon a ſmall rocky iſland, which riſes gently in a bay of the Baltic; the ſuburbs extend over another ſmall rock, and along the mole cloſe to the baſon where the fleet is moored. The way into the town from the main land is carried over a dyke to an iſland, and from thence along two long wooden bridges joined by a barren rock. The town is ſpacious, and contains about 18,000 inhabitants. It is adorned with one or two handſome churches, and a few tolerable houſes of brick; but the generality of buildings are of wood. The ſuburbs are fortified towards the land by a ſtone-wall. The entrance into the harbour, which by nature is extremely difficult from a number of ſhoals and rocky iſlands, is ſtill further ſecured from the attack of an enemy's fleet by two ſtrong forts built on two iſlands, under the batteries of which all veſſels muſt paſs.

Formerly veſſels in this port, when careened and repaired, were laid upon their ſides in the open harbour, until a dock, according to a plan given by Polheim, was hollowed in the ſolid rock: it was begun in 1714, and finiſhed in 1724; but as it was too ſmall for the admiſſion of men of war, it has lately been enlarged, and is now capable of receiving a ſhip of the firſt rate. But new docks have been begun upon a ſtupenduous plan worthy of the ancient Romans. According to the original ſcheme, it was intended to conſtruct 30 docks, for building and laying up the largeſt ſhips, at the extremity of the harbour. A large baſon, capable of admitting two men of war, is deſign to communicate, by ſluices, with two ſmaller baſons, from each of which are to extend, like the radii of a circle, five rows of covered docks: each row is to be ſeparted by walls of ſtones; and each dock to be provided with ſluice-gates, ſo as to be filled or emptied by means of pumps. Cloſe to the docks, magazines for naval ſtores are to be conſtructed, and the whole to be incloſed with a ſtone-wall. The project was begun in 1757; but was much neglected until the acceſſion of his preſent majeſty, who warmly patronized the arduous undertaking. At the commencement of the works, L. 25,000 were annually expended upon them; which ſum has been leſſened to about L. 6000 per annum, and the number of docks reduced to 20. The firſt dock was finiſhed in 1779, and it was computed that the whole number would be executed in 20 years.

CARLSTADT, a town of Germany, in the circle of Franconia, and biſhopric of Wurtſburg, ſeated on the river Maine, in E. Long. 9. 51. N. Lat. 50. 0.

CARLTON, a town in Norfolk held by this tenure, that they ſhall preſent 1000 herrings baked in 14 pies to the king, wherever he ſhall be when they firſt come in ſeaſon,

CARMAGNIOLA, a fortified town of Italy, in Piedmont, with a good caſtle. It was taken by the French in 1591, and retaken by prince Eugene the ſame year. It is ſeated in a country abounding in corn, flax, and ſilk, near the river Po, in E. Long. 7. 32. N. Lat. 44 43.

CARMANIA, (anc. geog.) a country of Aſia, to the eaſt of Perſia, having Parthia to the north, Gedroſia to the eaſt, to the ſouth the Perſian Gulf or Sea in part, and in part the Indian, called the *Carmanian Sea*, diſtinguiſhed into *Carmania Deſerta* and *Carmania Propria*; the former lying to the ſouth of Parthia: and to the ſouth of that, the *Propria*, quite to the ſea. Its name is from the Syriac, *Carma*, ſignifying a "vine," for which that country was famous, yielding cluſters three feet long. Now KERMAN, or CARIMANIA, a province of modern Perſia.

CARMEL, a high mountain of Paleſtine, ſtanding on the ſkirts of the ſea, and forming the moſt remarkable head-land on all that coaſt. It extends eaſtward from the ſea as far as the plain of Jezreel, and from the city of that name quite to Cæſarea on the ſouth. It ſeems to have had the name of *Carmel* from its great fertility; this word, according to the Hebrew import, ſignifying the *vine of God*, and is uſed in ſcripture to denote any fruitful ſpot, or any place planted with fruit trees. This mountain, we are aſſured, was very fertile. Mr Sandys acquaints us, that when well cultivated, it abounds with olives, vines, and variety of fruits and herbs both medical and aromatic. Others, however, repreſent it as rather dry and barren; which perhaps may have happened from the neglect of agriculture ſo common in all parts of the Turkiſh empire, eſpecially where they are expoſed to the incurſions of the Arabs. Carmel is the name of the mountain, and of a city built on it; as well as of a heathen deity worſhiped in it, but without either temple or ſtatue: though anciently there muſt have been a temple, as we are told that this mountain was a favourite retreat of Pythagoras, who ſpent a good deal of time in the temple, without any perſon with him. But what hath rendered mount Carmel moſt celebrated and revered both by Jews and Chriſtians, is its having been the reſidence of the prophet Elijah, who is ſuppoſed to have lived there in a cave (which is there ſhewn), before he was taken up into heaven.

CARMELITES, an order of religious, making one of the four tribes of mendicants or begging friars; and taking its name from mount Carmel, formerly inhabited by Elias, Eliſha, and the children of the prophets; from whom this order pretends to deſcend in an uninterrupted ſucceſſion. The manner in which they make out their antiquity has ſomething in it too ridiculous to be rehearſed. Some among them pretend they are deſcendants of Jeſus Chriſt; others go further, and make Pythagoras a Carmelite, and the ancient druids regular branches of their order. Phocas a Greek monk, ſpeaks the moſt reaſonably. He ſays, that in his time, 1185, Elias's cave was ſtill extent on the mountain; near which was the remains of a building which intimated that there had been anciently a monaſtery; that, ſome years before, an old monk, a prieſt of Calabria, by revelation, as he pretended, from the prophet Elias, fixed there, and aſſembled ten brothers.—In 1209, Albert, patriarch of Jeruſalem, gave the ſolitaries a rigid rule, which Papebroch has ſince printed. In 1217, or, according to others, 1226, pope Honorius III. approved and confirmed it. This rule contained 16 articles; one of which confirmed them to their cells, and enjoined them to continue day and night in prayers; another prohibited the brethren having any property; another enjoined faſting from the feaſt of the holy croſs till Eaſter, except on Sundays; abſtinence at all times from fleſh was enjoined by another article; one obliged them to manual labour; another impoſed a ſtrict ſilence on them from veſpers till the tierce the next day.

The peace concluded by the emperor Frederic II. with the Saracens, in the year 1229, ſo diſadvantageous to Chriſtendom, and ſo beneficial to the infidels, occaſioned the Carmelites to quit the Holy Land, under Alan the fifth general of the order. He firſt ſent ſome of the religious to Cyprus, who landed there in the year 1238, and founded a monaſtery in the foreſt of Fortania. Some Sicilians, at the ſame time, leaving mount Carmel, returned to their own country, where they founded a monaſtery in the ſuburbs of Meſſina. Some Engliſh departed out of Syria, in the year 1240, to found others in England. Others of Provence, in the year 1244, founded a monaſtery in the deſart of Aigualates, a league from Marſeilles: and thus, the number of their monaſteries increaſing, they held their European general chapter in the year 1245, at their monaſtery of Aylesford in England.—This order is ſo much increaſed, that it has, at preſent, 38 provinces, beſides the congregation of Mantua, in which are 54 monaſteries, under a vicar-general, and the congregations of Barefooted Carmelites in Italy and Spain, which have their peculiar generals.

After the eſtabliſhment of the Carmelites in Europe, their rule was in ſome reſpects altered; the firſt time, by pope Innocent IV. who added to the firſt article a precept of chaſtity, and relaxed the 11th which enjoins abſtinence at all times from fleſh, permitting them, when they travelled, to eat boiled fleſh: this pope likewiſe gave them leave to eat in a common refectory, and to keep aſſes or mules for their uſe. Their rule was again mitigated by the popes Eugenius IV. and Pius II. Hence the order is divided into two branches, viz. *the Carmelites of the ancient obſervance,* called the *moderate* or *mitigated;* and thoſe *of the ſtrict obſervance,* who are the *barefooted Carmelites;* a reform ſet on foot in 1540, by S. Thereſa, a nun of the convent of Avila, in Caſtile: theſe laſt are divided into two congregations, that of Spain and that of Italy.

The habit of the Carmelites was at firſt white, and the cloak laced at the bottom with ſeveral liſts. But pope Honorious IV. commanded them to change it for that of the Minims. Their ſcapulary is a ſmall woollen habit of a brown colour, thrown over their ſhoulders. They wear no linen ſhirts; but inſtead of them linſey-wolſey, which they change twice a-week in the ſummer and once a week in the winter.

If a monk of this order lies with a woman, he is prohibited ſaying maſs for three or four years, is declared infamous, and obliged to diſcipline himſelf publicly once a-week. If he is again guilty of the ſame fault, his penance is doubled; and if a third time, he is expelled the order.

CARMEN, an ancient term among the Latins, uſed in a general ſenſe to ſignify a verſe; but more particularly to ſignify a ſpell, charm, form of expiation or execration, couched in a few words placed in a myſtic order, on which its efficacy depended. Pezron derives the word *carmen* from the Celtic *carm,* the ſhout of joy, or the verſes which the ancient bards ſung to encourage the ſoldiers before the combat.—*Carmen* was anciently a denomination given alſo to precepts, laws, prayers, imprecations, and all ſolemn formulæ couched in a few words placed in a certain order, though written in proſe. In which ſenſe it was that the elder Cato wrote a *Carmen de moribus,* which was not in verſe, but in proſe.

CARMENTALIA, a feaſt among the ancient Romans celebrated annually upon the 11th of January, in honour of Carmenta, or Carmentis, a propheteſs of Arcadia, mother of Evander, with whom ſhe came into Italy 60 years before the Trojan war. The ſolemnity was alſo repeated on the 15th of January, which is marked in the old calendar by *Carmentalia relata.* This feaſt was eſtabliſhed on occaſion of a great fecundity among the Roman dames, after a general reconciliation with their huſbands, with whom they had been at variance, in regard of the uſe of coaches being prohibited them by an edict of the ſenate. This feaſt was celebrated by the women: he who offered the ſacrifices was called *ſacerdos carmentalis.*

CARMINATIVES, medicines uſed in colics, or other flatulent diſorders, to diſpel the wind. The word comes from the Latin *carminare,* to card or teaze wool, and figuratively to attenuate and diſcuſs wind or vapours, and promote their diſcharge by perſpiration. Though Dr Quincy makes it more myſterious: He ſays it comes from the word *carmen,* taking it in the ſenſe of an invocation or charm; and makes it to have been a general name for all medicines which operated like charms, *i. e.* in an extraordinary manner. Hence, as the moſt violent pains were frequently thoſe ariſing from pent-up wind, which immediately ceaſe upon diſperſion; the term *carminative* became in a peculiar ſenſe applied to medicines which gave relief in windy caſes, as if they cured by inchantment: but this interpretation ſeems a little too far ſtrained.

CARMINE, a powder of a very beautiful red colour, bordering upon purple; and uſed by painters in miniature, though rarely on account of its great price. The manner of preparing it is kept a ſecret by the colour-makers; neither do any of thoſe receipts which have for a long time been publiſhed concerning the preparation of this and other colours at all anſwer the purpoſe. See *Colour-Making.*

CARMONA, a town of Italy in Frioli, and in the county of Goritz, ſeated on a mountain near the river Indri. It belongs to the houſe of Auſtria. E. Long. 5. 37. N. Lat. 46. 15.

Carmona, an ancient town of Spain in Andaluſia. The gate towards Seville is one of the moſt extraordinary pieces of antiquity in all Spain. It is ſeated in a fertile country, 15 miles eaſt of Seville. W. Long. 5. 37. N. Lat. 37. 24.

CARNATION, in botany. See Dianthus.

Carnation-Colour, among painters, is underſtood of all the parts of a picture, in general, which repreſent fleſh, or which are naked and without drapery. Titian and Corregio in Italy, and Rubens and Vandyke in Flanders, excelled in carnations.—In colouring for fleſh, there is ſo great a variety, that it is hard to lay down any general rules for inſtruction therein; neither are there any regarded by thoſe who have acquired a ſkill this way: the various colouring for carnations may be eaſily produced, by taking more or leſs red, blue, yellog or biſtre, whether for the firſt colouring, or for the finiſhing the colouring for women ſhould be bluiſh, for children a little red, both freſh and gay; and for the men it ſhould incline to yellow, eſpecially if they are old.

Carnation, among dyers. To dye a carnation, or red roſe colour, it is directed to take liquor of wheat bran a ſufficient quantity, alum three pounds, tartar two ounces; boil them and enter twenty yards of broad cloth; after it has boiled three hours, cool and waſh it: take freſh clear bran liquor a ſufficient quantity, madder five pounds; boil and ſodden according to art.—The Bow dyers know that the ſolution of jupiter, or delved tin, being put in a kettle to the alum and tartar, in another proceſs, make the cloth, &c. attract the colour into it, ſo that none of the cochineal is left, but the whole is abſorbed by the cloth.

CARNEADES, a celebrated Greek Philoſopher, was a native of Cyrene in Africa, and founder of the third academy. He was ſo fond of ſtudy, that he not only avoided all entertainments, but forgot even to eat at his own table; his maid-ſervant Meliſſa was obliged to put the victuals into his hand. He was an antagoniſt of the Stoics; and applied himſelf with great eagerneſs

gerneſs to refute the works of Chryſippus, one of the moſt celebrated philoſophers of their ſect. The power of his eloquence was dreaded even by a Roman ſenate. The Athenians being condemned by the Romans to pay a fine of 500 talents for plundering the city of Oropus, ſent ambaſſadors to Rome, who got the fine mitigated to 100 talents. Carneades the academic, Diogenes the Stoic, and Critolaus the Peripatetic, were charged with this embaſſy. Before they had an audience of the ſenate, they harangued to great multitudes in different parts of the city. Carneades's eloquence was diſtinguiſhed from that of the others by its ſtrength and rapidity. Cato the elder made a motion in the ſenate, that theſe ambaſſadors ſhould be immediately ſent back, becauſe it was very difficult to diſcern the truth thro' the arguments of Carneades. The Athenian ambaſſadors (ſaid many of the ſenators) were ſent rather to force us to comply with their demands, than to ſolicit them by perſuaſion; meaning, that it was impoſſible to reſiſt the power of that eloquence with which Carneades addreſſed himſelf to them. According to Plutarch, the youth at Rome were ſo charmed by the fine orations of this philoſopher, that they forſook their exerciſes and other diverſions, and were carried with a kind of madneſs to philoſophy; the humour of philoſophiſing ſpreading like enthuſiaſm. This grieved Cato, who was particularly afraid of the ſubtilty of wit and ſtrength of argument with which Carneades maintained either ſide of a queſtion. Carneades harangued in favour of juſtice one day, and the next day againſt it, to the admiration of all who heard him, among whom were Galba and Cato, the greateſt orators of Rome. This was his element; he delighted in demoliſhing his own work; becauſe it ſerved in the end to confirm his grand principle, that there are only probabilities or reſemblances of truth in the mind of man; ſo that of two things directly oppoſite, either may be choſen indifferently. Quintilian remarks, that though Carneades argued in favour of injuſtice, yet he himſelf acted according to the ſtrict rules of juſtice. The following was a maxim of Carneades: "If a man privately knew that his enemy, or any other perſon whoſe death might be of advantage to him, would come to ſit down on graſs in which there lurked an aſp, he ought to give him notice of it, though it were in the power of no perſon whatever to blame him for being ſilent." Carneades, according to ſome, lived to be 85 years old; others make him to be 90: his death is placed in the 4th year of the 162d Olympiad.

CARNEDDE, in Britiſh antiquity, denotes heaps of ſtones ſuppoſed to be druidical remains, and thrown together on occaſion of confirming and commemorating a covenant. Gen. xxxi. 46. They are very common in the iſle of Angleſey, and were alſo uſed as ſepulchral monuments, in the manner of *tumuli*; for Mr Rowland found a curious urn in one of theſe carnedde. Whence it may be inferred, that the Britons had the cuſtom of throwing ſtones on the deceaſed. From this cuſtom is derived the Welch proverb, *Karn ardyben*, "ill betide thee."

CARNEIA, in antiquity, a feſtival in honour of Apollo, ſurnamed Carneus, held in moſt cities of Greece, but eſpecially at Sparta, where it was firſt inſtituted.

The reaſon of the name, as well as the occaſion of the inſtitution, is controverted. It laſted nine days, beginning on the 13th of the month Carneus. The ceremonies were an imitation of the method of living and diſcipline uſed in camps.

CARNEL.—The building of ſhips firſt with their timber and beams, and after bringing on their planks, is called *carnel-work*, to diſtinguiſh it from clinch-work.

Veſſels alſo which go with mizzen-ſails inſtead of main-ſails are by ſome called carnels.

CARNELIAN, in natural hiſtory, a precious ſtone, of which there are three kinds, diſtinguiſhed by three colours, a red, a yellow, and a white. The red is very well known among us; is found in roundiſh or oval maſſes, much like our common pebbles; and is generally met with between an inch and two or three inches in diameter: it is of a fine, compact, and cloſe texture; of a gloſſy ſurface; and, in the ſeveral ſpecimens, is of all the degrees of red, from the paleſt fleſh-colour to the deepeſt blood-red. It is generally free from ſpots, clouds, or variegations: but ſometimes it is veined very beautifully with an extremely pale red, or with white; the veins forming concentric circles, or other leſs regular figures, about a nucleus, in the manner of thoſe of agates. The pieces of carnelian which are all of one colour, and perfectly free from veins, are thoſe which our jewellers generally make uſe of for ſeals, though the variegated ones are much more beautiful. The carnelian is tolerably hard, and capable of a very good poliſh: it is not at all affected by acid menſtruums: the fire diveſts it of a part of its colour, and leaves it of a pale red; and a ſtrong and long continued heat will reduce it to a pale dirty gray.

The fineſt carnelians are thoſe of the Eaſt Indies; but there are very beautiful ones found in the rivers of Sileſia and Bohemia; and there are ſome not deſpicable ones in England.

Though the ancients have recommended the carnelian as aſtringent, and attributed a number of fanciful virtues to it, we know of no other uſe of the ſtone than the cutting ſeals on it; to which purpoſe it is excellently adapted, as being not too hard for cutting, and yet hard enough not to be liable to accidents, to take a good poliſh, and to ſeparate eaſily from the wax.

CARNERO, in geography, a name given to that part of the gulph of Venice which extends from the weſtern coaſt of Iſtria to the iſland of Groſſa and the coaſt of Morlachia.

CARNERO is likewiſe the name of the cape to the weſt of the mouth of the bay of Gibraltar.

CARNIFEX, among the Romans, the common executioner. By reaſon of the odiouſneſs of his office, the carnifex was expreſsly prohibited by the laws from having his dwelling-houſe within the city. In middle age writers carnifex alſo denotes a butcher.

Under the Anglo-Daniſh kings, the carnifex was an officer of great dignity; being ranked with the archbiſhop of York, earl Goodwin, and the lord ſteward. Flor. Wigorn. ann. 1040. *Rex Hardecanutus Alfricum Ebor. Archiep. Goodwinum comitem, Edricum diſpenſatorem, Thrond ſuum* carnificem, *& alios magnæ dignitatis viros Londinum miſit.*

CARNIOLA, a duchy of Germany bounded on the ſouth by the Adriatic ſea, and that part of Iſtria poſſeſſed by the republic of Venice; on the north, by Carinthia and Stiria; on the eaſt, by Sclavonia and Croatia; on the weſt, by Friuli, the county of Gorz or Goritz, and a part of the gulph of Venice; extending in length about 110 miles, and in breadth about 50. It had its ancient name *Carnia,* as well as the modern one *Carniola,* from its ancient inhabitants the *Carni,* a tribe of Scythians, otherwiſe called *Japides,* whence this and the adjacent countries were alſo called *Japidia.*

Carniola is full of mountains, ſome of which are cultivated and inhabited, ſome covered with wood, others naked and barren, and others continually buried in ſnow. The valleys are very fruitful. Here are likewiſe mines of iron, lead and copper; but ſalt muſt be had from the ſovereign's magazines. There are ſeveral rivers, beſides many medicinal ſprings and inland lakes. The common people are very hardy, going barefooted in winter through the ſnow, with open breaſts, and ſleeping on a hard bench without bed or bolſter. Their food is alſo very coarſe and mean. In winter, when the ſnow lies deep on the ground, the mountaineers bind either ſmall baſkets, or long thin narrow boards, like the Laplanders, to their feet, on which, with the help of a ſtout ſtaff or pole, they deſcend with great velocity from the mountains. When the ſnow is frozen, they make uſe of a ſort of irons or ſkaits. In different parts of the country the inhabitants, eſpecially the common ſort, differ greatly in their dreſs, language, and manner of living. In Upper and Lower Carniola they wear long beards. The languages chiefly in uſe are the Sclavonian or Wendiſh, and German; the firſt by the commonalty, and the latter by people of faſhion. The duchy is divided into the Upper, Lower, Middle, and Inner, Carniola. The principal commodities exported hence are, iron, ſteel, lead, quickſilver, white and red wine, oil of olives, cattle, ſheep, cheeſe, linen, and a kind of woollen ſtuff called *mahalan,* Spaniſh leather, honey, walnuts, and timber; together with all manner of wood-work, as boxes, diſhes, &c.—Chriſtianity was firſt planted here in the eight century.—Lntheraniſm made a conſiderable progreſs in it; but, excepting the Walachians or Uſkokes, who are of the Greek church, and ſtyle themſelves *Staraverzi,* i. e. old believers, all the inhabitants at preſent are Roman Catholics. Carniola was long a marquiſate or margravate; but in the year 1231 was erected into a duchy. As its proportion towards the maintenance of the army, it pays annually 363,171 florins; but only two regiments of foot are quartered in it.

CARNIVAL, or CARNAVAL, a time of rejoicing, a ſeaſon of mirth, obſerved with great ſolemnity by the Italians, particularly at Venice, holding from the twelfth day till Lent.

The word is formed from the Italian *Carnavalle;* which Mr Du-Cange derives from *Carn-a-val,* by reaſon the fleſh then goes to pot, to make amends for the ſeaſon of abſtinence then enſuing. Accordingly, in the corrupt Latin, he obſerves, it was called *Carnelevamen,* and *Carniſprivium;* as the Spaniards ſtill denominate it *carnes tollendas.*

Feaſts, balls, operas, concerts of muſic, intrigues, marriages, &c. are chiefly held in carnival time. The carnival begins at Venice the ſecond holiday in Chriſtmas: Then it is they begin to wear maſks, and open their play-houſes and gaming houſes; the place of St Mark is filled with mountebanks, jack-puddings, pedlars, whores, and ſuch like mob, who flock thither from all parts. There have been no leſs than ſeven ſovereign princes and 30,000 foreigners here to partake of theſe diverſions.

CARNIVOROUS, an epithet applied to thoſe animals which naturally ſeek and feed on fleſh.

It has been a diſpute among naturaliſts, whether man is naturally carnivorous. Thoſe who take the negative ſide of the queſtion, inſiſt chiefly on the ſtructure of our teeth, which are moſtly inciſores or molares; not ſuch as *carnivorus* animals are furniſhed with, and which are proper to tear fleſh in pieces: to which it may be added, that, even when we do feed on fleſh, it is not without a preparatory alteration by boiling, roaſting, &c. and even then that it is the hardeſt of digeſtion of all foods. To theſe arguments Dr Wallis ſubjoins another, which is that all quadrupeds which feed on herbs or plants have a long colon, with a cœcum at the upper end of it, or ſomewhat equivalent, which conveys the food by a long and large progreſs, from the ſtomach downwards, in order to its ſlower paſſage and longer ſtay in the inteſtines; but that, in *carnivorus* animals, ſuch cœcum is wanting, and inſtead thereof there is a more ſhort and ſlender gut, and a quicker paſſage through the inteſtines. Now, in man, the cœcum is very viſible: a ſtrong preſumption that nature, who is ſtill conſiſtent with herſelf, did not intend him for a *carnivorous* animal.—It is true, the cœcum is but ſmall in adults, and ſeems of little or no uſe; but in a fœtus it is much larger in proportion: And it is probable, our cuſtomary change of diet, as we grow up, may occaſion this ſhrinking. But to theſe arguments, Dr Tyſon replies, that if man had been by nature deſigned not to be *carnivorous,* there would doubtleſs have been found, ſomewhere on the globe, people who do not feed on fleſh; which is not the caſe. Neither are carnivorous animals always without a colon and cœcum; nor are all animals carnivorous which have theſe parts: the opoſſum, for inſtance, hath both a colon and cœcum, and yet feeds on poultry and other fleſh; whereas the hedge-hog, which has neither colon nor cœcum, and ſo ought to be carnivorous, feeds only on vegetables. Add to this, that hogs, which have both, will feed upon fleſh when they can get it; and rats and mice, which have large cœcums, will feed on bacon as well as bread and cheeſe. Laſtly, the human race are furniſhed with teeth neceſſary for the preparation of all kinds of foods; from whence it would ſeem, that nature intended we ſhould live on all. And as the alimentary duct in the human body is fitted for digeſting all kinds of food, ought we not rather to conclude, that nature did not intend to deny us any?

It is no leſs diſputed whether mankind were *carnivorous* before the flood. St Jerom, Chryſoſtom, Theodoret, and other ancients, maintain, that all animal food was then forbidden; which opinion is alſo ſtrenuouſly ſupported among the moderns by Curcellæus, and refuted by Heidegger, Danzius, Bockhart, &c. See ANTEDILUVIANS.

CARNOSITY is uſed by ſome authors for a little fleſhy

Caro, Carolina.

fleſhy excreſcence, tubercle, or wen, formed in the urethra, the neck of the bladder, or yard, which ſtops the paſſage of the urine.—Carnoſities are very difficult of cure: they are not eaſily known but by introducing a probe into the paſſage, which there meets with reſiſtance. They uſually ariſe from ſome venereal malady ill managed.

CARO, (Annibal) a celebrated Italian poet, was born at Civita Nuovo in 1507. He became ſecretary to the Duke of Parma, and afterwards to Cardinal Farneſe. He was alſo made a knight of Malta. He tranſlated Virgil's Æneid into his own language with ſuch propriety and elegance of expreſſion, that he was allowed by the beſt judges to have equalled the original. He alſo tranſlated Ariſtotle's rhetoric, two oratorios of Gregory Nazianzen, with a diſcourſe of Cyprian. He wrote a comedy; and a miſcellany of his poems was printed at Venice in 1584. He died at Rome in 1566.

CAROLINA, (North and South) two of the United States of North America, lying betwen 32° and 36°, 30 N. Lat. and 76° and 91° W. Long. Bounded on the eaſt by the Atlantic, on the weſt by the river Miſſiſippi, on the north by Virginia, and on the ſouth by Georgia and Florida.

This country is ſeated between the extremities of heat and cold, though the heat is more troubleſome in ſummer than the cold in winter; their winters being very ſhort, and the froſty mornings frequently ſucceeded by warm days. The air is generally ſerene and clear the greateſt part of the year; but in February and March the inhabitants have a cuſtom of burning the woods, which cauſes ſuch a ſmoke as to ſtrangers would ſeem to proceed from a fog or thickneſs in the air. The ſmoke of the tar-kilns likewiſe deceives ſtrangers, and gives them an ill opinion of the air of Carolina; to which alſo conduces a cuſtom of the Indians of ſetting fire to the woods in their huntings, for many miles round. The great rains are in winter, though they are not without heavy ſhowers at midſummer; add to theſe the conſtant dews that fall in the night, which refreſh the ground and ſupply the plants with moiſture. In North Carolina, the northweſt winds in the winter occaſion very pinching weather; but they are not of long continuance. Weſterly winds bring very pleaſant weather; but the ſoutherly are hot and unwholeſome, occaſioning fevers and other diſorders. But this muſt be underſtood of ſummer, for in winter they are very comfortable. The depth of winter is towards the latter end of February, and then the ice is not ſtrong enough to bear a man's weight. In Auguſt and September there are ſometimes great ſtorms and ſqualls of wind, which are ſo violent as to make lanes of 100 feet wide, more or leſs, thro' the woods, tearing up the trees by the roots. Theſe ſtorms generally happen once in about ſeven years; and are attended with dreadful thunder, lightning, and heavy rains. They commonly happen about the time of the hurricanes which rage ſo fatally among the iſlands between the tropics; and ſeem to be occaſioned by them, or to proceed from the ſame cauſe: but by the time they reach Carolina, their force is much abated; and the farther north they proceed, ſo much the more do they decreaſe in fury. The ſoil on the coaſt is ſandy; but farther up, the country is ſo fruitful that they have not yet been at the trouble to manure their land. The grains moſt cultivated are Indian corn and rice, though any ſort will thrive well enough; they have alſo pulſe of ſeveral ſorts, little known in England. All kinds of garden ſtuff uſual in England are cultivated here, and may be had in great plenty. They export large quantities yearly of rice, pitch, tar, turpentine, deer-ſkins, and timber for building; cypreſs, cedar, ſaſſafras, oak, walnut, and pine. Beſides theſe they alſo ſend out beef, pork, tallow, hides, furs, wheat, peas, potatoes, honey, bees-wax, myrtle-wax, tobacco, ſnake-root, cotton, ſeveral ſorts of gums and medicinal drugs. Indigo is alſo cultivated in this country, but of an inferior quality to that which is raiſed in the Caribbee iſlands. The culture of vines in this country has made but little progreſs, from the idea that the froſts, though not of long continuance, are yet ſufficient to check the growth of the vine, as well as olives, dates, oranges, &c. but as population increaſes theſe articles will become of much importance. The furs are bought of the Indians with vermilion, lead, gunpowder, coarſe cloth, iron, and ſpirituous liquors. The aſpect of the country is very fine, being adorned with beautiful rivers and creeks, and the woods with lofty timber, which afford delightful and pleaſant ſeats for the planters, and render the fencing their lands very eaſy. And as they have plenty of fiſh, wild fowl, and veniſon, beſides other neceſſaries which this country produces naturally, they live eaſy and luxuriouſly.

Carolina.

Carolina was diſcovered by Sebaſtian Cabot, about the year 1500, in the reign of Henry VII. but the ſettling of it being neglected by the Engliſh, a colony of French Proteſtants, by the encouragement of Admiral Coligni, were tranſported thither; and named the place of their firſt ſettlement *Arx Carolina*, in honour of their prince, Charles IX. of France: but in a ſhort time that colony was deſtroyed by the Spaniards; and no other attempt was made by any European power to ſettle there till the year 1664, when 800 Engliſh landed at Cape-Fear in North Carolina, and took poſſeſſion of the country. In 1670 Charles II. of Britain granted Carolina to the Lords Berkley, Clarendon, Albemarle, Craven, and Aſhley, Sir George Carteret, Sir William Berkley, and Sir John Colliton. The plan of government for this new colony was drawn up by the famous Mr Locke, who very wiſely propoſed an univerſal toleration in religious matters. The only reſtriction in this reſpect was, that every perſon claiming the protection of that ſettlement, ſhould, at the age of 17, regiſter himſelf in ſome particular communion. To civil liberty, however, our philoſopher was not ſo favourable; the code of Carolina gave to the eight proprietors who founded the colony, and to their heirs, not only all the rights of a monarch, but all the powers of a legiſlation. The court, which was compoſed of this ſovereign body, and called the *Palatine Court*, was inveſted with the right of nominating to all employments and dignities, and even of conferring nobility; but with new and unprecedented titles. They were, for inſtance, to create in each county two *caciques*, each of whom was to be poſſeſſed of 24,000 acres of land; and a *landgrave*; who was to have 80,000. The perſons on whom theſe honours ſhould be beſtowed were to compoſe the upper houſe, and their poſſeſſions were made unalienable. They had only the right of farming or letting out a third part of them

them at the moſt for three lives. The lower houſe was compoſed of the deputies from the ſeveral counties and towns. The number of this repreſentative body was to be increaſed as the colony grew more populous. No tenant was to pay more than about a ſhilling per acre, and even this rent was redeemable. All the inhabitants, however, both ſlaves and freemen, were under an obligation to take up arms upon the firſt order from the Palatine court.

It was not long before the defects of this conſtitution became apparent. The proprietary lords uſed every endeavour to eſtabliſh an arbitrary government; and, on the other hand, the coloniſts exerted themſelves with great zeal to avoid ſervitude. In conſequence of this ſtruggle, the whole province, diſtracted with tumults and diſſentions, became incapable of making any progreſs, though great things had been expected from its particular advantages of ſituation. Tho' a toleration in religious matters was a part of the original conſtitution, diſſentions aroſe likewiſe on that account. In 1705, Carteret, now Lord Granville, who, as the oldeſt of the proprietors, was ſole governor of the colony, formed a deſign of obliging all the non-conformiſts to embrace the ceremonies of the Church of England; and this act of violence, though diſavowed and rejected by the mother-country, inflamed the minds of the people. In the year 1712, a dangerous conſpiracy was formed by the Coree and Tuſcorora tribes of Indians, to murder and expel this infant colony. The foundation for this conſpiracy is not known. Probably they were offended at the encroachments upon their hunting ground. They managed their conſpiracy with great cunning and profound ſecrecy. They ſurrounded their principal town with a breaſt-work to ſecure their families. Here the warriors convened to the number of 1200. From this place of rendezvous they ſent out ſmall parties, by different roads, who entered the ſettlement under the maſk of friendſhip. At the change of the full moon, all of them had agreed to begin their murderous operations the ſame night. When the night came, they entered the houſes of the planters, demanding proviſions, and pretending to be offended, fell to murdering men, women and children without mercy or diſtinction. One hundred and thirty-ſeven ſettlers, among whom were a Swiſs baron, and almoſt all the poor Palatines that had lately come into the country, were ſlaughtered the firſt night. Such was the ſecrecy and diſpatch of the Indians in this expedition, that none knew what had befallen his neighbour, until the barbarians had reached his own door. Some few, however, eſcaped and gave the alarm.—The militia aſſembled in arms, and kept watch day and night, until the news of the ſad diſaſter had reached the province of South Carolina. Governor Craven loſt no time in ſending a force to their relief.—The aſſembly voted £. 4000 for the ſervice of the war. A body of 600 militia, under the command of colonel Barnwell, and 366 Indians of different tribes, with different commanders, marched with great expedition, through a hideous wilderneſs, to their aſſiſtance. In their firſt encounter with the Indians, they killed 300 and took 100 priſoners. After this defeat the Tuſcororas retreated to their fortified town—which was ſhortly after ſurrendered to colonel Barnwell. In this whole expedition it was computed that near a thouſand Tuſcororas were killed, wounded and taken. The remainder of the tribe ſoon after abandoned their country, and joined the Five Nations, with whom they have ever ſince remained. The lords proprietors having refuſed to contribute towards the expences of an expedition, of which they were to ſhare the immediate benefits, were deprived of their prerogative, except Lord Granville, who ſtill retained his eighth part. The reſt received a recompence of about 24,000l. The colony was taken under the immediate protection of the crown, and from that time began to flouriſh. The diviſion into North and South Carolina now took place, and from that time peace being reſtored unto the internal government as well as with the Cherokees and other Indian tribes, theſe provinces began to breathe, and their trade increaſed with wonderful rapidity. See NORTH CAROLINA and SOUTH-CAROLINA (A).

CAROLINE. See CARLINE.

CAROLINE-Books, the name of four books, compoſed by order of Charlemagne, to refute the ſecond council of Nice. Theſe books are couched in very harſh and ſevere terms, containing 120 heads of accuſation againſt the council of Nice, and condemning the worſhip of images.

CAROLOSTADIANS, or CARLOSTADIANS, an ancient ſect or branch of Lutherans, who denied the real preſence of Chriſt in the euchariſt.

They were thus denominated from their leader Andrew Caroloſtadius, who having originally been archdeacon of Wittemberg, was converted by Luther, and was the firſt of all the reformed clergy who took a wife: but diſagreeing afterwards with Luther, chiefly in the point of the ſacrament, founded a ſect apart. The Caroloſtadians are the ſame with what are otherwiſe denominated Sacramentarians, and agree in moſt things with the Zuinglians.

CAROLUS, an ancient Engliſh broad piece of gold ſtruck under Charles I. Its value has of late been at 23 ſhillings Sterling, though at the time it was coined it is ſaid to have been rated at 20 ſhillings.

CAROLUS, a ſmall copper coin, with a little ſilver mixed with it, ſtruck under Charles VIII. of France. The carolus was worth 12 deniers when it ceaſed to be current. Thoſe which are ſtill current in trade in Lorrain, or in ſome neighbouring provinces, go under the name of French ſols.

CAROTIDS, in anatomy, two arteries of the neck, which convey the blood from the aorta to the brain: one called the right, and the other the left, carotid.

CARP, in ichthyology, the Engliſh name of a ſpecies of cyprinus. See CYPRINUS; alſo *CARP-Fiſhing*.

The carp is the moſt valuable of all kinds of fiſh for ſtocking of ponds. It is very quick in its growth, and brings forth the ſpawn three times a year, ſo that the increaſe is very great. The female does not begin to breed till eight or nine years old; ſo that in breeding-ponds a ſupply muſt be kept of carp of that age.

(A) As communications of importance have been promiſed to the publiſher concerning theſe States, it was judged expedient to refer further particulars to the above articles.

The beſt judges allow, that, in ſtocking a breeding-pond, four males ſhould be allowed to twelve females. The uſual growth of a carp is two or three inches in length in a year; but, in ponds which receive the fattening of common ſewers, they have been known to grow from five inches to 18 in one year. A feeding-pond of one acre extent will very well feed 300 carp of three years old, 300 of two years, and 400 of one year old. Carp delight greatly in ponds that have marley ſides; they love alſo clay-ponds well ſheltered from the winds, and grown with weeds and long graſs at the edges, which they feed on in the hot months. Carp and tench thrive very faſt in ponds and rivers near the ſea, where the water is a little brackiſh; but they are not ſo well taſted as thoſe which live in freſh water. Grains, blood, chicken-guts, and the like, may at times be thrown into carp-ponds, to help to fatten the fiſh. To make them grow large and fat, the growth of graſs under the water ſhould by all means poſſible be encouraged. For this purpoſe, as the water decreaſes in the ſummer, the ſides of the pond left naked and dry ſhould be well raked with an iron rake, to deſtroy all the weeds, and cut up the ſurface of the earth; hay-ſeed ſhould then be ſown plentifully in theſe places; and more ground prepared in the ſame manner, as the water falls more and more away. By this means there will be a fine and plentiful growth of young graſs along the ſides of the pond to the water's edge; and when the rains fill up the pond again, this will be all buried under the water, and will make a feeding-place for the fiſh, where they will come early in the morning, and will fatten greatly upon what they find there.

CARPATES, or Apes Bastarnicae, (anc. geog.) a range of mountains, running out between Poland, Hungary, and Tranſylvania. Now called the Carpathian Mountains.

CARPATHIUM, (Mare, Horace, Ovid); the ſea that waſhes the iſland Carpathus.

CARPATHUS, an iſland on the coaſt of Aſia, two hundred ſtadia in compaſs, and an hundred in length. Its name is ſaid to be from its ſituation on the coaſt of Caria. It lies between Rhodes and Crete, in the ſea which, from this iſland is called the Carpathian Sea, and has to the north the Ionian, to the ſouth the Egyptian, to the weſt the Cretan and African ſeas. It is two hundred furlongs in compaſs, and a hundred in length. It had anciently according to Strabo, four cities; according to Scylax only three. Ptolemy mentions but one, which he calls Poſidium. This iſland is now called Scarpanto.

CARPÆA a kind of dance anciently in uſe among the Athenians and Magneſians, performed by two perſons, the one acting a labourer, the other a robber. The labourer, laying by his arms, goes to ploughing and ſowing, ſtill looking warily about him as if afraid of being ſurpriſed: the robber at length appears, and the labourer quitting his plough, betakes himſelf to his arms, and fights in defence of his oxen. The whole was performed to the ſound of flutes, and in cadence. Sometimes the robber was overcome and ſometimes the labourer; the victor's reward being the oxen and plough. The deſign of the exerciſe was to teach and accuſtom the peaſants to defend themſelves againſt the attacks of ruffians.

CARPENTER, a perſon who practices Carpentry. The word is formed from the French *charpentier*, which ſignifies the ſame, formed of *charpente*, which denotes timber; or rather from the Latin *carpentarius*, a maker of *carpenta*, or carriages.

Carpenter of a Ship, an officer appointed to examine and keep in order the frame of a ſhip, together with her maſts, yards, boats, and all other wooden machinery. It is his duty in particular to keep the ſhip *tight*; for which purpoſe he ought frequently to review the decks and ſides, and to caulk them when it is neceſſary. In the time of battle, he is to examine up and down, with all poſſible attention, in the lower apartments of the ſhip, to ſtop any holes that may have been made by ſhot, with wooden plugs provided of ſeveral ſizes.

CARPENTERAS, an epiſcopal town of Provence in France, and capital of Venaiſſin. It is ſubject to the pope; and is ſeated on the river Auſon, at the foot of a mountain. E. Long. 5. 6. N. Lat. 44. 4.

CARPENTRY, the art of cutting, framing, and joining large pieces of wood, for the uſes of building. It is one of the arts ſubſervient to architecture, and is divided into houſe-carpentry and ſhip-carpentry: the firſt is employed in raiſing, roofing, flooring of houſes, *&c.* and the ſecond the building of ſhips*, barges, *&c.* The rules in carpentry are much the ſame with thoſe of Joinery; the only difference is, that carpentry is uſed in the large and coarſer work, and joinery in the ſmaller and curious.

CARPENTUM, in antiquity, a name common to divers ſorts of vehicles, anſwering to coaches as well as waggons, or even carts among us. The carpentum was originally a kind of car or vehicle in which the Roman ladies were carried; though in after times it was alſo uſed in war. Some derive the word from *carro*; others from *Carmenta* the mother of Evander, by a converſion of the *m* into *p*.

CARPET, a ſort of covering of ſtuff, or other materials, wrought with the needle or on a loom, which is part of the furniture of a houſe, and commonly ſpread over tables, or laid upon the floor.

Perſian and Turkey carpets are thoſe moſt eſteemed! though at Paris there is a manufactory after the manner of Perſia, where they make them little inferior, not to ſay finer than the true Perſian carpets. They are velvety, and perfectly imitate the carpets which come from the Levant. There are alſo carpets of Germany, ſome of which are made of woollen ſtuffs, as ſerges, *&c.* and called ſquare carpets: others are made of wool alſo, but wrought with the needle, and pretty often embelliſhed with ſilk; and, laſtly, there are ſome made of dogs hair. There are likewiſe carpets made in Britain, which are uſed either as floor-carpets, or to cover chairs, &c. It is true, they are not arrived at the like perfection in this manufacture with their neighbours the French; but may not this be owing to the want of a like public encouragement?

CARPI, a principality of Modena in Italy, lying about four leagues from that city. It formerly belonged to the houſe of Pio; the elder ſons of which bore the title of *Princes of St Gregory*. In the beginning of the 14th century *Manfroy* was the firſt prince of Carpi; but in the 16th, the emperor Cha. V. gave the principality to Alfonzo duke of Ferrara.

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* See *Ship-building.*

Carpi, Carpinus.

This nobleman, in recompence, gave to Albert Pio, to whom the principality of Carpi belonged of right, the town of Saſſuolo and ſome other lands. Albert was, however, at laſt obliged to retire to Paris, where, being ſtripped of all his eſtates, he died in 1538, with the reputation of being one of the beſt and braveſt men of his age. The family of Pio is yet in being, and continues attached to the French court. Some of them have even been raiſed to the purple, and ſtill make a figure in Europe.

Carpi, a town of Italy in the duchy of Modena, and capital of the laſt mentioned principality. It has a ſtrong caſtle, and is ſituated in E. Long. 11. 12. N. Lat. 44. 45.

Carpi, a town of the Veroneſe in Italy, memorable for a victory gained by the Imperialiſts over the French in 1701. It is ſubject to the Venetians; and is ſituated on the river Adige, in E. Long. 11. 39. N. Lat. 45. 10.

CARPI, (Ugo da) an Italian painter, of no very conſiderable talents in that art, but remarkable for being the inventor of that ſpecies of engraving on wood, diſtinguiſhed by the name of chiaro-ſcuro, in imitation of drawing. This is performed by uſing more blocks than one; and Ugo da Carpi uſually had three; the firſt for the outline and dark ſhadows, the ſecond for the lighter ſhadows, and the third for the half tint. In that manner he ſtruck off prints after ſeveral deſigns, and cartons of Raphael; particularly one of the Sybil, a Deſcent from the Croſs, and the Hiſtory of Simon the Sorcerer. He died in 1500. This art was brought to a ſtill higher degree of perfection by Balthaſar Peruzzi of Siena, and Parmigiano, who publiſhed ſeveral excellent deſigns in that manner.

Carpi, (Girolamo da) hiſtory and portrait painter, was born at Ferrara in 1501, and became a diſciple of Garofalo. When he quitted that maſter, he devoted his whole time, thoughts, and attention, to ſtudy the works of Correggio, and to copy them with a moſt critical care and obſervation; in which labour he ſpent ſeveral years at Parma, Modena, and other cities of Italy, where the beſt works of that exquiſite painter were preſerved. He acquired ſuch an excellence in the imitation of Correggio's ſtyle, and copying his pictures, that many paintings finiſhed by him were taken for originals, and not only admired, but were eagerly purchaſed by the connoiſſeurs of that time. Nor is it improbable that ſeveral of the paintings of Girolamo da Carpi paſs at this day for the genuine work of Correggio himſelf. He died in 1556.

CARPINUS, the HORN-BEAM, in botany: A genus of the polyandria order, belonging to the monœcia claſs of plants; and in the natural mothod ranking under the 50th order, *Amentaceæ*. The calyx of the male is monophyllous and ciliated; there is no corolla, but 20 ſtamina. The calyx of the female is monophyllous and ciliated; no corolla; two germens, with two ſtyles on each. The fruit is an egg-ſhaped nut. There are two ſpecies, *viz.*

1. The betulus, or common hornbeam; a deciduous tree, native of Europe and America. Its leaves are of a darkiſh green, and about the ſize of thoſe of the beech, but more pointed and deeply ſerrated. Its branches are long, flexible, and crooked: yet in their general appearance very much reſemble thoſe of the beech: indeed there is ſo great a likeneſs between thoſe two trees, eſpecially in the ſhrubby and underwood ſtate, that it would be difficult to diſtinguiſh them at the firſt glance, were it not for that gloſſy varniſh with which the leaves of the beech are ſtrongly marked. In the days of Evelyn, when topiary work was the gardener's idol, the hornbeam might be conſidered as deſerving of thoſe endearing expreſſions which that enthuſiaſtic writer has been pleaſed to laviſh upon it; nevertheleſs, as an ornamental in modern gardening it ſtands low; and its preſent uſes are few. As an underwood it affords ſtakes and edders, fuel and charcoal. Its timber ranks with that of the beech and the ſycamore; and the inner bark is ſaid to be much uſed in Scandinavia to dye yellow. The only ſuperior excellency of the hornbeam lies in its fitneſs for ſkreen fences for ſheltering gardens, nurſeries, and young plantations from the ſeverities of the winter ſeaſon. It may be trained to almoſt any height, and by keeping it trimmed on the ſides it becomes thick of branches, and conſequently thick of leaves; which being by their nature retained upon the plant after they wither, a hornbeam hedge occaſions a degree of ſhelter nearly equal to that given by a brick wall. Indeed, being leſs reflective than that expenſive ſkreen, it affords a more uniform temperature of air to the plants which ſtand near it. In this point of view, too, the hornbeam is uſeful to be planted promiſcuouſly, or in alternate rows, amongſt more tender plants in expoſed ſituations, in the ſame manner as the birch; to which it has more than one preference: namely, it is warmer in winter,—and Hanbury ſays, the hornbeam is peculiarly grateful to hares and rabbits; conſequently it may prevent their injuring its more valuable neighbours: yet, like Evelyn, he ſeems to be of opininon that it is diſaffected by deer. If this be really the caſe, the hornbeam may upon many occaſions be introduced into the deer-parks with ſingular propriety.

Of this ſpecies there are three varieties: The Eaſtern Hornbeam, Flowering Hornbeam, American Hornbeam. The eaſtern hornbeam arrives to the leaſt height of all the ſorts; about ten feet is the fartheſt of its growth, and it looks pretty enough with trees of the ſame growth. The leaves are by no means ſo large as the common ſort; and as the branches are always cloſer in proportion to the ſmallneſs of the leaves, where a low hedge is wanted of the deciduous kind, this would not be an improper tree for the purpoſe, either to be kept ſheered, or ſuffered to grow in its natural ſtate. The bark of this ſort is more ſpotted than that of the common. The flowering hornbeam is the moſt free ſhooter of any of the ſorts; and will arrive to be the higheſt, the common hornbeam only excepted. It will grow to be thirty or forty feet high. The branches of this tree are leſs ſpotted with greyiſh ſpots than any of the other ſorts. The leaves are very rough, of a dark-green colour, and are longer than the common ſort. The property which the common hornbeam is poſſeſſed of, of retaining its leaves all winter, does not belong to this ſort, the leaves of which conſtantly fall off in the autumn with other deciduous trees. American hornbeam is a more elegant tree than any of the former ſorts. The branches are ſlender, covered with a browniſh ſpeckled bark, and are more ſparingly ſent forth than from any of the

Carpinus.

others. The leaves are oblong, pointed, and of a paliſh green, and are not nearly ſo rough as the common hornbeam, though the flowers and fruit are produced in the ſame manner.

2. The oſtrya, or hop-hornbeam, a native of Italy and of Virginia. This is of taller growth than the eaſtern kind. It will arrive to the height of twenty feet, or more. The leaves are nearly the ſize of the common ſort, and ſome people admire this tree on account of the ſingular appearance it makes with its ſeeds, before they begin to fall. There is a variety which grows to thirty feet high, ſhoots freely, has long rough leaves like thoſe of the elm, and longiſh yellow coloured flowers, called the *Virginian flowering hop-hornbeam.*

Propagation. The common hornbeam may be propagated either by layering (at almoſt any time of the year), or from ſeeds in the following manner: In the autumn the ſeeds will be ripe; when, having gathered a ſufficient quantity for the purpoſe, let them be ſpread upon a mat a few days to dry. After this, they ſhould be ſown in the ſeminary-ground, in beds four feet wide, with an alley of about two feet, and from one to two inches deep. In this bed they muſt remain till the ſecond ſpring before they make their appearance; and all the ſummer they lie concealed, the weeds ſhould conſtantly be plucked up as ſoon as they peep; for if they are neglected, they will get ſo ſtrong, and the fibres of their roots will be ſo far ſtruck down among the ſeeds, as to endanger the drawing many ſeeds out with them, on weeding the ground. After the young plants appear, they ſhould conſtantly be kept clear of weeds during the next ſummer; and if they were to be now and then gently refreſhed with water in dry weather, it would prove ſerviceable to them. In the ſpring following they may be taken out of theſe beds, and planted in the nurſery, in which ſituation they may remain till they are of a ſufficient ſize to plant out for ſtandards.

The other ſorts are to be propagated by layers; for which purpoſe a few plants for ſtools muſt be procured. The ſtools of the eaſtern hornbeam ſhould be planted a yard, and the other ſorts a yard and a half or two yards aſunder. After theſe plants have made ſome young ſhoots, they ſhould be layered in the autumn, and by that time twelvemonth they will have ſtruck root; at which time, or any time in the winter, or early in the ſpring, they ſhould be taken off, and planted in the nurſery-way, obſerving always to bruſh up the ſtool, that it may afford fine young ſhoots for freſh layering by the autumn following. The diſtance the plants ſhould be allowed in the nurſery need be no more than one foot, in rows that are two feet aſunder; and here they may ſtand, with the uſual nurſery care of weeding and digging the rows in winter, until they are to be finally planted out; though the Virginian hornbeam will frequently ſend forth two ſhoots, which will ſeem to ſtrive for maſtery in the lead. When this is obſerved, the weakeſt ſhould always be taken away, otherwiſe the tree will grow forked.

CARPOBALSAM, in the Materia Medica, the fruit of the tree which yields the true oriental balſam. The carpobalſam is uſed in Egypt, according to Proſper Alpinus, in all the intentions in which the balſam itſelf is applied: but the only uſe the Europeans make of it is in Venice treacle and mithridate; and in theſe not a great deal, for cubebs and juniper berries are generally ſubſtituted in its place.

CARPOCRATIANS, a branch of the ancient Gnoſtics, ſo called from *Carpocrates,* who in the ſecond century revived and improved upon the errors of Simon Magus, Menander, Saturnius, and other Gnoſtics. He owned, with them, one ſole principle and father of all things, whoſe name as well as nature was unknown. The world, he taught, was created by angels, vaſtly inferior to the firſt principle. He oppoſed the divinity of Jeſus Chriſt; making him a mere man, begotten carnally on the body of Mary by Joſeph, though poſſeſſed of uncommon gifts which ſet him above other creatures. He inculcated a community of women; and taught, that the ſoul could not be purified, till it had committed all kinds of abominations, making that an neceſſary condition of perfecfection.

CARPOLITHI, or FRUIT-STONE ROCKS of the Germans, are compoſed of a kind of jaſper, of the nature of the amygdaloides, or almond-ſtones. Bretrand aſſerts that the latter are thoſe which appear to be compoſed of elliptical pieces like petrified almonds, though in truth they are only ſmall oblong pieces of calcareous ſtone rounded by attrition, and ſometimes ſmall muſcle-ſhells connected by a ſtony concretion. The name of carpolithi, however, is given in general by writers on foſſils to all ſorts of ſtony concretions that have any reſemblance to fruit of whatever kind.

CARPUS, the wriſt. See ANATOMY, n° 53.

CARR, a kind of rolling throne, uſed in triumphs, and at the ſplendid entries of princes. See CHARIOT.

The word is from the ancient Gauliſh, or Celtic, *Carr*; mentioned by Cæſar, in his commentaries, under the name *Carrus.* Plutarch relates, that Camillus having entered Rome in triumph, mounted on a carr drawn by four white horſes, it was looked on as too haughty an innovation.

CARR is alſo uſed for a kind of light open chariot. The carr, on medals, drawn either by horſes, lions, or elephants, uſually ſignifies either a triumph or an apotheoſis: ſometimes a proceſſion of the images of the gods at a ſolemn ſupplication, and ſometimes of thoſe of ſome illuſtrious family at a funeral. The carr covered and drawn by mules, only ſignifies a conſecration, and the honour done any one of having his image carried at the games of the circus. See CONSECRATION, &c.

CARRAC, or CARRACA, a name given by the Portugueſe to the veſſels they ſend to Braſil and the Eaſt-Indies; being very large, round built, and fitted for fight as well as burden. Their capacity lies in their depth, which is very extraordinary. They are narrower above than underneath, and have ſometimes ſeven or eight floors; they carry about 2000 tons, and are capable of lodging 2000 men; but of late they are little uſed. Formerly they were alſo in uſe among the knights of Rhodes, as well as among the Genoeſe, and other Italians. It is a cuſtom among the Portugueſe, when the carracs returned from India, not to bring any boat or ſloop for the ſervice of the ſhip beyond the iſland of St Helena; at which place they ſink them on purpoſe, in order to take from the crew all hopes or poſſibility of ſaving themſelves, in caſe of ſhipwreck.

CARRARA MARBLE, among artificers, the name of a ſpecies of white marble, which is called *marmor lunenſe*, and *liguſtrium* by the ancients: it is diſtinguiſhed from the Parian, now called the ſtatuary marble, by being harder and leſs bright.

CARRAVEIRA, a town of Turkey in Europe, with a Greek archbiſhop's ſee. E. Long. 22. 25. N. Lat. 40. 27.

CARRIAGE, a vehicle ſerving to convey perſons, goods, merchandizes, and other things, from one place to another.

For the conſtruction and mechanical principles of wheel-carriages, ſee MECHANICS.

CARRIAGE of a cannon, the frame or timber-work on which it is mounted, ſerving to point it for ſhooting, or to carry it from one place to another. It is made of two planks of wood, commonly one half the length of the gun, called the cheeks, and joined by three wooden tranſums, ſtrengthened with three bolts of iron. It is mounted on two wheels, but on a march has two fore-wheels with limbers added. The principal parts of a carriage are the cheeks, tranſums, bolts, plates, train, bands, bridge, bed, hooks, trunnion holes, and capſquare.

Block-CARRIAGE, a cart made on purpoſe for carrying mortars and their beds from place to place.

Truck-CARRIAGE, two ſhort planks of wood, ſupported on two axle-trees, having four trucks of ſolid wood for carrying mortars or guns upon battery, where their own carriages cannot go. They are drawn by men.

CARRICK, the ſouthern diviſion of the ſhire of Ayr in Scotland. It borders on Galloway; ſtretches 32 miles in length; and is a hilly country fit for paſturage. The chief rivers are the Stencher and Girven, both abounding with ſalmon; here are alſo ſeveral lakes and foreſts; and the people on the coaſt employ themſelves in the herring-fiſhery, though they have no harbour of any conſequence. The only towns of this diſtrict are Bargeny and Maybole, two inconſiderable villages, yet the firſt gave the title (now extinct) of baron to a branch of the Hamilton family. The prince of Wales, as prince of Scotland, is earl of Carrick.

CARRICK on the Sure, a town of Ireland, in the county of Tipperary and province of Munſter. W. Long. 7. 14. N. Lat. 52. 16.

CARRICK-Fergus, a town of Ireland, in the county of Antrim and province of Ulſter. It is a town and county in itſelf, and ſends two members to parliament. It is very rich and populous, with a good harbour; and is governed by a mayor, recorder, and ſheriffs.—It has, however, been of far greater conſequence than at preſent, as appears from the mayor having been admiral of a conſiderable extent of coaſt in the counties of Down and Antrim, and the corporation enjoying the cuſtoms paid by all veſſels within theſe bounds, the creeks of Belfaſt and Bangor excepted. This grant was repurchaſed, and the cuſtom-houſe tranſferred to Belfaſt—Here is the ſkeleton of a fine houſe built by Lord Chicheſter in the reign of James I. an old Gothic church with many family monuments, and a very large old caſtle. The town was formerly walled round, and ſome part of the walls is ſtill remaining entire.—Carrick-fergus is ſeated on a bay of the ſame name in the Iriſh channel; and is noted for being the landing place of king William in 1690. Here alſo Thurot made a deſcent in 1759, took poſſeſſion of the caſtle, and carried away hoſtages for the ranſom of the town; but being ſoon after purſued by commodore Elliot, his three ſhips were taken, and he himſelf was killed.

CARRIER, is a perſon that carries goods for others for hire. A common carrier, having the charge and carriage of goods, is to anſwer for the ſame, or the value, to the owner. And where goods are delivered to a carrier, and he is robbed of them, he ſhall be charged and anſwer for them, becauſe of the hire. If a common carrier who is offered his hire, and who has convenience, refuſes to carry goods, he is liable to an action, in the ſame manner as an inn-keeper who refuſes to entertain a gueſt. See ASSUMPSIT.

Jacob's Law Dict.

One brought a box to a carrier, with a large ſum of money, and the carrier demanded of the owner what was in it; he anſwered, that it was filled with ſilks, and ſuch like goods: upon which the carrier took it, and was robbed, and adjudged to make it good; but a ſpecial acceptance, as, *provided there is no charge of money*, would have excuſed the carrier.—A perſon delivered to a carrier's book-keeper two bags of money ſealed up, to be carried from London to Exeter, and told him that it was L.200, and took his receipt for the ſame, with promiſe of delivery for 10s. *per cent.* carriage and riſk: though it be proved that there was L. 400 in the bags, if the carrier be robbed, he ſhall anſwer only for L. 200, becauſe there was a particular undertaking for that ſum and no more; and his reward, which makes him anſwerable, extends no farther. If a common carrier loſes goods which he is intruſted to carry, a ſpecial action on the caſe lies againſt him, on the cuſtom of the realm, and not trover; and ſo of a common carrier by boat. An action will lie againſt a porter, carrier, or barge-man, upon his bare receipt of the goods, if they are loſt through negligence. Alſo a lighter man ſpoiling goods he is to carry, by letting water come to them, action of the caſe lies againſt him, on the common cuſtom.

CARRIER-Pigeon, or *courier-pigeon*, a ſort of pigeon uſed, when properly trained, to be ſent with letters from one place to another. See COLUMBA.

Though you carry theſe birds hood-winked, 20, 30, nay 60 or 100 miles, they will find their way in a very little time to the place where they were bred. They are trained to this ſervice in Turkey and Perſia; and are carried firſt, while young, ſhort flights of half a mile, afterwards more, till at length they will return from the fartheſt part of the kingdom. Every Baſhaw has a baſket of theſe pigeons bred in the ſeraglio, which, upon any emergent occaſion, as an inſurrection, or the like, he diſpatches, with letters braced under their wings, to the ſeraglio; which proves a more ſpeedy method, as well as a more ſafe one, than any other; he ſends out more than one pigeon, however, for fear of accidents. Lithgow aſſures us, that one of theſe birds will carry a letter from Babylon to Aleppo, which

which is 30 days journey, in 48 hours. This is alſo a very ancient practice; Hirtius and Brutus, at the ſiege of Modena, held a correſpondence with one another by means of pigeons. And Ovid tells us, that Tauroſthenes, by a pigeon ſtained with purple, gave notice to his father of his victory at the Olympic Games, ſending it to him at Ægina.

In modern times, the moſt noted were the pigeons of Aleppo, which ſerved as couriers at Alexandretta and Bagdad. But this uſe of them has been laid aſide for the laſt 30 or 40 years, becauſe the Curd robbers killed the pigeons. The manner of ſending advice by them was this: they took pairs which had young ones, and carried them on horſeback to the place from whence they wiſhed them to return, taking care to let them have a full view. When the news arrived, the correſpondent tied a billet to the pigeon's foot, and let her looſe. The bird impatient to ſee its young, flew off like lightning, and arrived at Aleppo in ten hours from Alexandretta, and in two days from Bagdad. It was not difficult for them to find their way back, ſince Aleppo may be diſcovered at an immenſe diſtance. This pigeon has nothing peculiar in its form, accept its noſtrils, which, inſtead of being ſmooth and even, are ſwelled and rough.

CARRON, a ſmall but remarkable river in Scotland, riſing about the middle of the iſthmus between the friths of Forth and Clyde. Both its ſource, and the place where it emptieth itſelf into the ſea, are within the ſhire of Stirling, which it divides into two nearly equal parts. The whole length of its courſe, which is from weſt to eaſt, is not above 14 miles. It falls into the frith of Forth about three miles to the north-eaſt of Falkirk. The ſtream thereof is but ſmall, and ſcarce deſerves the notice of a traveller; yet there is no river in Scotland, and few in the whole iſland of Britain, whoſe banks have been the ſcene of ſo many memorable tranſactions. When the Roman empire was in all its glory, and had its eaſtern frontiers upon the Euphrates, the banks of Carron were its boundaries upon the north-weſt; for the wall of Antoninus*, which was raiſed to mark the limits of that mighty empire, ſtood in the neighbourhood of this river, and ran parallel to it for ſeveral miles.

Near the middle of its courſe, in a pleaſant valley, ſtand two beautiful mounts, called the *Hills of Dunipace*, which are taken notice of by moſt of the Scottiſh hiſtorians as monuments of great antiquity. The whole ſtructure of theſe mounts is of earth; but they are not both of the ſame form and dimenſions. The more eaſterly one is perfectly round, reſembling an oven, and about fifty feet in height: And that this is an artificial work does not admit of the leaſt doubt; but we cannot affirm the ſame, with equal certainty, of the other, though it has been generally ſuppoſed to be ſo too. It bears no reſemblance to the eaſtern one either in ſhape or ſize. At the foundation it is nearly of a triangular form; but the ſuperſtructure is quite irregular; nor does the height thereof bear any proportion to the extent of its baſe. Theſe mounts are now planted with firs, which, with the pariſh-church of Dunipace ſtanding in the middle between them, and the river running hard by, give this valley a very romantic appearance. The common account given of theſe mounts is, that they were erected as monuments of a peace concluded in that place between the Romans and the Caledonians, and that their name partakes of the language of both people; *Dun* ſignifying a hill in the old language of that iſland, and *Pax* "peace" in the language of Rome. The compound word, *Dunipace*, ſignifies "the hills of peace." And we find in hiſtory, that no leſs than three treaties of peace were, at different periods, entered into between the Romans and Caledonians; the firſt, by Severus, about the year 210; the ſecond, ſoon after, by his ſon Caracalla; and the third, by the uſurper Carauſius, about the year 280; but of which of thoſe treaties Dunipace is a monument, we do not pretend to determine. If the concurring teſtimony of hiſtorians and antiquaries did not agree in giving this original to theſe mounts, we would be tempted to conjecture that they are ſepulchral monuments. Human bones and urns have been diſcovered in earthen fabrics of this kind in many parts of Britain, and the little mounts or barrows, which are ſcattered in great numbers about Stonhenge in Saliſbury plain are generally ſuppoſed to have been the ſepulchres of the ancient Britons. See BARROWS.

From the valley of Dunipace, the river runs for ſome time in a deep and hollow channel, with ſteep banks on both ſides: here it paſſes by the foundations of the ancient Roman bridge; not far from which, as is generally thought, was the ſcene of the memorable conference betwixt the Scottiſh patriot William Wallace and Robert Bruce, father to the king of that name, which firſt opened the eyes of the latter to a juſt view, both of his own true intereſt and that of his country.

After the river has left the village and bridge of Larbert, it ſoon comes up to another ſmall valley, through the midſt of which it has now worn out to itſelf a ſtraight channel: whereas, in former ages, it had taken a conſiderable compaſs, as appears by the tract of the old bed, which is ſtill viſible. The high and circling banks upon the ſouth-ſide, give to this valley the appearance of a ſpacious bay; and, according to the tradition of the country, there was once an harbour here: nor does the tradition ſeem altogether groundleſs; pieces of broken anchors having been found here, and ſome of them within the memory of people yet alive. The ſtream-tides would ſtill flow near the place, if they were not kept back by the dam-head built acroſs the river at Stenhouſe; and there is reaſon to believe, that the frith flowed conſiderably higher in former ages than it does at preſent. In the near neighbourhood of this valley, upon the ſouth, ſtand the ruins of ancient Camelon; which, after it was abandoned by the Romans, was probably inhabited, for ſome ages, by the natives of the country.

Another ancient monument, called *Arthur's Oven*, once ſtood upon the banks of Carron; but was, with a ſpirit truly Gothic, entirely demoliſhed about 40 years ago. The corner of a ſmall incloſure between Stenhouſe and the Carron iron-works, is pointed out as the place of its ſituation. This is generally ſuppoſed to have been a Roman work; though it is not eaſy to conceive what could be their motive for erecting ſuch a fabric, at ſo great a diſtance from any other

* See *Antoninus's Wall.*

of their works, and in a ſpot which, at that time, muſt have been very remote and unfrequented. The form of it is ſaid to have been perfectly round, and riſing perpendicular for ſome yards at firſt, but afterwards gradually contracted, till it terminated in a narrow orifice at the top.

As Carron extends over the half of the iſthmus, and runs ſo near the ancient boundaries of the Roman empire, the adjacent country fell naturally to be the ſcene of many battles and rencounters. Hiſtorians mention a bloody battle fought near this river between the Romans and the confederate army of the Scots and Picts in the beginning of the 5th century. The ſcenes of ſome of Oſſian's poems were, in the opinion of the tranſlator, upon the banks of this river. Here Fingal fought with Caracal, the ſon of the king of the world, ſuppoſed to have been the ſame with Caracalla the ſon of the Roman emperor Severus. Here alſo young Oſcar, the ſon of Oſſian, performed ſome of his heroic exploits. Hereabout was the ſtream of Crona, celebrated in the ancient compoſitions of the Gaelic bard; poſſibly that now called the water of Bonny, which runs in the neighbourhood of the Roman wall, and diſchargeth itſelf into Carron at Dunipace. In thoſe poems, mention is made of a green vale upon the banks of this river, with a tomb ſtanding in the middle of it, where young Oſcar's party and the warriors of Caros met. We only take notice of this as it ſtrengthens the conjecture hazarded above, that the mounts of Dunipace, eſpecially the more eaſterly of them, were ſepulchral monuments.—About the diſtance of half a mile from the river, and near the town of Falkirk, lies the field of that battle which was fought by William Wallace and the Engliſh in the beginning of the 14th century. It goes by the name of *Graham's muir*, from the valiant John Graham, who fell there, and whoſe grave-ſtone is ſtill to be ſeen in the church-yard of Falkirk.

The river Carron, though it hath long ſince ceaſed to roll its ſtream amidſt the din of arms, ſtill preſerves its fame, by lending its aid to trade and manufactures; (ſee the next article.)—The river is navigable for ſome miles near its mouth, and a conſiderable trade is carried on upon it by ſmall craft; for the convenience of which, its channel has of late years been ſtraightened and much ſhortened, and the great Canal * has its entrance from it.

Carron-Works, a large iron-foundery, two miles north from Falkirk in Scotland. They are conveniently ſituated on the banks of the Carron, three miles above its entry into the frith of Forth. Above 100 acres of land have been converted into reſervoirs and pools, for water diverted from the river, by magnificent dams built about two miles above the works, which, after turning 18 large wheels for the ſeveral purpoſes of the manufacture, falls into a tide-navigation that conveys their caſtings to the ſea.

Theſe works are the greateſt of the kind in Europe, and were eſtabliſhed in 1760. At preſent, the buildings are of vaſt extent; and the machinery, conſtructed by Mr Smeaton, is the firſt in Britain, both in elegance and correctneſs: there are 1600 men employed, to whom is paid weekly above 650 l. Sterling; which has greatly enriched the adjoining country: 6500 tons of iron are ſmelted annually from the mineral with pit-coal, and caſt into cannon, cylinders, &c.—In the founding of cannon, theſe works have lately arrived at ſuch perfection, that they make above 5000 pieces a-year, many of which are exported to foreign ſtates; and their guns of *new conſtruction* are the lighteſt and neateſt now in uſe, not excepting braſs guns; the 32 pounder ſhip-gun weighing 42 hundred-weight, the 6 pounder 8 hundred weight and one half, and the other calibers in proportion.

The preſent proprietors are a chartered company, with a capital of 150,000 l. Sterling, a common ſeal, &c. but their ſtock is confined to a very few individuals.

CARRONADE, a ſhort kind of ordnance, capable of carrying a large ball, and uſeful in cloſe engagements at ſea. It takes its name from Carron, the place where this ſort of ordnance was firſt made, or the principle applied to an improved conſtruction. See the article GUNNERY, n° 45, 46.

CARROT, in Botany. See DAUCUS.

Deadly-CARROT. See THAPSIA.

CARROUSAL, a courſe of horſes and chariots, or a magnificent entertainment exhibited by princes on ſome public rejoicing. It conſiſts in a cavalcade of ſeveral gentlemen, richly dreſſed and equipped after the manner of ancient cavaliers, divided into ſquadrons, meeting in ſome public place, and practiſing juſts, tournaments, &c. The laſt carrouſals were in the reign of Louis XIV.—The word comes from the Italian word *caroſello*, a diminutive of *carro*, "chariot." Tertullian aſcribes the invention of carrouſals to Circe; and will have them inſtituted in honour of the Sun, her father; whence ſome derive the word from *carrus* or *currus ſolis*. The Moors introduced cyphers, liveries, and other ornaments of their arms, with trappings, &c. for their horſes. The Goths added creſts, plumes, &c.

CARRUCA, in antiquity, a ſplendid kind of carr, or chariot, mounted on four wheels, richly decorated with gold, ſilver, ivory, &c. in which the emperors, ſenators, and people of condition, were carried. The word comes from the Latin *carrus*, or Britiſh carr, which is ſtill the Iriſh name for any wheel-carriage.

CARRUCA, or CARUCA, is alſo uſed in middle-age writers for a plough.

CARRUCA was alſo ſometimes uſed for *carrucata*. See CARRUCATE.

CARUCAGE, (*carucagium*,) a kind of tax anciently impoſed on every plough, for the public ſervice. See CARRUCATE and HIDAGE.

CARRUCAGE, CARUCAGE, or CARUAGE, in huſbandry, denotes the ploughing of ground, either ordinary, as for grain, hemp, and flax; or extraordinary, as for woad, dyers weed, rape, and the like.

CARRUCATE, (*carrucata*,) in ancient laws and hiſtory, denotes a plough-land, or as much arable ground as can be tilled in one year with one plough.

In Doomſday Inquiſition, the arable land is eſtimated in carrucates, the paſture in hides, and meadow in acres. Skene makes the *carrucata* the ſame with *hilda* or *hida terræ*; Littleton the ſame with ſoc.

The meaſure of a carrucate appears to have differed in reſpect of place as well as time. In the reign of Richard I. it was eſtimated at 60 acres, and in a-

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* See the article *Canal*.

nother charter of the ſame reign at 100 acres: in the time of Edward I. at 180 acres: and in the 23d of Edward III. a carrucate of land in Burcheſter contained 112 acres, and in Middleton 150 acres.

By a ſtatute under William III. for charging perſons to the repair of the highways, a plough-land is rated at a fifty pound *per annum*, and may contain houſes, mills, wood, paſture, &c.

CARRYING, in falconry, ſignifies a hawk's flying away with the quarry. Carrying is one of the ill qualities of a hawk, which ſhe acquires either by a diſlike of the falconer, or not being ſufficiently broke to the lure.

CARRYING, among huntſmen. When a hare runs on rotten ground (or even ſometimes in a froſt), and it ſticks to her feet, they ſay ſhe carries.

CARRYING, among riding-maſters. A horſe is ſaid to carry low, when having naturally an ill-ſhaped neck, he lowers his head too much. All horſes that arm themſelves carry low, but a horſe may carry low without arming. A French branch, or gigot, is preſcribed as a remedy againſt carrying low.

A horſe is ſaid to carry well, when his neck is raiſed, or arched, and he holds his head high and firm, without conſtraint.

CARRYING wind, a term uſed by dealers in horſes to expreſs ſuch a one as frequently toſſes his noſe as high as his ears, and does not carry handſomely. This is called *carrying wind*; and the difference between carrying in the wind, and beating upon the hand, is this: that the horſe who beats upon the hand, ſhakes the bridle and reſiſts it, while he ſhakes his head; but the horſe that carries in the wind puts up his head without ſhaking, and ſometimes beats upon the hand. The oppoſite to carrying in the wind, is arming and carrying low; and even between theſe two there is a difference in wind.

CARS, or **KARS**, a conſiderable and ſtrong town of Aſia, in Armenia, ſeated on a river of the ſame name, with a caſtle almoſt impregnable. E. Long. 43. 50. N. Lat. 41. 30.

CARSE, or *Carſe of Gowry*, a diſtrict of Perthſhire in Scotland. It lies on the north ſide of the Tay, and extends 14 miles in length from Dundee to Perth, and is from two to four in breadth. It is a rich plain country, cultivated like a garden, and producing as good harveſts of wheat as any in Great Britain. It abounds with all the neceſſaries of life; but from its low damp ſituation, the inhabitants are ſubject to agues and the commonalty are in great want of firing. In this diſtrict, not far from the Tay, ſtands the houſe of Errol, which formerly belonged to the Earls of that name, the chiefs of the ancient family of Hay, hereditary conſtables of Scotland.

CARSTAIRS, (William) an eminent Scots Divine, whoſe merit and good fortune called him to act in great ſcenes, and to aſſociate with men to whoſe ſociety and intercourſe his birth gave him few pretenſions to aſpire. A ſmall village, in the neighbourhood of Glaſgow, was the place of his nativity. His father, of whom little is known, exerciſed the functions of a clergyman.

Young Carſtairs turned his thoughts to the profeſſion of theology; and the perſecutions and oppreſſions of government, both in regard to civil and religious liberty, having excited his ſtrongeſt indignation, it became a matter of prudence that he ſhould proſecute his ſtudies in a foreign univerſity. He went accordingly to Utrecht; and his induſtry and attention being directed with ſkill, opened up and unfolded thoſe faculties which he was about to employ with equal honour to his country and himſelf.

During his reſidence abroad, he became acquainted with Penſionary Fagel, and entered with warmth into the intereſt of the Prince of Orange. On his return to Scotland to procure a licence to teach doctrines which he had ſtudied with the greateſt care, he became diſguſted with the proud and inſolent conduct of Archbiſhop Sharp, and prepared to reviſit Holland; where he knew that religious liberty was reſpected, and where he hoped he might better his condition by the connexions he had formed.

His expectations were not vain. His prudence, his reſerve, and his political addreſs, were ſtrong recommendations of him to the Prince of Orange; and he was employed in perſonal negociations in Holland, England, and Scotland. Upon the elevation of his maſter to the Engliſh throne, he was appointed the King's chaplain for Scotland, and employed in ſettling the affairs of that kingdom. William, who carried politics into religion, was ſolicitous that epiſcopacy ſhould prevail there as univerſally as in England. Carſtairs, more verſant in the affairs of his native country, ſaw all the impropriety of this project, and the danger that would ariſe from the enforcing of it. His reaſonings, his remonſtrances, his intreaties, overcame the firmneſs of king William. He yielded to conſiderations founded alike in policy and in prudence; and to Carſtairs, Scotland is indebted for the full eſtabliſhment of its church in the Preſbyterian form of government.

The death of King William was a ſevere affliction to him; and it happened before that Prince had provided for him with the liberality he deſerved. He was continued, however, in the office of chaplain for Scotland by Queen Anne; and he was invited to accept the Principality of the Univerſity of Edinburgh. He was one of the miniſters of the city, and four times moderator of the general aſſembly. Placed at the head of the church, he proſecuted its intereſt with zeal and with integrity. Nor were his influence and activity confined to matters of religion. They were exerted with ſucceſs in promoting the culture of the arts and ſciences. The univerſities of Scotland owe him obligations of the higheſt kind. He procured, in particular, an augmentation of the ſalaries of their profeſſors; a circumſtance to which may be aſcribed their reputation, as it enabled them to cultivate with ſpirit the different branches of knowledge.

A zeal for truth, a love of moderation and order, prudence and humanity, diſtinguiſhed Principal Carſtairs in an uncommon degree. His religion had no mixture of auſterity; his ſecular tranſactions were attended with no imputation of artifice; and the verſatility of his talents made him paſs with eaſe from a court to a college. He was among the laſt who ſuffered torture before the privy-council, in order to make him divulge the ſecrets intruſted to him, which he firmly reſiſted; and after the revolution, that inhuman inſtrument the thumb-ſcrew was given to him in a preſent by the council.—This excellent perſon died in 1715; and in 1774 his *State-papers and Letters*, with an account of his life, were publiſhed in one vol. 4to, by the Rev. Dr M'Cormick.

CARSUGHI, (Rainier) a Jeſuit, born at Citerna in Tuſcany, in 1647, was the author of a Latin poem, entitled, *Ars bene ſcribendi*, which is eſteemed both for the elegance of the ſtyle and for the excellent precepts it contains. He alſo wrote ſome good epigrams. He died in 1709.

CARTAMA, a town of Spain in the kingdom of Grenada, formerly very conſiderable. It is ſeated at the foot of a mountain, near the river Guadala-Medina, in W. Long. 4. 28. N. Lat. 36. 40.

CART, a land-carriage with two wheels, drawn commonly by horſes, to carry heavy goods, &c. from one place to another. The word ſeems formed from the French *charrette*, which ſignifies the ſame, or rather the Latin *carreta*, a diminutive of *carrus*. See CARR.

In London and Weſtminſter carts ſhall not carry more than twelve ſacks of meal, ſeven hundred and fifty bricks, one chaldron of coals, &c. on pain of forfeiting one of the horſes, (6 Geo. I. cap. 6.) By the laws of the city, carr-men are forbidden to ride either on their carts or horſes. They are to lead or drive them on foot through the ſtreets on the forfeiture of ten ſhillings, (Stat. 1. Geo. I. cap. 57.) Criminals uſed to be drawn to execution in a cart. Bawds and other malefactors are whipped at the cart's tail.

Scripture makes mention of a ſort of carts or drags uſed by the Jews to do the office of threſhing. They were ſupported on low thick wheels, bound with iron, which were rolled up and down on the ſheaves, to break them, and force out the corn. Something of the like kind alſo obtained among the Romans, under the denomination of *plauſtra*, of which Virgil makes mention, (Georg. I.)

> *Tardaque Eleuſinæ matris volventia plauſtra,*
> *Tribulaque, traheæque.*——

On which Servius obſerves, that *trahea* denotes a cart without wheels, and *tribula* a ſort of cart armed on all ſides with teeth, uſed chiefly in Africa for threſhing corn. The Septuagint and St Jerome repreſent theſe carts as furniſhed with ſaws, inſomuch that their ſurface was beſet with teeth. David having taken Rabbah, the capital of the Ammonites, ordered all the inhabitants to be cruſhed to pieces under ſuch carts, moving on wheels ſet with iron teeth; and the king of Damaſcus is ſaid to have treated the Iſraelites of the land of Gilead in the ſame manner.

Cart-Bote, in law, ſignifies wood to be employed in making and repairing inſtruments of huſbandry.

Carts of War, a peculiar kind of artillery anciently in uſe among the Scots. They are thus deſcribed in an act of parliament, A. D. 1456: "It is thocht ſpeidfull, that the King mak requeiſt to certain of the great burrous of the land that are of ony myght, to mak carts of weir, and ilk cart twa gunnis, and ilk ane to have twa chalmers, with the remanent of the graith that effeirs thereto, and an cunnand man to ſhut thame." By another act, A. D. 1471, the prelates and barons are commanded to provide ſuch carts of war againſt their old enemies the Engliſh.

CARTE, (Thomas) the hiſtorian, was the ſon of Mr Samuel Carte prebendary of Litchfield, and born in 1686. When he was reader in the abbey-church at Bath, he took occaſion, in a 30th of January ſermon, 1714, to vindicate Charles I. with reſpect to the Iriſh maſſacre, which drew him into a controverſy with Mr Chandler the diſſenting miniſter; and on the acceſſion of the preſent royal family he refuſed to take the oaths to government, and put on a lay habit. He is ſaid to have acted as a kind of ſecretary to Biſhop Atterbury before his troubles; and in the year 1722, being accuſed of high treaſon, a reward of 1000 *l.* was offered for apprehending him: but Queen Caroline, the great patroneſs of learned men, obtained leave for him to return home in ſecurity. He publiſhed, 1. An edition of Thuanus, in ſeven volumes folio. 2. The Life of the firſt Duke of Ormond, three volumes, folio. 3. The hiſtory of England, four volumes, folio. 4. A Collection of Original Letters and Papers concerning the affairs of England, two volumes octavo; and ſome other works. He died in April 1754.—His hiſtory of England ends in 1654. His deſign was to have brought it down to the Revolution; for which purpoſe he had taken great pains in copying every thing valuable that could be met with in England, Scotland, France, Ireland, &c.—He had (as he himſelf ſays, p. 43. of his Vindication of a full anſwer to a letter from a byſtander), "read abundance of collections relating to the time of King Charles II. and had in his power a ſeries of memoirs from the beginning to the end of that reign; in which all thoſe intrigues and turns at court, at the latter end of that king's life, which biſhop Burnet, with all his goût for tales of ſecret hiſtory, and all his genius for conjectures, does not pretend to account for, are laid open in the cleareſt and moſt convincing manner; by the perſon who was moſt affected by them, and had the beſt reaſon to know them."—At his death, all his papers came into the hands of his widow, who afterwards married Mr Jernegan, a member of the church of Rome. They are now depoſited in the Bodleian library, having been delivered by Mr Jernegan to the univerſity, 1778, for a valuable conſideration. Whilſt they were in this gentleman's poſſeſſion, the earl of Hardwicke paid 200 *l.* for the peruſal of them. For a conſideration of 300 *l.* Mr Macpherſon had the uſe of them; and from theſe and other materials compiled his hiſtory and ſtate-papers. Mr Carte was a man of a ſtrong conſtitution and indefatigable application. When the ſtudies of the day were over, he would eat heartily; and in converſation was cheerful and entertaining.

Carte-Blanche, a ſort of white paper, ſigned at the bottom with a perſon's name, and ſometimes alſo ſealed with his ſeal, giving another perſon power to ſuperſcribe what conditions he pleaſes. Much like this is the French *blanc ſigne*, a paper without writing, except a ſignature at the bottom, given by contending parties to arbitrators or friends, to fill up with the conditions they judge reaſonable, in order to end the difference.

CARTEL, an agreement between two ſtates for the exchange of their priſoners of war.

CARTEL ſignifies alſo a letter of defiance or a challenge to decide a controverſy either in a tournament or in a ſingle combat. See DUEL.

Cartel-Ship, a ſhip commiſſioned in time of war to exchange the priſoners of any two hoſtile powers; alſo to carry any particular requeſt or propoſal from one to another: for this reaſon, the officer who commands her is particularly ordered to carry no cargo, ammunition, or implements of war, except a ſingle gun for the purpoſe of firing ſignals.

CARTES, (Rene des) deſcended of an ancient family in Touraine in France, was one of the moſt eminent philoſophers and mathematicians in the 17th century. At the Jeſuits College at la Fleche, he made a very great progreſs in the learned languages and polite literature, and became acquainted with Father Marſenne. His father deſigned him for the army; but his tender conſtitution then not permitting him to expoſe himſelf to ſuch fatigues, he was ſent to Paris, where he launched into gaming, in which he had prodigious ſucceſs. Here Marſenne perſuaded him to return to ſtudy; which he purſued till he went to Holland, in May 1616, where he engaged as a volunteer among the prince of Orange's troops. While he lay in garriſon at Breda, he wrote a *treatiſe on muſic*, and laid the foundation of ſeveral of his works. He was at the ſiege of Rochelle in 1628; returned to Paris; and, a few days after his return, at an aſſembly of men of learning in the houſe of Monſignor Bagni the Pope's Nuncio, was prevailed upon to explain his ſentiments with regard to philoſophy, when the nuncio urged him to publiſh his ſyſtem. Upon this he went to Amſterdam, and from thence to Franeker, where he began his *metaphyſical meditations*, and drew up his *diſcourſe on meteors*. He made a ſhort tour to England; and not far from London, made ſome obſervations concerning the declination of the magnet. He returned to Holland, where he finiſhed his *treatiſe on the world*.

His books made a great noiſe in France; and Holland thought of nothing but diſcarding the old philoſophy, and following his. Voetius being choſen rector of the univerſity of Utrecht, procured his philoſophy to be prohibited, and wrote againſt him; but he immediately publiſhed a vindication of himſelf. In 1647, he took a journey into France, where the king ſettled a penſion of 3000 livres upon him. Chriſtina, queen of Sweden, having invited him into that kingdom, he went thither, where he was received with the greateſt civility by her majeſty, who engaged him to attend her every morning at five o'clock, to inſtruct her in philoſophy, and deſired him to reviſe and digeſt all his writings which were unpubliſhed, and to form a complete body of philoſophy from them. She likewiſe propoſed to allow him a revenue, and to form an academy of which he was to be the director. But theſe deſigns were broken off by his death in 1650. His body was interred at Stockholm, and 17 years afterwards removed to Paris, where a magnificent monument was erected to him in the church of St Genevieve du Mont. The great Dr Halley, in a paper concerning optics, obſerves, that though ſome of the ancients mention refraction as an effect of tranſparent mediums, Des Cartes was the firſt who diſcovered the laws of refraction, and reduced dioptrics to a ſcience. As to his philoſophy, Dr Keil, in his introduction to his examination of Dr Burnet's theory of the earth, ſays, that Des Cartes was ſo far from applying geometry to natural philoſophy, that his whole ſyſtem is one continued blunder on account of his negligence in that point; the laws obſerved by the planets in their revolutions round the ſun, not agreeing with his theory of vortices. His philoſophy has accordingly given way to the more accurate diſcoveries and demonſtrations of the Newtonian ſyſtem.

CARTESIANS, a ſect of philoſophers, who adhered to the ſyſtem of Des Cartes, founded on the two following principles, the one metaphyſical, the other phyſical. The metaphyſical one is, *I think, therefore I am:* the phyſical principle is, that *nothing exiſts but ſubſtance.* Subſtance he makes of two kinds; the one a ſubſtance that thinks, the other a ſubſtance extended; whence actual thought, and actual extenſion, are the eſſence of ſubſtance.

The eſſence of matter being thus fixed in extenſion, the Carteſians conclude that there is no vacuum, nor any poſſibility thereof in nature; but that the univerſe is abſolutely full: mere ſpace is excluded by this principle; becauſe extenſion being implied in the idea of ſpace, matter is ſo too. Upon theſe principles, the Carteſians explained mechanically how the world was formed, and how the preſent celeſtial phenomena came to take place. See ASTRONOMY, nº 252.

CARTHAGE, a famed city of Antiquity, the capital of Africa Propria; and which, for many years, diſputed with Rome the ſovereignty of the world. According to Velleius Paterculus, this city was built 65, according to Juſtin and Trogus 72, according to others 100 or 140 years before the foundations of Rome were laid. It is on all hands agreed that the Phœnicians were the founders.

1
When founded.

The beginning of the Carthaginian hiſtory, like that of all other nations, is obſcure and uncertain. In the 7th year of Pygmalion king of Tyre, his ſiſter Eliſa, or Dido, is ſaid to have fled, with ſome of her companions and vaſſals, from the cruelty and avarice of her brother Sichæus.

2
Eliſa, or Dido, eſcapes from her brother.

She firſt touched at the iſland of Cyprus, where ſhe met with a prieſt of Jupiter, who was deſirous of attending her; to which ſhe readily conſented, and fixed the prieſthood in his family. At that time, it was a cuſtom in the iſland of Cyprus, for the young women to go on certain ſtated days, before marriage, to the ſea-ſide, there to look for ſtrangers, that might poſſibly arrive on their coaſts, in order to proſtitute themſelves for gain, that they might thereby acquire a dowry. Out of theſe, the Tyrians ſelected 80, whom they carried along with them. From Cyprus they ſailed directly for the coaſt of Africa; and at laſt ſafely landed in the province called *Africa Propria*, not far from Uttica, a Phœnician city of great antiquity. The inhabitants received their countrymen with great demonſtrations of joy, and invited them to ſettle among them. The common fable is, that the Phœnicians impoſed upon the Africans in the following manner: They deſired, for their intended ſettlement, only as much ground as an ox's hide would encompaſs. This requeſt the Africans laughed at: but were ſurpriſed, when, upon their granting it, they ſaw Eliſa cut the hide into the ſmalleſt ſhreds, by which means it ſurrounded a large territory; in which ſhe built the citadel called *Byrſa*. The learned, however, are now un-

3
Builds the citadel Byrſa.

animous in exploding this fable; and it is certain that the Carthaginians for many years paid an annual tribute to the Africans for the ground they poſſeſſed.

The new city ſoon became populous and flouriſhing, by the acceſſion of the neighbouring Africans, who came thither at firſt with a view of traffic. In a ſhort time it became ſo conſiderable, that *Jarbas*, a neighbouring prince, thought of making himſelf maſter of it without any effuſion of blood. In order to this, he deſired that an embaſſy of ten of the moſt noble Carthaginians might be ſent him; and, upon their arrival, propoſed to them a marriage with Dido, threatening war in caſe of a refuſal. The ambaſſadors, being afraid to deliver this meſſage, told the queen that Jarbas deſired ſome perſon might be ſent him who was capable of civilizing his Africans; but that there was no poſſibility of finding any of her ſubjects who would leave his relations for the converſation of ſuch barbarians. For this they were reprimanded by the queen; who told them that they ought to be aſhamed of refuſing to live in any manner for the benefit of their country. Upon this, they informed her of the true nature of their meſſage from Jarbas; and that, according to her own deciſion, ſhe ought to ſacrifice herſelf for the good of her country. The unhappy queen, rather than ſubmit to be the wife of ſuch a barbarian, cauſed a funeral pile to be erected, and put an end to her life with a dagger.

4
She kills herſelf.

This is Juſtin's account of the death of Queen Dido, and is the moſt probable; Virgil's ſtory of her amour with Æneas, being looked upon as fabulous, even in the days of Macrobius, as we are informed by that hiſtorian. How long monarchical government continued in Carthage, or what happened to this ſtate in its infancy, we are altogether ignorant, by reaſon of the Punic Archives being deſtroyed by the Romans; ſo that there is a chaſm in the Carthaginian hiſtory for above 300 years. It, however, appears, that from the very beginning, the Carthaginians applied themſelves to maritime affairs, and were formidable by ſea in the time of Cyrus and Cambyſes. From Diodorus Siculus and Juſtin, it appears, that the principal ſupport of the Carthaginians were the mines of Spain, in which country they ſeem to have eſtabliſhed themſelves very early. By means of the riches drawn from theſe mines, they were enabled to equip ſuch formidable fleets as we are told they fitted out in the time of Cyrus or Cambyſes. Juſtin inſinuates, that the firſt Carthaginian ſettlement in Spain happened when the city of Gades, now Cadis, was but of late ſtanding, or even in its infancy. The Spaniards finding this new colony begin to flouriſh, attacked it with a numerous army, inſomuch that the inhabitants were obliged to call in the Carthaginians to their aid. The latter very readily granted their requeſt, and not only repulſed the Spaniards, but made themſelves maſters of almoſt the whole province in which their new city ſtood. By this ſucceſs, they were encouraged to attempt the conqueſt of the whole country: but having to do with very warlike nations, they could not puſh their conqueſts to any great length at firſt; and it appears from the accounts of Livy and Polybius, that the greateſt part of Spain remained unſubdued till the times of Hamilcar, Aſdrubal, and Hannibal.

5
Spaniſh mines of vaſt ſervice to the Carthaginians.

About 503 years before the birth of Chriſt, the Carthaginians entered into a treaty with the Romans. It related chiefly to matters of navigation and commerce. From it we learn, that the whole iſland of Sardinia, and part of Sicily, were then ſubject to Carthage; that they were very well acquainted with the coaſts of Italy, and had made ſome attempts upon them before this time; and that, even at this early period, a ſpirit of jealouſy had taken place between the two republics. Some time near this period, the Carthaginians had a mind to diſcontinue the tribute they had hitherto paid the Africans for the ground on which their city ſtood. But, notwithſtanding all their power, they were at preſent unſucceſsful; and at laſt were obliged to conclude a peace, one of the articles of which was, that the tribute ſhould be continued.

6
Firſt treaty between Carthage and Rome.

7
Sicily invaded by the Carthaginians.

By degrees the Carthaginians extended their power over all the iſlands in the Mediterranean, Sicily excepted; and for the entire conqueſt of this, they made vaſt preparations, about 480 years before Chriſt. Their army conſiſted of 300,000 men; their fleet was compoſed of upwards of 2000 men of war, and 3000 tranſports; and with ſuch an immenſe armament, they made no doubt of conquering the whole iſland in a ſingle campaign. In this, however, they found themſelves miſerably deceived. Hamilcar their general having landed his numerous forces, inveſted Himera, a city of conſiderable importance. He carried on his attacks with the greateſt aſſiduity; but was at laſt attacked in his trenches by Gelon and Theron, the tyrants of Syracuſe and Agrigentum, who gave the Carthaginians one of the greateſt overthrows mentioned in hiſtory. An hundred and fifty thouſand were killed in the battle and purſuit, and all the reſt taken priſoners; ſo that of ſo mighty an army, not a ſingle perſon eſcaped. Of the 2000 ſhips of war and 3000 tranſports, of which the Carthaginian fleet conſiſted, eights ſhips only, which then happened to be out at ſea, made their eſcape: theſe immediately ſet ſail for Carthage; but were all caſt away, and every ſoul periſhed, except a few who were ſaved in a ſmall boat, and at laſt reached Carthage with the diſmal news of the total loſs of the fleet and army. No words can expreſs the conſternation of the Carthaginians upon receiving the news of ſo terrible a diſaſter. Ambaſſadors were immediately diſpatched to Sicily, with orders to conclude a peace upon any terms. They put to ſea without delay; and landing at Syracuſe, threw themſeves at the conqueror's feet. They begged Gelon, with many tears, to receive their city into favour, and grant them a peace on whatever terms he ſhould chooſe to preſcribe. He granted their requeſt upon condition that Carthage ſhould pay him 2000 talents of ſilver to defray the expences of the war; that they ſhould build two temples, where the articles of the treaty ſhould be lodged and kept as ſacred; and that for the future they ſhould abſtain from human ſacrifices. This was not thought a dear purchaſe of a peace for which there was ſuch occaſion; and to ſhow their gratitude for Gelon's moderation, the Carthaginians complimented his wife Demarata with a crown of gold worth 100 talents.

8
They are utterly deſtroyed.

9
Peace concluded.

From this time we find little mention of the Carthaginians for 70 years. Some time during this period, however, they had greatly extended their dominions

10 Diſpute with the Cyreneans

11 Story of the *Philæni.*

minions in Africa, and likewiſe ſhaken off the tribute which gave them ſo much uneaſineſs. They had warm diſputes with the inhabitants of Cyrene the capital of Cyrenaica, about a regulation of the limits of their reſpective territories. The conſequence of theſe diſputes was a war, which reduced both nations ſo low, that they agreed firſt to a ceſſation of arms, and then to a peace. At laſt it was agreed, that each ſtate ſhould appoint two commiſſaries, who ſhould ſet out from their reſpective cities on the ſame day, and that the ſpot on which they met ſhould be the boundary of both ſtates. In conſequence of this, two brothers called *Philæni* were ſent out from Carthage, who advanced with great celerity, while thoſe from Cyrene were much more ſlow in their motions. Whether this proceeded from accident or deſign, or perfidy, we are not certainly informed; but, be this as it will, the Cyreneans finding themſelves greatly outſtripped by the Philæni, accuſed them of breach of faith, aſſerting that they had ſet out before the time appointed, and conſequently that the convention between their principals was broken. The Philæni deſired them to propoſe ſome expedient whereby their differences might be accommodated; promiſing to ſubmit to it, whatever it might be. The Cyreneans then propoſed, either that the Philæni ſhould retire from the place where they were, or that they ſhould be buried alive upon the ſpot. With this laſt condition the brothers immediately complied, and by their death gained a large extent of territory to their country. The Carthaginians ever after celebrated this as a moſt brave and heroic action; paid them divine honours; and endeavoured to immortalize their names by erecting two altars there, with ſuitable inſcriptions upon them.

12 Sicily invaded anew.

About the year before Chriſt 412, ſome diſputes happening between the Egeſtines and Selinuntines, inhabitants of two cities in Sicily, the former called in the Carthaginians to their aſſiſtance; and this occaſioned a new invaſion of Sicily by that nation. Great preparations were made for this war; Hannibal, whom they had appointed general, was empowered to raiſe an army equal to the undertaking, and equip a ſuitable fleet. They alſo appointed certain funds for defraying all the expences of the war, intending to exert their whole force to reduce the iſland under their ſubjection.

13 Emporium and Selinus taken.

The Carthaginian general having landed his forces, immediately marched for Selinus. In his way he took Emporium, a town ſituated on the river Mazara; and having arrived at Selinus, he immediately inveſted it. The beſieged made a very vigorous defence; but at laſt the city was taken by ſtorm, and the inhabitants were treated with the utmoſt cruelty. All were maſſacred by the ſavage conquerors, except the women who fled to the temples; and theſe eſcaped, not through the merciful diſpoſition of the Carthaginians, but becauſe they were afraid, that if driven to deſpair they would ſet fire to the temples, and by that means conſume the treaſure they expected to find in thoſe places. Sixteen thouſand were maſſacred; 2250 eſcaped to Agrigentum; and the women and children, about 5000 in number, were carried away captives. At the ſame time the temples were plundered, and the city raſed to the ground.

14 As likewiſe Himera.

After the reduction of Selinus, Hannibal laid ſiege to Himera; that city he deſired above all things to become maſter of, that he might revenge the death of his grandfather Hamilcar, who had been ſlain before it by Gelon. His troops, fluſhed with their late ſucceſs, behaved with undaunted courage; but finding his battering engines not to anſwer his purpoſe ſufficiently, he undermined the wall, ſupporting it with large beams of timber, to which he afterwards ſet fire, and thus laid part of it flat on the ground. Notwithſtanding this advange, however, the Carthaginians were ſeveral times repulſed with great ſlaughter; but at laſt they became maſters of the place, and treated it in the ſame manner as they had done Selinus. After this, Hannibal, diſmiſſing his Sicilian and Italian allies, returned to Africa.

15 Agrigentum beſieged;

16 And taken.

The Carthaginians were now ſo much elated, that they meditated the reduction of the whole iſland. But as the age and infirmities of Hannibal rendered him incapable of commanding the forces alone, they joined in commiſſion with him Imilcar the ſon of Hanno, one of the ſame family. On the landing of the Carthaginian army, all Sicily was alarmed, and the principal cities put themſelves into the beſt ſtate of defence they were able. The Carthaginians immediately marched to Agrigentum, and began to batter the walls with great fury. The beſieged, however, defended themſelves with incredible reſolution, in a ſally burnt all the machines raiſed againſt their city, and repulſed the enemy with great ſlaughter. The Syracuſians in the mean time, being alarmed at the danger of Agrigentum, ſent an army to its relief. On their approach they were immediately attacked by the Carthaginians; but after a ſharp diſpute the latter were defeated and forced to fly to the very walls of Agrigentum, with the loſs of 6000 men. Had the Agrigentine commanders now ſallied out, and fallen upon the fugitives, in all probability the Carthaginian army muſt have been deſtroyed; but either through fear or corruption, they refuſed to ſtir out of the place, and this occaſioned the loſs of it Immenſe booty was found in the city; and the Carthaginians behaved with their uſual cruelty, putting all the inhabitants to the ſword, not excepting even thoſe who had fled to the temples.

17 Gela beſieged.

The next attempt of the Carthaginians was deſigned againſt the city of Gela: but the Geleans, being greatly alarmed, implored the protection of Syracuſe; and, at their requeſt, Dionyſius was ſent to aſſiſt them with 2000 foot and 400 horſe. The Geleans were ſo well ſatisfied with his conduct, that they treated him with the higheſt marks of diſtinction; they even ſent ambaſſadors to Syracuſe to return thanks for the important ſervices done them by ſending him thither; and ſoon after he was appointed generaliſſimo of the Syracuſian forces and thoſe of their allies againſt the Carthaginians. In the mean time Imilcar, having raſed the city of Agrigentum, made an incurſion into the territories of Gela and Comarina; which having ravaged in a dreadful manner, he carried off ſuch immenſe quantity of plunder, as filled his whole camp. He then marched againſt the city: but though it was but indifferently fortified, he met with a very vigorous reſiſtance; and the place held out for a long time without receiving any aſſiſtance from its allies.

Carthage.

At laſt Dionyſius came to its aſſiſtance with an army of 50,000 foot and 1000 horſe. With theſe he attacked the Carthaginian camp, but was repulſed with great loſs: after which, he called a council of war, the reſult of whoſe deliberations was, that ſince the enemy was ſo much ſuperior to them in ſtrength, it would be highly imprudent to put all to the iſſue of a battle; and therefore, that the inhabitants ſhould be perſuaded to abandon the country, as the only means of ſaving their lives. In conſequence of this, a trumpet was ſent to Imilcar to deſire a ceſſation of arms till the next day, in order, as was pretended, to bury the dead, but in reality to give the people of Gela an opportunity of making their eſcape. Towards the beginning of the night the bulk of the citizens left the place; and he himſelf with the army followed them about midnight. To amuſe the enemy, he left 2000 of his light armed troops behind him, commanding them to make fires all night, and ſet up loud ſhouts as though the army ſtill remained in town. At day-break theſe took the ſame route as their companions, and purſued their march with great celerity. The Carthaginians finding the city deſerted by the greateſt part of its inhabitants, immediately entered it, putting to death all who had remained; after which, Imilcar having thoroughly plundered it, moved towards Camarina. The inhabitants of this city had been likewiſe drawn off by Dionyſius, and it underwent the ſame fate with Gela.

18 Abandoned by its inhabitants.

19 Peace concluded.

Notwithſtanding theſe ſucceſſes, however, Imilcar finding his army greatly weakened, partly by the caſualties of war, and partly by a plague which broke out in it, ſent a herald to Syracuſe to offer terms of peace. His unexpected arrival was very agreeable to the Syracuſians, and a peace was immediately concluded upon the following terms, *viz.* That the Carthaginians, beſides their ancient acquiſitions in Sicily, ſhould ſtill poſſeſs the countries of the Silicani, the Selinuntines, the Himereans, and Agrigentines: that the people of Gela and Camarina ſhould be permitted to reſide in their reſpective cities, which yet ſhould be diſmantled, upon their paying an annual tribute to the Carthaginians; that all the other Sicilians ſhould preſerve their independency except the Syracuſians, who ſhould continue in ſubjection to Dionyſius.

20 Dionyſius breaks the treaty.

The tyrant of Syracuſe, however, had concluded this peace with no other view than to gain time, and to put himſelf in a condition to attack the Carthaginian territories with greater force. Having accompliſhed this, he acquainted the Syracuſians with his deſign, and they immediately approved of it; upon which he gave up to the fury of the populace the perſons and poſſeſſions of the Carthaginians who reſided in Syracuſe, and traded there on the faith of treaties. As there were many of their ſhips at that time in the harbour, laden with cargoes of great value, the people immediately plundered them; and, not content with this, ranſacked all their houſes in a moſt outrageous manner. This example was followed throughout the whole iſland; and in the mean time Dionyſius diſpatched a herald to Carthage with a letter to the ſenate and people, telling them, that if they did not immediately withdraw their garriſons from all the Greek cities in Sicily, the people of Syracuſe would treat them as enemies. With this demand, however, he did not allow them to comply; for without waiting for any anſwer from Carthage, he advanced with his army to Mount Eryx, near which ſtood the city of Motya, a Carthaginian colony of great importance, and this he immediately inveſted. But ſoon after, leaving his brother Leptines to carry on the attacks, he himſelf went with the greateſt part of his forces to reduce the cities in alliance with the Carthaginians. He deſtroyed their territories with fire and ſword, cut down all their trees; and then he ſat down before Egeſta and Entella, moſt of the other towns having opened their gates at his approach; but theſe baffling his utmoſt efforts, he returned to Motya, and puſhed on the ſiege of that place with the utmoſt vigour.

The Carthaginians, in the mean time, though alarmed at the meſſage ſent them by Dionyſius, and though reduced to a miſerable ſituation by the plague which had broken out in their city, did not deſpond, but ſent officers to Europe, with conſiderable ſums, to raiſe troops with the utmoſt diligence. Ten gallies were alſo ſent from Carthage to deſtroy all the ſhips that were found in the harbour of Syracuſe. The admiral, according to his orders, entered the harbour in the night, without being diſcerned by the enemy; and having ſunk moſt of the ſhips he found there, returned without the loſs of a man.

21 Syracuſian ſhips deſtroyed.

22 Motya taken by the Greeks.

All this while the Motyans defended themſelves with incredible vigour: while their enemies, deſirous of revenging the cruelties exerciſed upon their countrymen by the Carthaginians, fought like lions. At laſt the place was taken by ſtorm, and the Greek ſoldiers began a general maſſacre. For ſome time Dionyſius was not able to reſtrain their fury: but at laſt he proclaimed that the Motyans ſhould fly to the Greek temples; which they accordingly did, and a ſtop was put to the ſlaughter; but the ſoldiers took care thoroughly to plunder the town, in which they found a great treaſure.

The following ſpring, Dionyſius invaded the Carthaginian territories, and made an attempt upon Egeſte; but here he was again diſappointed. The Carthaginians were greatly alarmed at his progreſs; but, next year, notwithſtanding a conſiderable loſs ſuſtained in a ſea-fight with Leptines, Himilco their general landed a powerful army at Panormus, ſeized upon Eryx, and then advancing towards Motya, made himſelf maſter of it, before Dionyſius could ſend any forces to its relief. He next advanced to Meſſana, which he likewiſe beſieged and took; after which moſt of the Siculi revolted from Dionyſius.

23 Greeks defeated at ſea by the Carthaginians.

Notwithſtanding this defection, Dionyſius, finding his forces ſtill amount to 30,000 foot and 3000 horſe, advanced againſt the enemy. At the ſame time, Leptines was ſent with the Syracuſian fleet againſt that of the Carthaginians, but with poſitive orders not to break the line of battle upon any account whatever. But, notwithſtanding theſe orders, he thought proper to divide his fleet, and the conſequence of this was a total defeat; above 100 of the Syracuſian galleys being ſunk or taken, and 20,000 of their men killed in the battle or in the purſuit. Dionyſius diſheartened by this misfortune, returned with his army to Syracuſe, being afraid that the Carthagenian fleet might become maſters of that city, if he ſhould advance to fight the land army. Himilco did not fail immediately to inveſt the capital:

24 Syracuſe beſieged by the Carthaginians.

capital; and had certainly become maſter of it, and conſequently of the whole iſland, had not a moſt malignant peſtilence obliged him to deſiſt from all further operations. This dreadful malady made great havock among his forces both by ſea and land; and to complete his misfortunes, Dionyſius attacked him unexpectedly, totally ruined his fleet, and made himſelf maſter of his camp.

25 Himilco obliged to return.

Himilco finding himſelf altogether unable to ſuſtain another attack, was obliged to come to a private agreement with Dionyſius; who for 300 talents conſented to let him eſcape to Africa, with the ſhattered remains of his fleet and army. The unfortunate general arrived at Carthage, clad in mean and ſordid attire, where he was met by a great number of people bewailing their ſad and inauſpicious fortune. Himilco joined them in their lamentations; and being unable to ſurvive his misfortunes, put an end to his own life. He had left Mago in Sicily, to take care of the Carthaginian intereſts in the beſt manner he could. In order to this, Mago treated all the Sicilians ſubject to Carthage with the greateſt humanity; and having received a conſiderable number of ſoldiers from Africa, he at laſt formed an army with which he ventured a battle: in this he was defeated, and driven out of the field, with the loſs of 800 men; which obliged him to deſiſt from farther attempts of that nature.

26 Another invaſion of Sicily.

27 Syracuſians aſſiſted by the Corinthians.

Notwithſtanding all theſe terrible diſaſters, the Carthaginians could not forbear making new attempts upon the iſland of Sicily; and about the year before Chriſt 392, Mago landed in it with an army of 80,000 men. This attempt, however, was attended with no better ſucceſs than before; Dionyſius found means to reduce him to ſuch ſtraits for want of proviſions, that he was obliged to ſue for peace. This continued for nine years, at the end of which the war was renewed with various ſucceſs. It continued with little interruption till the year before Chriſt 367, when, the Syracuſian ſtate being rent by civil diſſentions, the Carthaginians thought it a proper time to exert themſelves, in order to become maſters of the whole iſland. They fitted out a great fleet, and entered into alliance with Icetas, tyrant of Leontini, who pretended to have taken Syracuſe under his protection. By this treaty, the two powers engaged to aſſiſt each other, in order to expel Dionyſius II. after which they were to divide the iſland between them. The Syracuſians applied for ſuccours to the Corinthians; and they readily ſent them a body of troops under the command of Timoleon an experienced general. By a ſtratagem, he got his forces landed at Taurominium. The whole of them did not exceed 1200 in number: yet with theſe he marched againſt Icetas, who was at the head of 5000 men; his army he ſurpriſed at ſupper, put 300 of them to the ſword, and took 600 priſoners. He then marched to Syracuſe, and broke into one part of the town before the enemy had any notice of his approach: here he took poſt, and defended himſelf with ſuch reſolution, that he could not be diſlodged by the united power of Icetas and the Carthaginians.

28 Fooliſh conduct of the Carthaginian admiral.

29 Cowardice of Mago.

In this place he remained for ſome time, in expectation of a reinforcement from Corinth; till the arrival of which, he did not judge it practicable to extend his conqueſts.—The Carthaginians being appriſed that the Corinthian ſuccours were detained by tempeſtuous weather at Thurium, poſted a ſtrong ſquadron, under Hanno their admiral, to intercept them in their paſſage to Sicily. But that commander, not imagining the Corinthians would attempt a paſſage to Sicily in ſuch a ſtormy ſeaſon, left his ſtation at Thurium, and ordering his ſeamen to crown themſelves with garlands, and adorn their veſſels with bucklers both of the Greek and Carthaginian form, ſailed to Syracuſe in a triumphant manner. Upon his arrival there, he gave the troops in the citadel to underſtand, that he had taken the ſuccours Timoleon expected, thinking by this means to intimidate them to ſurrender. But, while he thus trifled away his time, the Corinthians marched with great expedition to Rhegium, and, taking the advantage of a gentle breeze, were eaſily wafted over into Sicily. Mago, the Carthaginian general, was no ſooner informed of the arrival of this reinforcement, than he was ſtruck with terror, though the whole Corinthian army did not exceed 4000 men; and, ſoon after, fearing a revolt of his mercenaries, he weighed anchor, in ſpite of all the remonſtrances of Icetas, and ſet ſail for Africa. Here he no ſooner arrived, than, overcome with grief and ſhame for his unparalleled cowardice, he laid violent hands on himſelf. His body was hung upon a gallows or croſs, in order to deter ſucceeding generals from forfeiting their honour in ſo flagrant a manner.

30 Exploits of Timoleon.

After the flight of Mago, Timoleon carried all before him. He obliged Icetas to renounce his alliance with the ſtate of Carthage, and even depoſed him, and continued his military preparations with the greateſt vigour. On the other hand, the Carthaginians prepared for the enſuing campaign with the greateſt alacrity. An army of 70,000 men was ſent over, with a fleet of 200 ſhips of war, and 1000 tranſports laden with warlike engines, armed chariots, horſes, and all other ſorts of proviſions. This immenſe multitude, however, was overthrown on the banks of the Crimeſus by Timoleon: 10,000 were left dead on the field of battle; and of theſe, above 3000 were native Carthaginians of the beſt families in the city. Above 15,000 were taken priſoners; all their baggage and proviſions, with 200 chariots, 1000 coats of mail, and 10,000 ſhields, fell into Timoleon's hands. The ſpoil, which conſiſted chiefly of gold and ſilver, was ſo immenſe, that the whole Sicilian army was three days in collecting it and ſtripping the ſlain. After this ſignal victory, he left his mercenary forces upon the frontiers of the enemy, to plunder and ravage the country; while he himſelf returned to Syracuſe with the reſt of his army, where he was received with the greateſt demonſtrations of joy. Soon after, Icetas, grown weary of his private ſtation, concluded a new peace with the Carthaginians; and, having aſſembled an army, ventured an egagement with Timoleon: but in this he was utterly defeated; and himſelf, with Eupolemus his ſon, and Euthymus general of his horſe, were brought bound to Timoleon by their own ſoldiers. The two firſt were immediately executed as tyrants and traitors, and the laſt murdered in cold blood; Icetas's wives and daughters were likewiſe cruelly put to death after a public trial. In a ſhort time after, Mamercus, another of the Carthaginian confederates, was

31 Peace concluded.

overthrown by Timoleon, with the loſs of 2000 men. Theſe misfortunes induced the Carthaginians to conclude a peace on the following terms: That all the Greek cities ſhould be ſet free; that the river Halycus ſhould be the boundary between the territories of both parties; that the natives of the cities ſubject to the Carthaginians ſhould be allowed to withdraw, if they pleaſed, to Syracuſe, or its dependencies, with their families and effects; and laſtly, that Carthage ſhould not, for the future, give any aſſiſtance to the remaining tyrants againſt Syracuſe.

32 War renewed

33 Agathocles raiſes himſelf to the throne of Syracuſe.

About 316 years before Chriſt, we find the Carthaginians engaged in another bloody war with the Sicilians, on the following occaſion. Soſiſtratus, who had uſurped the ſupreme authority at Syracuſe, having been forced by Agathocles to raiſe the ſiege of Rhegium, returned with his ſhattered troops to Sicily. But ſoon after this unſucceſsful expedition, he was obliged to abdicate the ſovereignty and quit Syracuſe. With him were expelled above 600 of the principal citizens, who were ſuſpected of having formed a deſign to overturn the plan of government which then prevailed in the city. As Soſiſtratus and the exiles thought themſelves ill treated, they had recourſe to the Carthaginians, who readily eſpouſed their cauſe. Hereupon the Syracuſians having recalled Agathocles, who had before been baniſhed by Soſiſtratus, appointed him commander in chief of all their forces, principally on account of the known averſion he bore that tyrant. The war, however, did not then continue long; for Soſiſtratus and the exiles were quickly received again into the city, and peace was concluded with Carthage: the people of Syracuſe, however, finding that Agathocles wanted to make himſelf abſolute, exacted an oath from him, that he would do nothing to the prejudice of the democracy. But, notwithſtanding this oath, Agathocles purſued his purpoſe, and by a general maſſacre of the principal citizens of Syracuſe raiſed himſelf to the throne. For ſome time he was obliged to keep the peace he had concluded with Carthage; but at laſt finding his authority eſtabliſhed, and that his ſubjects were ready to ſecond his ambitious deſigns, he paid no regard to his treaties, but immediately made war on the neighbouring ſtates, which he had expreſsly agreed not to do, and then carried his arms into the very heart of the iſland. In theſe expeditions he was attended with ſuch ſucceſs, that in two years time he brought into ſubjection all the Greek part of Sicily. This being accompliſhed, he committed great devaſtations in the Carthaginian territories, their general Hamilcar not offering to give him the leaſt diſturbance. This perfidious conduct greatly incenſed the people of thoſe driſtricts againſt Hamilcar, whom they accuſed before the ſenate. He died, however, in Sicily; and Hamilcar the ſon of Giſco was appointed to ſucceed him in the command of the forces. The laſt place that held out againſt Agathocles was Meſſana, whither all the Syracuſian exiles had retired. Paſiphilus, Agathocles's general, found means to cajole the inhabitants into a treaty; which Agathocles, according to cuſtom, paid no regard to, but as ſoon as he was in poſſeſſion of the town, cut off all thoſe who had oppoſed his government. For, as he intended to proſecute the war with the utmoſt vigour againſt Carthage, he thought it a point of good policy to deſtroy as many of his Sicilian enemies as poſſible.

34 Defeated by the Carthaginians, and beſieged in Syracuſe.

The Carthaginians in the mean time having landed a powerful army in Sicily, an engagement ſoon enſued, in which Agathocles was defeated with the loſs of 7000 men. After this defeat he was obliged to ſhut himſelf up in Syracuſe, which the Carthaginians immediately inveſted, and moſt of the Greek ſtates in the iſland ſubmitted to them.

35 He invades Africa.

Agathocles ſeeing himſelf ſtripped of almoſt all his dominions, and his capital itſelf in danger of falling into the hands of the enemy, formed a deſign which, were it not atteſted by writers of undoubted authority, would ſeem abſolutely incredible. This was no leſs than to transfer the war into Africa, and lay ſiege to the enemy's capital, at a time when he himſelf was beſieged, and only one city left to him in all Sicily. Before he departed, however, he made all the neceſſary preparations for the defence of the place, and appointed his brother Antandrus governor of it. He alſo gave permiſſion to all who were not willing to ſtand the fatigues of a ſiege to retire out of the city. Many of the principal citizens, Juſtin ſays 1600, accepted of this offer; but they were no ſooner got out of the place, than they were cut off by parties poſted on the road for that purpoſe. Having ſeized upon their eſtates, Agathocles raiſed a conſiderable ſum, which was intended in ſome meaſure to defray the expence of the expedition; however, he carried with him only 50 talents to ſupply his preſent wants, being well aſſured that he ſhould find in the enemy's country whatever was neceſſary for his ſubſiſtence. As the Carthaginians had a much ſuperior fleet, they for ſome time kept the mouth of the harbour blocked up: but at laſt a fair opportunity offered; and Agathocles hoiſting ſail, by the activity of his rowers ſoon got clear both of the port and city of Syracuſe. The Carthaginians purſed him with all poſſible expedition; but, notwithſtanding their utmoſt efforts, Agathocles got his troops landed with very little oppoſition.

36 He burns his fleet.

Soon after his forces were landed, Agathocles burnt his fleet, probably that his ſoldiers might behave with the greater reſolution, as they ſaw no poſſibility of flying from their danger. He firſt advanced to a place called the Great City. This, after a feeble reſiſtance, he took and plundered. From hence he marched to Tunis, which ſurrendered on the firſt ſummons; and Agathocles levelled both places with the ground.

37 Carthiginians defeated.

38 Their method of appeaſing their deities.

The Carthaginians were at firſt thrown into the greateſt conſternation; but ſoon recovering themſelves, the citizens took up arms with ſo much alacrity, that in a few days they had on foot an army of 40,000 foot and 1000 horſe, with 2000 armed chariots. The command of this army they entruſted to Hanno and Bomilcar, two generals between whom there ſubſiſted a great animoſity. This occaſioned the defeat of their whole army with the loſs of their camp, though all the forces of Agathocles did not exceed 14,000 in number. Among other rich ſpoils the conqueror found many chariots of curious workmanſhip, which carried 20,000 pair of fetters and manacles that the enemy had provided for the Sicilian priſoners. After this defeat, the Carthaginians, ſuppoſing themſelves to have fallen under the diſpleaſure of their deities on account of their neglecting to ſacrifice children of noble families

lies to them, reſolved to expiate this guilt. Accordingly 200 children of the firſt rank were ſacrificed to their bloody gods, beſides 300 other perſons who voluntarily offered themſelves to pacify the wrath of theſe deities.

39 Hamilcar makes an aſſault on Syracuſe.

After theſe expiations, Hamilcar was recalled from Sicily. When the meſſengers arrived, Hamilcar commanded them not once to mention the victory of Agathocles; but, on the contrary, to give out among the troops that he had been entirely defeated, his forces all cut off, and his fleet deſtroyed by the Carthaginians. This threw the Syracuſians into the utmoſt deſpair; however, one Eurymnon, an Etolian, prevailed upon Antandrus, not to conſent to a capitulation, but to ſtand a general aſſault. Hamilcar being informed of this, prepared his battering engines, and made all the neceſſary preparations to ſtorm the town without delay. But while matters remained in this ſituation, a galley, which Agathocles had cauſed to be built immediately after the battle, got into the harbour of Syracuſe, and acquainted the inhabitants with the certainty of Agathocles's victory. Hamilcar obſerving that the garriſon flocked down to the port on this occaſion, and expecting to find the walls unguarded, ordered his ſoldiers to erect ſcaling-ladders, and begin the intended aſſault. The enemy having left the ramparts quite expoſed, the Carthaginians mounted them without being diſcerned, and had almoſt poſſeſſed themſelves of an entire part lying between two towers, when the patrol diſcovered them. Upon this a warm diſpute enſued; but at laſt the Carthaginians were repulſed with loſs. Hamilcar, therefore, finding it in vain to continue the ſiege after ſuch glad tidings had reſtored life and ſoul to the Syracuſians, drew off his forces, and ſent a detachment of 5000 men to reinforce the troops in Africa. He ſtill entertained hopes, however, that he might oblige Agathocles to quit Africa, and return to the defence of his own dominions. He ſpent ſome time in making himſelf maſter of ſuch cities as ſided with the Syracuſians; and after having brought all their allies under ſubjection, returned again to Syracuſe, hoping to ſurpriſe it by an attack in the night-time. But being attacked while advancing thro' narrow paſſes, where his numerous army had not room to act, he was defeated with great ſlaugther, and himſelf taken priſoner, carried into Syracuſe, and put to death.

40 He raiſes the ſiege.

41 Is defeated and taken priſoner and put to death.

42 Agrigentines attempt the ſovereignty of Sicily.

In the mean time the Agrigentines, finding that the Carthaginians and Syracuſians had greatly weakened each other by this war, thought it a proper opportunity to attempt the ſovereignty of the whole iſland. They therefore commenced a war againſt both parties; and proſecuted it with ſuch ſucceſs, that in a ſhort time they wreſted many places of note both out of the hands of the Syracuſians and Carthaginians.

43 Succeſs of Agathocles in Africa.

In Africa the tyrant carried every thing before him. He reduced moſt of the places of any note in the territory of Carthage; and hearing that Elymas king of Libya had declared againſt him, he immediately entered Libya Superior, and in a great battle overthrew that prince, putting to the ſword a good part of his troops, and the general who commanded them; after which he advanced againſt the Carthaginians with ſuch expedition, that he ſurpriſed and defeated them, with the loſs of 2000 killed, and a great number taken priſoners. He next prepared for the ſiege of Carthage itſelf; and in order thereto advanced to a poſt within five miles of that city. On the other hand, notwithſtanding the great loſſes they had already ſuſtained, the Carthaginians, with a powerful army, encamped between him and their capital. In this ſituation Agathocles received advice of the defeat of the Carthaginian forces before Syracuſe, and the head of Hamilcar their general. Upon this he immediately rode up to the enemy's camp, and ſhowing them the head, gave them an account of the total deſtruction of their army before Syracuſe. This threw them into ſuch conſternation, that in all human probability Agathocles would have made himſelf maſter of Carthage, had not an unexpected mutiny ariſen in his camp, which gave the Carthaginians an opportunity of recovering from their terror.

44 He makes an alliance with Ophellas;

The year following an engagement happened, in which neither party gained any great advantage: but ſoon after the tyrant, notwithſtanding all his victories, found himſelf unable to carry on the war alone; and therefore endeavoured to gain over to his intereſt Ophellas, one of the captains of Alexander the Great. In this he perfectly ſucceeded; and, to ſuccour his new ally the more effectually, Ophellas ſent to Athens for a body of troops. Having finiſhed his military preparations, Ophellas found his army to conſiſt of 10,000 foot and 600 horſe, all regular troops, beſides 100 chariots, and a body of 10,000 men, attended by their wives and children, as though he had been going to plant a new colony. At the head of theſe forces he continued his march towards Agathocles for 18 days; and then encamped at Automolæ, a city about 3000 ſtadia diſtant from the capital of his dominions. From thence he advanced through the Regio Syrtica; but found himſelf reduced to ſuch extremities, that his army was in danger of periſhing for want of bread, water, and other proviſions. They were alſo greatly annoyed by ſerpents and wild beaſts, with which that deſert region abounded. The ſerpents made the greateſt havock among the troops; for, being of the ſame colour with the earth, and extremely venomous, many ſoldiers, who trod upon them without ſeeing them, were ſtung to death. At laſt, after a very fatiguing march of two months, he approached Agathocles, and encamped at a ſmall diſtance from him, to the no ſmall terror of the Carthaginians, who apprehended the moſt fatal conſequences from this junction. Agathocles at firſt careſſed him, and adviſed him to take all poſſible care of his troops that had undergone ſo many fatigues; but ſoon after cut him off by treachery, and then by fair words and promiſes perſuaded his troops to ſerve under himſelf.

45 Whom he treacherouſly murders.

Agathocles now finding himſelf at the head of a numerous army, aſſumed the title of King of Africa, intending ſoon to complete his conqueſts by the reduction of Carthage. He began with the ſiege of Utica, which was taken by aſſault. After this he marched againſt Hippo Diarrhytus, the Biſerta of the moderns, which was alſo taken by ſtorm; and after this moſt of the people bordering upon the ſea-coaſts, and even thoſe who inhabited the inland parts of the country, ſubmitted to him. But in the midſt of this career of ſucceſs, the Sicilians formed an aſſociation in

46 Is obliged to return home.

favour of liberty ; which obliged the tyrant to return home, leaving his ſon Archagathus to carry on the war in Africa.

47 Succeſs of Archagathus.

Archagathus, after his father's departure, greatly extended the African conqueſts. He ſent Eumachus at the head of a large detachment to invade ſome of the neighbouring provinces, while he himſelf, with the greateſt part of his army, obſerved the motions of the Carthaginians. Eumachus falling into Numidia, firſt took the great city of Tocas, and conquered ſeveral of the Numidian cantons. Afterwards he beſieged and took Phellina ; which was attended with the ſubmiſſion of the Aſphodelodians, a nation, according to Diodorus, as black as the Ethiopians. He then reduced ſeveral cities ; and being at laſt elated with ſuch a run of good fortune, reſolved to penetrate into the more remote parts of Africa. Here he at firſt met with ſucceſs ; but hearing that the barbarous nations were advancing in a formidable body to give him battle, he abandoned his conqueſts, and retreated with the utmoſt precipitation towards the ſea-coaſts, after having loſt abundance of men.

48 He is reduced to the utmoſt diſtreſs.

This unfortunate expedition made a great alteration for the worſe in the affairs of Archagathus. The Carthaginians being informed of Eumachas's bad ſucceſs, reſolved to exert themſelves in an extraordinary manner to repair their former loſſes. They divided their forces into three bodies : one of theſe they ſent to the ſea-coaſts, to keep the towns there in awe ; another they diſpatched into the Mediterranean parts, to preſerve the allegiance of the inhabitants there ; and the laſt body they ordered to the Upper Africa, to ſupport their confederates in that country. Archagathus being appriſed of the motions of the Carthaginians, divided his forces likewiſe into three bodies. One of theſe he ſent to obſerve the Carthaginian troops on the ſea-coaſts, with orders to advance afterwards into the Upper Africa ; another under the command of Æſchrion, one of his generals, he poſted at a proper diſtance in the heart of the country, to have an eye both on the enemy there and the barbarous nations ; and with the laſt, which he led in perſon, he kept nearer Carthage, preſerving a communication with the other two, in order to ſend them ſuccours, or recal them, as the exigency of affairs ſhould require.—The Carthaginian troops ſent into the heart of the country, were commanded by Hanno, a general of great experience, who being informed of the approach of Æſchrion, laid an ambuſcade for him, into which he was drawn and cut off with 4000 foot and 200 horſe. Himilco, who commanded the Carthaginian forces in Upper Africa, having advice of Eumachus's march, immediately advanced againſt him. An engagement enſued, in which the Greeks were almoſt totally cut off, or periſhed with thirſt after the battle, out of 8000 foot only 30, and of 800 horſe only 40, having the good fortune to make their eſcape.

Archagathus receiving the melancholy news of theſe two defeats, immediately called in the detachments he had ſent out to haraſs the enemy, which would otherwiſe have been inſtantly cut off. He was, however, in a ſhort time hemmed in on all ſides in ſuch a manner as to be reduced to the laſt extremity for want of proviſions, and ready every moment to be ſwallowed up by the numerous forces which ſurrounded him. In this deplorable ſituation Agathocles received an expreſs from Archagathus, acquainting him of the loſſes he had ſuſtained, and the ſcarcity of proviſions he laboured under. Upon this the tyrant, leaving the care of the Sicilian war to one Leptines, by a ſtratagem got 18 Etruſcan ſhips that came to his aſſiſtance out of the harbour; and then engaging the Carthaginian ſquadron which lay in its neighbourhood, took five of their ſhips, and made all their men priſoners. By this means he became maſter of the port, and ſecured a paſſage into it for the merchants of all nations, which ſoon reſtored plenty to that city, where the famine before had begun to make great havock. Supplying himſelf, therefore, with a ſufficient quantity of neceſſaries for the voyage he was going to undertake, he immediately ſet ſail for Africa.

49 Agathocle arrives in Africa.

Upon his arrival in this country, Agathocles reviewed his forces, and found them to conſiſt of 6000 Greeks, as many Samnites, Celtes, and Etruſcans ; beſides 10,000 Africans, and 1500 horſe. As he found his troops almoſt in a ſtate of deſpair, he thought this a proper time for offering the enemy battle. The Carthaginians, however, did not think proper to accept the challenge ; eſpecially as by keeping cloſe in their camp, where they had plenty of every thing, they could ſtarve the Greeks to a ſurrender without ſtriking a ſtroke.

50 Attacks the camp of the enemy without ſucceſs.

Upon this Agathocles attacked the Carthaginian camp with great bravery, made a conſiderable impreſſion upon it, and might perhaps have carried it, had not his mercenaries deſerted him almoſt at the firſt onſet. By this piece of cowardice he was forced to retire with precipitation to his camp, whither the Carthaginians purſued him very cloſely, doing great execution in the purſuit.

51 Diſaſter in the Carthaginian camp.

The next night, the Carthaginians ſacrificed all the priſoners of diſtinction as a greatful acknowledgment to the gods for the victory they had gained. While they were employed in the inhuman work, the wind, ſuddenly riſing, carried the flames to the ſacred tabernacle near the altar, which was entirely conſumed, as well as the general's tent, and thoſe of the principal officers adjoining to it. A dreadful alarm took place through the whole camp, which was heightened by the great progreſs the fire made. For the ſoldiers tents conſiſting of very combuſtible materials, and the wind blowing in a moſt violent manner, the whole camp was almoſt entirely laid in aſhes ; and many of the ſoldiers endeavouring to carry off their arms, and the rich baggage of their officers, periſhed in the flames. Some of thoſe who made their eſcape met with a fate equally unhappy : For, after Agathocles had received the laſt blow, the Africans deſerted him, and were in that inſtant coming over in a body to the Carthaginians. Theſe, the perſons who were flying from the flames took to be the whole Syracuſian army advancing in order of battle to attack their camp. Upon this a dreadful confuſion enſued. Some took to their heels ; others fell down in heaps one upon another ; and others engaged their comrades, miſtaking them for the enemy. Five thouſand men loſt their lives in this tumult, and the reſt thought proper to take refuge within the walls of Carthage ; nor could the appearance of day-light, for ſome time, diſ-

52 Another in that of Agathocles.

ſipate their terrible apprehenſions. In the mean time, the African deſerters, obſerving the great confuſion the Carthaginians were in, and not knowing the meaning of it, were ſo terrified, that they thought proper to return to the place from whence they came. The Syracuſians ſeeing a body of troops advancing towards them in good order, concluded that the enemy were marching to attack them, and therefore immediately cried out "To arms." The flames aſcending out of the Carthaginian camp into the air, and the lamentable outcries proceeding from thence, confirmed them in this opinion, and greatly heightened their confuſion. The conſequence was much the ſame as in the Carthaginian camp; for coming to blows with one another inſtead of the enemy, they ſcarce recovered their ſenſes upon the return of light, and the inteſtine fray was ſo bloody, that it coſt Agathocles 4000 men.

53 He eſcapes privately.

This laſt diſaſter ſo diſheartened the tyrant, that he immediately ſet about contriving means for making his eſcape privately; and this he at laſt, though with great difficulty, effected. After his departure, his two ſons were immediately put to death by the ſoldiers, who, chooſing a leader from among themſelves, made peace with the Carthaginians upon the following conditions: 1. That the Greeks ſhould deliver up all the places they held in Africa, receiving from them 300 talents; 2. That ſuch of them as were willing to ſerve in the Carthaginian army ſhould be kindly treated, and receive the uſual pay; and, 3. That the reſt ſhould be tranſported to Sicily, and have the city of Selinus for their habitation.

54 Cauſes of the firſt Punic War.

55 Hanno intercepts the Roman fleet.

From this time, to that of the firſt war with the Romans, we find nothing remarkable in the hiſtory of the Carthaginians. The firſt Punic war, as it is commonly called, happened about 256 years before Chriſt. At that time, the Carthaginians were poſſeſſed of extenſive dominions in Africa; they had made conſiderable progreſs in Spain; were maſters of Sardinia, Corſica, and all the iſlands on the coaſt of Italy; and had extended their conqueſts to a great part of Sicily. The occaſion of the firſt rupture between the two republics was as follows. The Mamertines being vanquiſhed in battle, and reduced to great ſtraits by Hiero king of Syracuſe, had reſolved to deliver up Meſſina, the only city they now poſſeſſed, to that prince, with whoſe mild government and ſtrict probity they were well acquainted. Accordingly, Hiero was advancing at the head of his troops to take poſſeſſion of the city, when Hannibal, who at that time commanded the Carthaginian army in Sicily, prevented him by a ſtratagem. He came to meet Hiero, as it were to congratulate him on his victory; and amuſed him while ſome of the Carthaginian troops filed off towards Meſſina. Hereupon the Mamertines, ſeeing their city ſupported by a new reinforcement, were divided into ſeveral opinions. Some were for accepting the protection of Carthage; others were for ſurrendering to the king of Syracuſe; but the greater part were for calling in the Romans to their aſſiſtance. Deputies were accordingly diſpatched to Rome, offering the poſſeſſion of the city to the Romans, and in the moſt moving terms imploring protection. This, after ſome debate, was agreed to; and the conſul Appius Claudius received orders to attempt a paſſage to Sicily, at the head of a powerful army. Being obliged to ſtay ſome time at Rome, however, one Caius Claudius, a perſon of great intrepidity and reſolution, was diſpatched with a few veſſels to Rhegium. On his arrival there, he obſerved the Carthaginian ſquadron to be ſo much ſuperior to his own, that he thought it would be little better than madneſs to attempt at that time to tranſport forces to Sicily. He croſſed the ſtraits, however, and had a conference with the Mamertines, in which he prevailed upon them to accept of the protection of Rome; and on this he made the neceſſary preparations for tranſporting his forces. The Carthaginians being informed of the reſolutions of the Romans, ſent a ſtrong ſquadron of galleys under the command of Hanno, to intercept the Roman fleet; and accordingly the Carthaginian admiral, coming up with them near the coaſt of Sicily, attacked them with great fury. During the engagement a violent ſtorm aroſe, which daſhed many of the Roman veſſels againſt the rocks, and did a vaſt deal of damage to their ſquadron; by which means Claudius was forced to retire to Rhegium, and this he accompliſhed with great difficulty. Hanno reſtored all the veſſels he had taken; but ordered the deputies ſent with them, to expoſtulate with the Roman general upon the infraction of the treaties ſubſiſting between the two republics. This expoſtulation, however juſt, produced an open rupture; Claudius ſoon after poſſeſſing himſelf of Meſſina.

56 Carthaginians and Syracuſians defeated by the Romans.

Such was the beginning of the firſt Punic war, which is ſaid to have laſted 24 years. The firſt year, the Carthaginians and Syracuſians laid ſiege to Meſſina; but, not acting in concert as they ought to have done, were overthrown by the conſul Appius Claudius; and this defeat ſo much diſguſted Hiero with the Carthaginians, that he ſoon after concluded an alliance with the Romans. After this treaty, having no enemy to contend with but the Carthaginians, the Romans made themſelves maſters of all the cities on the weſtern coaſt of Sicily, and at the end of the campaign carried back moſt of their troops with them to take up their winter-quarters in Italy.

57 Agrigentum taken by the Romans.

The ſecond year, Hanno, the Carthaginian general, fixed his principal magazine at Agrigentum. This place was very ſtrong by nature, had been rendered almoſt impregnable by the new fortifications raiſed by the Carthaginians during the preceding winter, and was defended by a numerous garriſon commanded by one Hannibal, a general of great experience in war. For five months the Romans attempted to reduce the place by famine, and had actually brought the inhabitants to great diſtreſs, when a Carthaginian army of 50,000 foot, 6000 horſe, and 60 elephants, landed at Lilybæum, and from thence marched to Heraclea, within 20 miles of Agrigentum. There the general received a deputation from ſome of the inhabitants of Erbeſſa, where the Romans had their magazines, offering to put the town into his hands. It was accordingly delivered up; and by this means the Romans became ſo much diſtreſſed, that they had certainly been obliged to abandon their enterpriſe, had not Hiero ſupplied then with proviſions. But all the aſſiſtance he was able to give could not long have ſupported them, as their army was ſo much weakened by diſorders occaſioned by famine, that, out of 100,000 men of whom it originally conſiſted, ſcarce a fourth part remained fit for ſervice, and could no longer ſubſiſt on ſuch parſimonious ſupplies. But in the mean time Hannibal acquainted Hanno that the city was reduced to the utmoſt diſtreſs: upon which he reſolved to venture an engagement, which he had before declined. In this the Romans were victorious, and the city ſurrendered at diſcretion, though Hannibal, with the greateſt part of the garriſon made their eſcape. This ended the campaign; and the Carthaginians being greatly chagrined at their bad ſucceſs, fined Hanno of an immenſe ſum of money, and deprived him of his command, appointing Hamilcar to ſucceed him in the command of the land army, and Hannibal in that of the fleet.

58
They build a fleet,

The third year, Hannibal received orders to ravage the coaſts of Italy; but the Romans had taken care to poſt detachments in ſuch places as were moſt proper to prevent his landing, ſo that the Carthaginian found it impoſſible to execute his orders. At the ſame time the Romans perceiving the advantages of being maſters of the ſea, ſet about building 120 galleys.—While this was doing they made themſelves maſters of moſt of the inland cities, but the Carthaginians reduced or kept ſteady in their intereſt moſt of the maritime ones; ſo that both parties were equally ſucceſsful during this campaign.

59
And defeat the Carthaginians at ſea.

The fourth year, Hannibal by a ſtratagem made himſelf maſter of 17 Roman galleys; after which he committed great ravages on the coaſt of Italy, whither he had advanced to take a view of the Roman fleet. But he was afterwards attacked in his turn, loſt the greateſt part of his ſhips, and with great difficulty made his own eſcape. Soon after he was totally defeated by the conſul Duillius, with the loſs of 80 ſhips taken, thirteen ſunk, 7000 men killed, and as many taken priſoners. After this victory Duillius landed in Sicily, put himſelf at the head of the land forces, relieved Segeſta beſieged by Hamilcar, and made himſelf maſter of Macella, though defended by a numerous garriſon.

60
Sicilians defeated by the Carthaginians.

The fifth year, a difference aroſe between the Romans and their Sicilian allies, which came to ſuch an height, that they encamped ſeparately. Of this Hamilcar availed himſelf, and attacking the Sicilians in their entrenchments, put 4000 of them to the ſword. He then drove the Romans from their poſts, took ſeveral cities from them, and over-ran the greateſt part of the country. In the mean time, Hannibal, after his defeat, ſailed with the ſhattered remains of his fleet to Carthage; but in order to ſecure himſelf from puniſhment, he ſent one of his friends with all ſpeed, before the event of the battle was known there, to acquaint the ſenate, that the Romans had put to ſea with a good number of heavy ill built veſſels, each of them carrying ſome machine, the uſe of which the Carthaginians did not underſtand; and aſked, whether it was the opinion of the ſenate that Hannibal ſhould attack them. Theſe machines were the *corvi*, which were then newly invented, and by means of which, chiefly, Duillius had gained the victory. The ſenate were unanimous in their opinion, that the Romans ſhould be attacked; upon which the meſſenger acquainted them with the unfortunate event of the battle. As the ſenators had already declared themſelves for the engagement, they ſpared their general's life, and, according to Polybius even continued him in the command of the fleet. In a ſhort time, being reinforced by a good number of galleys, and attended by ſome officers of great merit, he ſailed for the coaſt of Sardinia. He had not been long here, before he was ſurpriſed by the Romans, who carried off many of his ſhips, and took great numbers of his men priſoners. This ſo incenſed the reſt, that they ſeized their unfortunate admiral, and crucified him; but who was his immediate ſucceſſor does not appear.

61
Corſica and Sardinia reduced by the Romans.

The ſixth year, the Romans made themſelves maſters of the iſlands of Corſica and Sardinia. Hanno, who commanded the Carthaginian forces in the latter, defended himſelf at a city called Olbia with incredible bravery; but being at laſt killed in one of the attacks, the place was ſurrendered, and the Romans ſoon became maſters of the whole iſland.

62
The Roman army in great danger.
63
Reſcued by the bravery of a legionary tribune.

The ſeventh year, the Romans took the town of Myteſtratum, in Sicily, from whence they marched towards Camarina, but in their way were ſurrounded in a deep valley, and in the moſt imminent danger of being cut off by the Carthaginian army. In this extremity, a legionary tribune, by name *M. Calpurnius Flamma*, deſired the general to give him 300 choſen men; promiſing, with this ſmall company, to find the enemy ſuch employment as ſhould oblige them to leave a paſſage open for the Roman army. He performed his promiſe with a bravery truly heroic; for, having ſeized, in ſpite of all oppoſition, an eminence, and entrenched himſelf on it, the Carthaginians, jealous of his deſign, flocked from all quarters to drive him from his poſt. But the brave tribune kept their whole army in play, till the conſul taking advantage of the diverſion, drew his army out of the bad ſituation in which he had imprudently brought it.—The legions were no ſooner out of danger, than they haſtened to the relief of their brave companions: but all they could do was to ſave their bodies from the inſults of their enemies; for they found them all dead on the ſpot, except Calpurnius, who lay under an heap of dead bodies, all covered with wounds, but ſtill breathing. His wounds were immediately dreſſed, and it fortunately happened that none of them proved mortal; and for this glorious enterpriſe he received a crown of *gramen*. After this the Romans reduced ſeveral cities, and drove the enemy quite out of the territory of the Agrigentines; but were repulſed with great loſs before Lipara.

64
Carthaginians defeated at ſea by the Romans.

The eighth year, Regulus, who commanded the Roman fleet, obſerving that of the Carthaginians lying along the coaſt in diſorder, ſailed with a ſquadron of ten galleys to obſerve their number and ſtrength, ordering the reſt of the fleet to follow him with all expedition. But as he drew too near the enemy, he was ſurrounded by a great number of Carthaginian galleys. The Romans fought with their uſual bravery; but being overpowered with numbers, were obliged to yield. The conſul, however, found means to make his eſcape, and join the reſt of the fleet; and then had his full revenge of the enemy, 18 of their ſhips being taken, and 8 ſunk.

The ninth year, the Romans made preparations for invading

65
Regulus invades Africa.

invading Africa. Their fleet for this purpoſe conſiſted of 330 galleys, each of them having on board 120 ſoldiers and 300 rowers The Carthaginian fleet conſiſted of 360 ſail, and was much better manned than that of the Romans. The two fleets met near Ecnomus, a promontory in Sicily; where, after a bloody engagement which laſted the greater part of the day, the Carthaginians were entirely defeated, with the loſs of 30 galleys ſunk, and 63 taken with all their men. The Romans loſt only 24 galleys, which were all ſunk.—After this victory, the Romans having refitted their fleet, ſet ſail for the coaſt of Africa with all expedition. The firſt land they got ſight of was Cape Hermea, where the fleet lay at anchor for ſome time waiting till the galleys and tranſports came up. From thence they coaſted along till they arrived before Clupea, a city to the eaſt of Carthage, where they made their firſt deſcent.

66
Carthaginians in great conſternation.

No words can expreſs the conſternation of the Carthaginians, on the arrival of the Romans in Africa. The inhabitants of Clupea were ſo terrified, that, according to Zonaras, they abandoned the place, which the Romans immediately took poſſeſſion of. Having left there a ſtrong garriſon to ſecure their ſhipping, and keep the adjacent territory in awe, they moved nearer Carthage, taking a great number of towns: they likewiſe plundered a prodigious number of villages, laid vaſt numbers of noblemens ſeats in aſhes, and took above 20,000 priſoners. In ſhort, having plundered and ravaged the whole country, almoſt to the gates of Carthage, they returned to Clupea loaden with the immenſe booty they had acquired in the expedition.

67
Succeſs of Regulus.

The tenth year, Regulus puſhed on his conqueſts with great rapidity. To oppoſe his progreſs, Hamilcar was recalled from Sicily, and with him Boſtar and Aſdrubal were joined in command. Hamilcar commanded an army juſt equal to that of Regulus. The other two commanded ſeparate bodies, which were to join him, or act apart as occaſion required. But, before they were in a condition to take the field, Regulus, purſuing his conqueſts, arrived on the banks of the *Bragada*, a river which empties itſelf into the ſea at a ſmall diſtance from Carthage. Here he had a monſtrous ſerpent to contend with, which, according to the accounts of thoſe days, infected the waters of the river, poiſoned the air, and killed all other animals with its breath alone. When the Romans went to draw water, this huge dragon attacked them; and, twiſting itſelf round their bodies, either ſqueezed them to death or ſwallowed them alive. As its hard and thick ſcales were proof againſt their darts and arrows, they were forced to have recourſe to the baliſtæ, which they made uſe of in the ſieges to throw great ſtones, and to beat down the walls of beſieged cities. With theſe they diſcharged ſhowers of huge ſtones againſt this new enemy, and had the good luck, with one of them, to break his back-bone; which diſabled him from twiſting and winding his immenſe body, and by that means gave the Romans an opportunity of approaching and diſpatching him with their darts. But his dead body corrupted the air and the water of the river; and ſpread ſo great an infection over the whole country, that the Romans were obliged to decamp. We are told that Regulus ſent to Rome the ſkin of this monſter, which was 120 feet long; and that it was hung up in a temple, where it was preſerved to the time of the Numantine war.

68
He kills a monſtrous ſerpent.

69
Defeats the Carthaginians;

Having paſſed the river, he beſieged *Adis*, or *Adda*, not far from Carthage, which the enemy attempted to relieve; but as they lay encamped among hills and rocks, where their elephants, in which the main ſtrength of their army conſiſted, could be of no uſe, Regulus attacked them in their camp, killed 17,000 of them, and took 5000 priſoners, and 18 elephants. Upon the fame of this victory, deputations came from all quarters, inſomuch that the conqueror in a few days became maſter of 80 towns; among which were the city and port of Utica. This increaſed the alarm at Carthage; which was reduced to deſpair, when Regulus laid ſiege to Tunis, a great city about nine miles from the capital. The place was taken in ſight of the Carthaginians, who, from their walls, beheld all the operations of the ſiege, without making the leaſt attempt to relieve it. And to complete their misfortunes, the Numidians, their neighbours, and implacable enemies, entered their territories, committing every where the moſt dreadful devaſtations, which ſoon occaſioned a great ſcarcity of proviſions in the city. The public magazines were ſoon exhauſted: and, as the city was full of ſelfiſh merchants, who took advantage of the public diſtreſs, to ſell proviſions at an exhorbitant price, a famine enſued, with all the evils which attended it.

70
And reduces them to the utmoſt deſpair.

71
His propoſals of peace rejected.

In this extremity Regulus advanced to the very gates of Carthage; and having encamped under the walls, ſent deputies to treat of a peace with the ſenate. The deputies were received with inexpreſſible joy; but the conditions they propoſed were ſuch that the ſenate could not hear them without the greateſt indignation. They were, 1. That the Carthaginians ſhould relinquiſh all claims to Sardinia, Corſica, and Sicily. 2. That they ſhould reſtore to the Romans all the priſoners they had taken from them ſince the beginning of the war. 3. That if they cared to redeem any of their own priſoners, they ſhould pay ſo much a-head for them as Rome ſhould judge reaſonable. 4. That they ſhould for ever pay the Romans an annual tribute. 5. That for the future they ſhould fit out but one man of war for their own uſe, and 50 triremes to ſerve in the Roman fleet, at the expence of Carthage, when required by any of the future conſuls. Theſe extravagant demands provoked the ſenators, who loudly and unanimouſly rejected them; the Roman deputies, however, told them that Regulus would not alter a ſingle letter of the propoſals, and that they muſt either conquer the Romans or obey them.

72
Xanthippus appointed to command the Carthaginian army.

In this extreme diſtreſs, ſome mercenaries arrived from Greece, among whom was a Lacedemonian, by name Xanthippus, a man of great valour and experience in war. This man, having informed himſelf of the circumſtances of the late battle, declared publicly, that their overthrow was more owing to their own miſconduct than to the ſuperiority of the enemy. This diſcourſe being ſpread abroad, came at laſt to the knowledge of the ſenate; and by them, and even by the deſire of the Carthaginian generals themſelves, Xanthippus was appointed commander in chief of their forces. His firſt care was to diſcipline his troops in a proper

proper manner. He taught them how to march, encamp, widen and cloſe the ranks, and rally after the Lacedemonian manner under their proper colours. He then took the field with 12,000 foot, 4000 horſe, and 100 elephants. The Romans were ſurpriſed at the ſudden alteration they obſerved in the enemy's conduct; but Regulus, elated with his laſt ſucceſs, came and encamped at a ſmall diſtance from the Carthaginian army in a vaſt plain, where their elephants and horſe had room to act. The two armies were parted by a river, which Regulus boldly paſſed, by which means he left no room for a retreat in caſe of any misfortune. The engagement began with great fury; but ended in the total defeat of the Romans, who except 2000 that eſcaped to Clupea, were all killed or taken priſoners, and among the latter was Regulus himſelf. The loſs of the Carthaginians ſcarce exceeded 800 men.

73
The Romans utterly defeated, and Regulus taken.

The Carthagenians remained on the field of battle till they had ſtripped the ſlain; and then entered their metropolis, which was almoſt the only place left them, in great triumph. They treated all their priſoners with great humanity, except Regulus; but as for him, he had ſo inſulted them in his proſperity, that they could not forbear ſhewing the higheſt marks of their reſentment. According to Zonaras and others, he was thrown into a dungeon, where he had only ſuſtenance allowed him barely ſufficient to keep him alive. Nay, his cruel maſters, to heighten his other torments, ordered an huge elephant (at the ſight of which animal, it ſeems, he was greatly terrified) to be conſtantly placed near him; which prevented him from enjoying any tranquillity or repoſe.

74
He is cruelly uſed.

75.
Carthaginians defeated by ſea and land.

The eleventh year of this war, the Carthaginians, elated with their victory over Regulus, began to talk in a very high ſtrain, threatening Italy itſelf with an invaſion. To prevent this, the Romans took care to garriſon all their maritime towns, and fitted out a new fleet. In the mean time, the Carthaginians beſieged Clupea and Utica in vain, being obliged to abandon their enterprize, upon hearing that the Romans were equipping a fleet of 350 ſail. The Carthaginians having with incredible expedition refitted their old veſſels, and built a good number of new ones, met the Roman fleet off Cape Hermea. An engagement enſued which the Carthaginians were utterly defeated; 104 of their ſhips being ſunk, 30 taken, and 15,000 of their ſoldiers and rowers killed in the action. The Romans purſued their courſe to Clupea, where they were no ſooner landed, than they found themſelves attacked by the Carthaginian army, under the two Hanno's, father and ſon. But, as the brave Xanthippus no longer commanded their army, notwithſtanding the Lacedemonian diſcipline he had introduced among them, they were routed at the very firſt onſet, with the loſs of 9000 men, and among them many of their chief lords.

76
Romans obliged to abandon Africa.

Notwithſtanding all their victories, however, the Romans found themſelves now obliged, for want of proviſions, to evacuate both Clupea and Utica, and abandon Africa altogether. Being deſirous of ſignalizing the end of their conſulate by ſome important conqueſt on Sicily, the conſuls ſteered for that iſland, contrary to the advice of their pilots, who repreſented their danger, on account of the ſeaſon being ſo far advanced. Their obſtinacy proved the deſtruction of the whole fleet; for a violent ſtorm ariſing, out of 370 veſſels, only 80 eſcaped ſhipwreck, the reſt being ſwallowed up in the ſea, or daſhed againſt the rocks. This was by far the greateſt loſs that Rome had ever ſuſtained; for beſides the ſhips that were caſt away with their crews, a numerous army was deſtroyed, with all the riches of Africa, which had been by Regulus amaſſed and depoſited in Clupea, and were now from thence tranſporting to Rome. The whole coaſt from Pachinum to Camerina was covered with dead bodies and wrecks of ſhips; ſo that hiſtory can ſcarce afford an example of ſuch a dreadful diſaſter.

77
Their fleet totally deſtroyed by a ſtorm.

The twelfth year the Carthaginians hearing of this misfortune of the Romans, renewed the war in Sicily with freſh fury, hoping the whole iſland, which was now left defenceleſs, would fall into their hands. Carthalo, a Carthaginian commander beſieged and took Agrigentum. The town he laid in aſhes and demoliſhed the walls, obliging the inhabitants to fly to Olympium. Upon the news of this ſucceſs, Aſdrubal was ſent to Sicily with a large reinforcement of troops, and 150 elephants. They likewiſe fitted out a ſquadron with which they retook the iſland of Coſyra, and marched a ſtrong body of forces into Mauritania and Numidia, to puniſh the people of thoſe countries for ſhewing a diſpoſition to join the Romans. In Sicily the Romans poſſeſſed themſelves of Cephalodium and Panormus, but were obliged by Carthalo to raiſe the ſiege of Drepanum with great loſs.

78
Agrigentum taken and deſtroyed by the Carthaginians.

The 13th year the Romans ſent out a fleet of 260 galleys, which appeared off Lilybæum in Sicily; but finding this place too ſtrong, they ſteered from thence to the eaſtern coaſt of Africa, where they made ſeveral deſcents, ſurpriſed ſome cities, and plundered ſeveral towns and villages. They arrived ſafe at Panormus, and in a few days ſet ſail for Italy, having a fair wind till they came off Cape Palinurus, where ſo violent a ſtorm overtook them, that 160 of their galleys and a great number of their tranſports were loſt; upon which the Roman ſenate made a decree, that, for the future, no more than 50 veſſels ſhould be equipped; and that theſe ſhould be employed only in guarding the coaſt of Italy and tranſporting the troops into Sicily.

79
The Romans fit out a new fleet.

80
Which is again deſtroyed.

The 14th year, the Romans made themſelves maſters of Himera and Lipara in Sicily; and the Carthaginians conceiving new hopes of conquering that iſland, began to make freſh levies in Gaul and Spain, and to equip a new fleet. But their treaſures being exhauſted, they applied to Ptolemy king of Egypt, intreating him to lend them 2000 talents: but he being reſolved to ſtand neuter, refuſed to comply with their requeſt; telling them, that he could not without breach of fidelity aſſiſt one friend againſt another. However, the republic of Carthage making an effort, equipped a fleet of 100 ſail, and raiſed an army of 30,000 men, horſe and foot, and 240 elephants, appointing Aſdrubal commander in chief both of the fleet and army. The Romans then finding the great advantages of a fleet, reſolved to equip one notwithſtanding all former diſaſters; and while the veſſels were building, two conſuls were choſen, men of valour and experience, to ſuperſede the acting ones in Sicily. Metellus, however, one of the former conſuls being continued with the title of proconſul, found

81
They fit out another.

means

82
Carthaginians utterly defeated.

means to draw Aſdrubal into a battle on diſadvantageous terms near Panormus, and then ſallying out upon him, gave him a moſt terrible overthrow. Twenty thouſand of the enemy were killed, and many elephants. An hundred and four elephants were taken with their leaders, and ſent to Rome, where they were hunted and put to death in the circus.

83
Lilybæum beſieged by the Romans.

84
They are defeated at ſea by the Carthaginians.

85
A Roman fleet utterly deſtroyed by a ſtorm.

The 15th year, the Romans beſieged Lilybæum; and the ſiege continued during the reſt of the firſt Punic war, and was the only thing remarkable that happened during that time*. The Carthaginians, on the firſt news of its being beſieged, ſent Regulus with ſome deputies to Rome to treat of a peace: but inſtead of forwarding the negociation, he hindered it; and notwithſtanding he knew the torments prepared for him at Carthage, could not be prevailed upon to ſtay at Rome, but returning to his enemies country, was put to a moſt cruel death. During this ſiege, the Roman fleet under Claudius Pulcher was utterly defeated by Adherbal the Carthaginian admiral. Ninety of the Roman galleys were loſt in the action, 8000 of their men either killed or drowned, and 20,000 taken and ſent priſoners to Carthage; and the Carthaginians gained this ſignal victory without the loſs of a ſingle ſhip, or even a ſingle man. Another Roman fleet met with a ſtill ſeverer fate. It conſiſted of 120 galleys, 800 tranſports, and was laden with all ſorts of military ſtores and proviſions. Every one of theſe veſſels were loſt by a ſtorm, with all they contained, not a ſingle plank being ſaved that could be uſed again; ſo that the Romans found themſelves once more deprived of their whole naval force.

86
Hamiclar Barcas ſent into Sicily.

87
Peace with the Romans.

In the mean time, the Carthaginian ſoldiery having ſhown a diſpoſition to mutiny, the ſenate ſent over Hamilcar Barcas, father of the famous Hannibal, to Sicily. He received a charte blanche from the ſenate to act as he thought proper; and by his excellent conduct and reſolution, ſhowed himſelf the greateſt general of his age. He defended Eryx, which he had taken by ſurpriſe, with ſuch vigour, that the Romans would never have been able to make themſelves maſters of it, had they not fitted out a new fleet at the expence of private citizens, which, having utterly defeated that of the Carthaginians, Hamilcar, notwithſtanding all his valour, was obliged to yield up the place which he had ſo long and ſo bravely defended. The following articles of peace were immediately drawn up between the two commanders. 1. The Carthaginians ſhall evacuate all the places which they have in Sicily, and entirely quit that iſland. 2. They ſhall, in 20 years, pay the Romans, at equal payments every year, 2200 talents of ſilver, that is, L. 437,250 Sterling. 3. They ſhall reſtore the Roman captives and deſerters without ranſom, and redeem their own priſoners with money. 4. They ſhall not make war upon Hiero king of Syracuſe, or his allies. Theſe articles being agreed to, Hamilcar ſurrendered Eryx upon condition that all his ſoldiers ſhould march out with him upon his paying for each of them 18 *Roman denarii*. Hoſtages were given on both ſides, and deputies were ſent to Rome to procure a ratification of the treaty by the ſenate. After the ſenators had thoroughly informed themſelves of the ſtate of affairs, two more articles were added, *viz*. 1. That 1000 talents ſhould be paid immediately, and the 2200 in the ſpace of 10 years at equal payments. 2. That the Carthaginians ſhould quit all the little iſlands about Italy and Sicily, and never more come near them with ſhips of war, or raiſe mercenaries in thoſe places. Neceſſity obliged Hamilcar to conſent to theſe terms; but he returned to Carthage with an hatred to the Romans, which he did not even ſuffer to die with him, but tranſmitted to his ſon the great Hannibal.

88
Cauſes of the war with the mercenaries.

89
Imprudent conduct of Hanno.

The Carthaginians were no ſooner got out of this bloody and expenſive war, than they found themſelves engaged in another which was like to have proved fatal to them. It is called by ancient hiſtorians the *Libyan war*, or the *war with the mercenaries*. The principal occaſion of it was, that when Hamilcar returned to Carthage, he found the republic ſo much impoveriſhed, that, far from being able to give theſe troops the largeſſes and rewards promiſed them, it could not pay them their arrears. He had committed the care of tranſporting them to one *Giſco*, who, being an officer of great penetration, as though he had foreſeen what would happen, did not ſhip them off all at once, but in ſmall and ſeparate parties, that thoſe who came firſt might be paid off and ſent home before the arrival of the reſt. The Carthaginians at home, however, did not act with the ſame prudence. As the ſtate was almoſt entirely exhauſted by the laſt war, and the immenſe ſum of money, in conſequence of the peace, paid to the Romans, they judged it would be a laudable action to ſave ſomething to the public. They did not therefore pay off the mercenaries in proportion as they arrived, thinking it more proper to wait till they all came together, with a view of obtaining ſome remiſſion of their arrears. But being ſoon made ſenſible of their wrong conduct on this occaſion, by the frequent diſorders theſe barbarians committed in the city, they with ſome difficulty prevailed upon the officers to take up their quarters at Sicca, and canton their troops in that neighbourhood. To induce them to this, however, they gave them a ſum of money for their preſent ſubſiſtence, and promiſed to comply with their pretenſions when the remainder of their troops arrived from Sicily. Here, being wholly immerſed in idleneſs, to which they had long been ſtrangers, a neglect of diſcipline enſued, and of courſe a petulant and licentious ſpirit immediately took place. They were now determined not to acquieſce in receiving their bare pay, but to inſiſt upon the rewards Hamiclar had promiſed them, and even to compel the ſtate of Carthage to comply with their demands by force of arms. The ſenate being informed of the mutinous diſpoſition of the ſoldiery, diſpatched Hanno, one of the ſuffetes, to pacify them. Upon his arrival at Sicca, he expatiated largely upon the poverty of the ſtate, and the heavy taxes with which the citizens of Carthage were loaded; and therefore, inſtead of anſwering their high expectations, he deſired them to be ſatisfied with receiving part of their pay, and remit the remainder to ſerve the preſſing exigencies of the republic. The mercenaries being highly provoked, that neither Hamilcar, nor any other of the principal officers who commanded them in Sicily, and were the beſt judges of their merit, made their appearance on this occaſion, but only Hanno, a perſon utterly unknown, and above all others

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* See *Lilybæum*.

others utterly diſagreeable to them, immediately had recourſe to arms. Aſſembling therefore in a body to the number of 20,000, they advanced to Tunis, and immediately encamped before that city.

The Carthaginians being greatly alarmed at the approach of ſo formidable a body to Tunis, made large conceſſions to the mercenaries, in order to bring them back to their duty: but, far from being ſoftened, they grew more inſolent upon theſe conceſſions, taking them for the effects of fear; and therefore were altogether averſe to thoughts of accommodation. The Carthaginians, making a virtue of a neceſſity, ſhowed a diſpoſition to ſatisfy them in all points, and agreed to refer themſelves to the opinion of ſome general in Sicily, which they had all along deſired; leaving the choice of ſuch commander entirely to them. Giſco was accordingly pitched upon to mediate this affair, the mercenaries believing Hamilcar to have been a principal cauſe of the ill treatment they met with, ſince he never appeared among them, and, according to the general opinion, had voluntarily reſigned his commiſſion. Giſco ſoon arrived at Tunis with money to pay the troops; and after conferring with the officers of the ſeveral nations apart, he harangued them in ſuch a manner, that a treaty was upon the point of being concluded, when Spendius and Mathos, two of the principal mutineers, occaſioned a tumult in every part of the camp. Spendius was by nation a Campanian, who had been a ſlave at Rome, and had fled to the Carthaginians. The apprehenſions he was under of being delivered to his old maſter, by whom he was ſure to be hanged or crucified, prompted him to break off the accommodation. Mathos was an African, and free born; but as he had been active in raiſing the rebellion, and was well acquainted with the implacable diſpoſition of the Carthaginians, he knew that a peace muſt infallibly prove his ruin. He therefore joined with Spendius, and inſinuated to the Africans the danger of concluding a treaty at that juncture, which could not but leave them ſingly expoſed to the rage of the Carthaginians. This ſo incenſed the Africans, who were much more numerous than the troops of any other nation, that they immediately aſſembled in a tumultuous manner. The foreigners ſoon joined them, being inſpired by Spendius with an equal degree of fury. Nothing was now to be heard but the moſt horrid oaths and imprecations againſt Giſco and the Carthaginians. Whoever offered to make any remonſtrance, or lend an ear to temperate counſels, was ſtoned to death by the enraged multitude. Nay, many perſons loſt their lives barely for attempting to ſpeak, before it could be known whether they were in the intereſt of Spendius or the Carthaginians.

90
The mercenaries declare war.

In the midſt of theſe commotions, Giſco behaved with great firmneſs and intrepidity. He left no methods untried to ſoften the officers and calm the minds of the ſoldiery; but the torrent of ſedition was now ſo ſtrong, that there was no poſſibility of keeping it within bounds. They therefore ſeized upon the military cheſt, dividing the money among themſelves in part of their arrears, put the perſon of Giſco under an arreſt, and treated him, as well as his attendants, with the utmoſt indignity. Mathos and Spendius, to deſtroy the remoteſt hopes of an accommodation with Carthage, applauded the courage and reſolution of their men, loaded the unhappy Giſco and his followers with irons, and formally declared war againſt the Carthaginians. All the cities of Africa to whom they had ſent deputies to exhort them to recover their liberty, ſoon came over to them, except Utica and Hippo Diarrhytus. By this means their army being greatly increaſed, they divided it into two parts, with one of which they moved towards Utica, whilſt the other marched to Hippo, in order to beſiege both places. The Carthaginians, in the mean time, found themſelves ready to ſink under the preſſure of their misfortunes. After they had been haraſſed 24 years by a moſt cruel and deſtructive foreign war, they entertained ſome hopes of enjoying repoſe. The citizens of Carthage drew their particular ſubſiſtence from the rents or revenues of their lands, and the public expences from the tribute paid from Africa; all which they were not only deprived of at once, but, what was worſe, had it directly turned againſt them. They were deſtitute of arms and forces either by ſea or land; had made no preparations for the ſuſtaining of a ſiege, or the equipping of a fleet. They ſuffered all the calamities incident to the moſt ruinous civil war; and, to complete their miſery, had not the leaſt proſpect of receiving aſſiſtance from any foreign friend or ally. Notwithſtanding their deplorable ſituation, however, they did not deſpond, but purſued all the meaſures neceſſary to put themſelves into a poſture of defence. Hanno was appointed commander in chief of all their forces; and the moſt ſtrenuous efforts were made, not only to repel all the attempts of the mutineers, but even to reduce them by force of arms.

In the mean time Mathos and Spendius laid ſiege to Utica and Hippacra at once; but as they were carried on by detachments drawn from the army for that purpoſe, they remained with the main body of their forces at Tunis, and thereby cut off all communication betwixt Carthage and the continent of Africa. By this means the capital was kept in a kind of blockade. The Africans likewiſe haraſſed them by perpetual alarms, advancing to the very walls of Carthage by day as well as by night, and treating with the utmoſt cruelty every Carthaginian that fell into their hands.

91
They are defeated by Hanno.

Hanno was diſpatched to the relief of Utica with a good body of forces, 100 elephants, and a large train of battering engines. Having taken a view of the enemy, he immediately attacked their intrenchments, and, after an obſtinate diſpute, forced them. The mercenaries loſt a vaſt number of men; and conſequently the advantages gained by Hanno were ſo great, that they might have proved deciſive, had he made a proper uſe of them: But becoming ſecure after his victory, and his troops being every where off their duty, the mercenaries, having railled their forces, fell upon him, cut off many of his men, forced the reſt to fly into the town, retook and plundered the camp, and ſeized all the proviſions, military ſtores, &c. brought to the relief of the beſieged. Nor was this the only inſtance of Hanno's military incapacity. Notwithſtanding he lay encamped in the moſt advantageous manner near a town called *Gorza*, at which place he twice overthrew the enemy, and had it in his

92
He is in his turn defeated.

power to have totally ruined them, he yet neglected to improve thoſe advantages, and even ſuffered the mercenaries to poſſeſs themſelves of the iſthmus, which joined the peninſula on which Carthage ſtood, to the continent of Africa.

93 Hamilcar Barcas appointed to command againſt them.

Theſe repeated miſtakes induced the Carthaginians once more to place Hamilcar Barcas at the head of their forces. He marched againſt the enemy with 10,000 men, horſe and foot; being all the troops the Carthaginians could then aſſemble for their defence; a full proof of the low ſtate to which they were at that time reduced. As Mathos, after he had poſſeſſed himſelf of the iſthmus, had poſted proper detachments in two paſſes on two hills facing the continent, and guarded the bridge over the Bagrada, which through Hanno's neglect he had taken, Hamilcar ſaw little probability of engaging him upon equal terms, or indeed of coming at him. Obſerving, however, that on the blowing of certain winds the mouth of the river was choaked up with ſand, ſo as to become paſſable, though with no ſmall difficulty, as long as theſe winds continued; he halted for ſome time at the river's mouth, without communicating his deſign to any perſon. As ſoon as the wind favoured his intended project, he paſſed the river privately by night, and immediately after his paſſage he drew up the troops in order of battle, and advancing into the plain where his elephants were capable of acting, moved towards Mathos, who was poſted at the village near the bridge. This daring action greatly ſurpriſed and intimidated the Africans. However, Spendius receiving intelligence of the enemy's motions, drew a body of 10,000 men out of Mathos's camp, with which he attended Hamilcar on one ſide, and ordered 15,000 from Utica to obſerve him on the other, thinking by this means to ſurround the Carthaginians, and cut them all off at one ſtroke. 94 He defeats them. By feigning a retreat, Hamilcar found means to engage them at a diſadvantage; and gave them a total overthrow, with the loſs of 6000 killed and 2000 taken priſoners. The reſt fled, ſome to the town at the bridge, and others to the camp at Utica. He did not give them time to recover from their defeat, but purſued them to the town near the bridge before mentioned; which he entered without oppoſition, the mercenaries flying in great confuſion to Tunis; and upon this many towns ſubmitted of their own accord to the Carthaginians, whilſt others were reduced by force.

Notwithſtanding theſe diſaſters, Mathos puſhed on the ſiege of Hippo with great vigour, and appointed Spendius and Autaritus, commanders of the Gauls, with a ſtrong body, to obſerve the motions of Hamilcar. Theſe two commanders, therefore, at the head of a choice detachment of 6000 men drawn out of the camp at Tunis, and 2000 Gallic horſe, attended the Carthaginian general, approaching him as near as they could with ſafety, and keeping cloſe to the ſkirts of the mountains. At laſt Spendius, having received a ſtrong reinforcement of Africans and Numidians, and poſſeſſing himſelf of all the heights ſurrounding the plain in which Hamilcar lay encamped, reſolved not to let ſlip ſo favourable an opportunity of attacking him. Had a battle now enſued, Hamilcar and his army muſt in all probability have been cut off; but by the deſertion of one Naravaſus, a young Numidian nobleman, with 2000 men, he found himſelf enabled to offer his enemies battle. 95 Mercenaries again defeated. The fight was obſtinate and bloody; but at laſt the mercenaries were entirely overthrown, with the loſs of 10,000 men killed and 4000 taken priſoners. All the priſoners that were willing to enliſt in the Carthaginian ſervice, Hamilcar received among his troops, ſupplying them with the arms of the ſoldiers who had fallen in the engagement. To the reſt he gave full liberty to go where they pleaſed; upon condition that they ſhould never for the future bear arms againſt the Carthaginians; informing them at the ſame time, however, that as many violators of this agreement as fell into his hands muſt expect to find no mercy.

96 They put to death all the Carthaginian priſoners.

Mathos and his aſſociates, fearing that this affected lenity of Hamilcar might occaſion a defection among the troops, thought that the beſt expedient would be to put them upon ſome action ſo execrable in its nature that no hopes of reconciliation might remain. By their advice, therefore, Giſco and all the Carthaginian priſoners were put to death; and when Hamilcar ſent to demand the remains of his countrymen, he received for anſwer, that whoever preſumed hereafter to come upon that errand, ſhould meet with Giſco's fate: after which they came to a reſolution to treat with the ſame barbarity all ſuch Carthaginians as ſhould fall into their hands. In return for this enormity; Hamilcar threw all the priſoners that fell into his hands to be devoured by wild beaſts; being convinced that compaſſion ſerved only to make his enemies more fierce and untractable.

The war was now carried on generally to the advantage of the Carthaginians; nevertheleſs, the malecontents ſtill found themſelves in a capacity to take the field with an army of 50,000 men. They watched Hamilcar's motions; but kept on the hills, carefully avoiding to come down into the plains, on account of the Numidian horſe and Carthaginian elephants. Hamilcar, being much ſuperior in ſkill to any of their generals, at laſt ſhut them up in a poſt ſo ſituated that it was impoſſible to get out of it. Here he kept them ſtrictly beſieged, and the mercenaries, not daring to venture a battle, began to fortify their camp and ſurround it with ditches and intrenchments. 97 They are beſieged by Hamilcar. They were ſoon preſſed by famine ſo ſorely, that they were obliged to eat one another; but they were driven deſperate by the conſciouſneſs of their guilt, and therefore did not deſire any terms of accommodation. At laſt being reduced to the utmoſt extremity of miſery, they inſiſted that Spendius, Autaritus, and Zarxas, their leaders, ſhould in perſon have a conference with Hamilcar, and make propoſals to him. Peace was accordingly concluded upon the following terms, *viz.* That ten of the ringleaders of the malecontents ſhould be left entirely to the mercy of the Carthaginians; and that the troops ſhould all be diſarmed, every man retiring only in a ſingle coat. The treaty was no ſooner concluded, than Hamilcar, by virtue of the firſt article, ſeized upon the negociators themſelves, and the army being informed that their chiefs were under arreſt, had immediately recourſe to arms, as ſuſpecting they were betrayed; 98 40,000 of them deſtroyed. but Hamilcar, drawing out his army in order of battle, ſurrounded them, and either cut them to pieces,

pieces, or trod them to death with his elephants. The number of wretches who periſhed on this occaſion amounted to above 40,000.

After the deſtruction of this army, Hamilcar inveſted Tunis, whither Mathos had retired with all his remaining forces. Hamilcar had another general. named *Hannibal*, joined in the command with him, Hannibal's quarter was on the road leading to Carthage, and Hamilcar's on the oppoſite ſide. The army was no ſooner encamped, than Hamilcar cauſed Spendius, and the reſt of the priſoners, to be led out in the view of the beſieged, and crucified near the walls.

99 Hannibal taken and crucified by Mathos.

Mathos, however, obſerving that Hannibal did not keep ſo good a guard as he ought to have done, made a ſally, attacked his quarters, killed many of his men, took ſeveral priſoners, among whom was Hannibal himſelf, and plundered his camp. Taking the body of Spendius from the croſs, Mathos immediately ſubſtituted Hannibal, in its room; and 30 Carthaginian priſoners of diſtinction were crucified around him. Upon this diſaſter, Hamilcar immediately decamped, and poſted himſelf along the ſea-coaſt, near the mouth of the river Bagrada.

The ſenate, though greatly terrified by this unexpected blow, omitted no means neceſſary for their preſervation. They ſent 30 ſenators, with Hanno at their head, to conſult with Hamilcar about the proper meaſures for putting an end to this unnatural war, conjuring, in the moſt preſſing manner, Hanno to be reconciled to Hamilcar, and to ſacrifice his private reſentment to the public benefit. This, with ſome difficulty, was effected: and the two generals came to full reſolution to act in concert for the good of the public. The ſenate at the ſame time, ordered all the youth capable of bearing arms to be preſſed into the ſervice: by which means a ſtrong reinforcement being ſent to Hamilcar, he ſoon found himſelf in a condition to act offenſively.

100 Mathos entirely defeated and taken priſoner.

He now defeated the enemy in all rencounters, drew Mathos into frequent ambuſcades, and gave him one notable overthrow near Leptis. This reduced the rebels to the neceſſity of hazarding a deciſive battle, which proved fatal to them. The mercenaries fled almoſt at the firſt onſet; and moſt of their army fell in the field of battle, and in the purſuit. Mathos, with a few, eſcaped to a neighbouring town, where he was taken alive, carried to Carthage and executed; and then, by the reduction of the revolted cities, an end was put to this war, which from the exceſſes of cruelty committed in it, according to Polybius, went among the Greeks by the name of the *inexpiable war*.

During the Lybian war, the Romans upon ſome abſurd pretences, wreſted the iſland of Sardinia from the Carthaginians; which the latter not being able to reſiſt, were obliged to ſubmit to.

101 Hamilcar's ſcheme to equal Carthage with Rome.

Hamilcar finding his country not in a condition to enter into an immediate war with Rome, formed a ſcheme to put it on a level with that haughty republic. This was by making an entire conqueſt of Spain, by which means the Carthaginians might have troops capable of coping with the Romans. In order to facilitate the execution of this ſcheme, he inſpired both his ſon-in-law Aſdrubal, and his ſon Hannibal, with an implacable averſion to the Romans, as the great oppoſers of his country's grandeur. Having completed all the neceſſary preparations, Hamilcar, after having greatly enlarged the Carthaginian dominions in Africa, entered Spain, where he commanded nine years, during which time he ſubdued many warlike nations, and amaſſed an immenſe quantity of treaſure, which he diſtributed partly amongſt his troops, and partly amongſt the great men at Carthage; by which means he ſupported his intereſts with theſe two powerful bodies.

102 His death.

At laſt, he was killed in a battle, and was ſucceeded by his ſon-in-law Aſdrubal. This general fully anſwered the expectations of his countrymen; greatly enlarged their dominions in Spain; and built the city of New Carthage, now Carthagena. He made ſuch progreſs in his conqueſts, that the Romans began to grow jealous. They did not, however, chooſe at preſent to come to an open rupture, on account of the apprehenſions they were under of an invaſion from the Gauls. They judged it moſt proper, therefore, to have recourſe to milder methods; and prevailed upon Aſdrubal to conclude a new treaty with them.

103 Aſdrubal's treaty with the Romans.

The articles of it were, 1. That the Carthaginians ſhould not paſs the Iberus. 2. That the Saguntines, a colony of Zacynthians, and a city ſituated between the Iberus and that part of Spain ſubject to the Carthaginians, as well as the other Greek colonies there, ſhould enjoy their ancient rights and privileges.

104 He is murdered.

Aſdrubal, after having governed the Carthaginian dominions in Spain for eight years, was treacherouſly murdered by a Gaul whoſe maſter he had put to death. Three years before this happened, he had written to Carthage, to deſire that young Hannibal, then twenty-two years of age, might be ſent to him. This requeſt was complied with, notwithſtanding the oppoſition of Hanno; and from the firſt arrival of the young man in the camp, he became the darling of the whole army. The great reſemblance he bore to Hamilcar, rendered him extremely agreeably to the troops. Every talent and qualification he ſeemed to poſſeſs that can contribute towards forming a great man.

105 Succeeded by Hannibal, who makes vaſt conqueſts in Spain.

After the death of Aſdrubal, he was ſaluted general by the army with the higheſt demonſtrations of joy. He immediately put himſelf in motion: and, in the firſt campaign conquered the Olcades, a nation ſeated near the Iberus. The next year he ſubdued the Vaccæi, another nation in that neighbourhood. Soon after, the Carpætani, one of the moſt powerful nations in Spain, declared againſt the Carthaginians. Their army conſiſted of 100,000 men, with which they propoſed to attack Hannibal on his return from the Vaccæi; but by a ſtratagem they were utterly defeated, and the whole nation obliged to ſubmit.

Nothing now remained to oppoſe the the progreſs of the Carthaginian arms but the city of Saguntum. Hannabal, however, for ſome time, did not think proper to come to a rupture with the Romans by attacking that place.

106 He attacks Saguntum.

At laſt he found means to embroil ſome of the neighbouring cantons, eſpecially the Turdetani, or, as Appian calls them, the *Torboletæ*, with the Saguntines, and thus furniſhed himſelf with a pretence to attack their city. Upon the commencement of the ſiege, the Roman ſenate diſpatched two ambaſſadors to Hannibal, with orders to proceed to Carthage in caſe the general refuſed to give them ſatisfaction. They were ſcarce landed when Hannibal, who was carrying on the ſiege of Saguntum with great vigour, ſent them word that he had ſomething elſe to do than to give audience to ambaſſadors. At laſt, however, he admitted them; and, in anſwer to their remonſtrances, told them, that the Saguntines had drawn their misfortunes upon themſelves, by committing hoſtilities againſt the allies of Carthage; and at the ſame time deſired the deputies, if they had any complaints to make of him, to carry them to the ſenate of Carthage. On their arrival in that capital, they demanded that Hannibal might be delivered up to the Romans to be puniſhed according to his deſerts; and this not being complied with, war was immediately declared between the two nations.

107 And takes it.

The Saguntines are ſaid to have defended themſelves for eight months with incredible bravery. At laſt, however, the city was taken, and the inhabitants were treated with the utmoſt cruelty. After this conqueſt, Hannibal put his African troops into winter-quarters at New Carthage; but in order to gain their affection, he permitted the Spaniards to retire to their reſpective homes.

108 He ſets out for Italy.

The next campaign, having taken the neceſſary meaſures for ſecuring Africa and Spain, he paſſed the Iberus, ſubdued all the nations betwixt that river and the Pyrenees, appointed Hanno commander of all the new conquered diſtrict, and immediately began his march for Italy. Upon muſtering his forces, after they had been weakened by ſieges, deſertion, mortality, and a detachment of 10,000 foot and 1000 horſe left with Hanno to ſupport him in his new poſt, he found them to amount to 50,000 foot and 9000 horſe, all veteran troops, and the beſt in the world. As they had left their heavy baggage with Hanno, and were all light armed, Hannibal eaſily croſſed the Pyrenees; paſſed by Ruſcino, a frontier town of the Gauls; and arrived on the banks of the Rhone without oppoſition. This river he paſſed, notwithſtanding of ſome oppoſition from the Gauls; and was for ſome time in doubt whether he ſhould advance to engage the Romans, who, under Scipio, were bending their march that way, or continue his march for Italy. But to the latter he was ſoon determined by the arrival of Magilus prince of the Boii, who brought rich preſents with him, and offered to conduct the Carthaginian army over the Alps. Nothing could have happened more favourable to Hannibal's affairs than the arrival of this prince, ſince there was no room to doubt the ſincerity of his intentions. For the Boii bore an implacable enmity to the Romans, and had even come to an open rupture with them upon the firſt news that Italy was threatened with an invaſion from the Carthaginians.

109 He croſſes the Alps.

It is not known with certainty where Hannibal began to aſcend the Alps. As ſoon as he began his march, the petty kings of the country aſſembled their forces in great numbers: and taking poſſeſſion of the eminences over which the Carthaginians muſt neceſſarily paſs, they continued haraſſing them, and were no ſooner driven from one eminence than they ſeized on another, diſputing every foot of land with the enemy, and deſtroying great numbers of them by the advantage they had of the ground. Hannibal, however, having found means to poſſeſs himſelf of an advantageous poſt, defeated and diſperſed the enemy; and ſoon after took their capital city, where he found the priſoners, horſes, &c. that had before fallen into the hands of the enemy, and likewiſe corn ſufficient to ſerve the army for three days. At laſt, after a moſt fatiguing march of nine days, he arrived at the top of the mountains. Here he encamped, and halted two days, to give his wearied troops ſome repoſe, and to wait for the ſtragglers. As the ſnow was lately fallen in great plenty, and covered the ground, this ſight terrified the Africans and Spaniards, who were much affected with the cold. In order therefore to encourage them, the Carthaginian general led them to the top of the higheſt rock on the ſide of Italy, and thence gave them a view of the large and fruitful plains of Inſubria, acquainting them that the Gauls, whoſe country they ſaw, were ready to join them. He alſo pointed out to them the place whereabout Rome ſtood, telling them, that by climbing the Alps, they had ſcaled the walls of that rich metropolis; and having thus animated his troops, he decamped, and began to deſcend the mountains. The difficulties they met with in their deſcent were much greater than thoſe that had occurred while they aſcended. They had indeed no enemy to contend with, except ſome ſcattered parties that came to ſteal rather than to fight; but the deep ſnows, the mountains of ice, craggy rocks, and frightful precipices, proved more terrible than any enemy. After they had for ſome days marched through narrow, ſteep, and ſlippery ways, they came at laſt to a place which neither elephants, horſes, nor men, could paſs. The way which lay between two precipices was exceeding narrow; and the declivity, which was very ſteep, had become more dangerous by the falling away of the earth. Here the guides ſtopped; and the whole army being terrified, Hannibal propoſed at firſt to march round about, and attempt ſome other way: but all places round him being covered with ſnow, he found himſelf reduced to the neceſſity of cutting away into the rock itſelf, through which his men, horſes, and elephants, might deſcend. This work was accompliſhed with incredible labour; and then Hannibal, having ſpent nine days in aſcending, and ſix in deſcending, the Alps, gained at length Inſubria; and, notwithſtanding all the diſaſters he had met with by the way, entered the country with all the boldneſs of a conqueror.

Hannibal, on his entry into Inſubria, reviewed his army, when he found that of the 50,000 foot with whom he ſet out from New Carthage five months and 15 days before, he had now but 20,000, and that his 9000 horſe were reduced to 6000. His firſt care, after he entered Italy, was to refreſh his troops; who after ſo long a march, and ſuch inexpreſſible hardſhips, looked like as many ſkeletons raiſed from the dead, or ſavages born in a deſert. He did not, however, ſuffer them to languiſh long in idleneſs; but, joining the Inſubrians, who were at war with the Taurinians, laid ſiege to Taurinum, the only city in the country, and in three days time became maſter of it, putting all who reſiſted to the ſword. This ſtruck the neighbouring barbarians with ſuch terror, that of their own accord they ſubmitted to the conqueror, and ſupplied his army with all ſorts of proviſions.

110 Taurinum taken.

Scipio, the Roman general, in the mean time, who had gone in queſt of Hannibal on the banks of the Rhone, was ſurpriſed to find his antagoniſt had croſ-

111
The Romans defeated near the Ticinus.

ſed the Alps and entered Italy. He therefore returned with the utmoſt expedition. An engagement enſued near the river Ticinus, in which the Romans were defeated. The immediate conſequence was, that Scipio repaſſed that river, and Hannibal continued his march to the banks of the Po. Here he ſtaid two days, before he could croſs that river over a bridge of boats. He then ſent Mago in purſuit of the enemy, who having rallied their ſcattered forces, and repaſſed the Po, were encamped at Placentia. Afterwards having concluded a treaty with ſeveral of the Gallic cantons, he joined his brother with the reſt of the army, and again offered battle to the Romans; but this they thought proper to decline; and at laſt the conſul, being intimidated by the deſertion of a body of Gauls, abandoned his camp, paſſed the Trebia, and poſted himſelf on an eminence near that river. Here he drew lines round his camp, and waited the arrival of his colleague with the forces from Sicily.

112
They are again defeated.

Hannibal being appriſed of the conſul's departure, ſent out the Numidian horſe to haraſs him on his march; himſelf moving with the main body to ſupport them in caſe of need. The Numidians arriving before the rear of the Roman army had quite paſſed the Trebia, put to the ſword or made priſoners all the ſtragglers they found there. Soon after, Hannibal coming up, encamped in ſight of the Roman army, on the oppoſite bank. Here having learned the character of the conſul Sempronius lately arrived, he ſoon brought him to an engagement, and entirely defeated him. Ten thouſand of the enemy retired to Placentia; but the reſt were either killed or taken priſoners. The Carthaginians purſued the flying Romans as far as the Trebia, but did not think proper to repaſs that river on account of the exceſſive cold.

Hannibal, after this action upon the Trebia, ordered the Numidians, Celtiberians, and Luſitanians, to make incurſions into the Roman territories, where they committed great devaſtations. During his ſtate of inaction, he endeavoured to win the affections of the Gauls, and likewiſe of the allies of the Romans; declaring to the Gallic and Italian priſoners, that he had no intention of making war upon them, being determined to reſtore them to their liberty, and protect them againſt the Romans: and to confirm them in their good opinion of him, he diſmiſſed them all without ranſom.

113
They are utterly defeated near the lake Thraſymenus.

Next year, having croſſed the Apennines, and penetrated into Etruria, Hannibal received intelligence that the new conſul Flaminius lay encamped with the Roman army under the walls of Arretium. Having learned the true character of this general, that he was of an haughty, fierce, and raſh diſpoſition, he doubted not of being ſoon able to bring him to a battle. To inflame the impetuous ſpirit of Flaminius, the Carthaginian general took the road to Rome, and, leaving the Roman army behind him, deſtroyed all the country through which he paſſed with fire and ſword; and as that part of Italy abounded with all the elegancies as well as neceſſaries of life, the Romans and their allies ſuffered an incredible loſs on this occaſion. The raſh conſul was inflamed with the utmoſt rage on ſeeing the ravages committed by the Carthaginians; and therefore immediately approached them with great temerity, as if certain of victory. Hannibal in the mean time kept on, ſtill advancing towards Rome, having Cortona on the left hand, and the lake Thraſymenus on the right; and at laſt, having drawn Flaminius into an ambuſcade, entirely defeated him. The general himſelf, with 15,000 of his men, fell on the field of battle. A great number were likewiſe taken priſoners, and a body of 6000 men, who had fled to a town in Etruria, ſurrendered to Maherbal the next day. Hannibal loſt only 1500 men on this occaſion, moſt of whom were Gauls; though great numbers, both of his ſoldiers and of the Romans, died of their wounds.

114
A Roman detachment cut to pieces or taken.

Being ſoon after informed that the conſul Servilius had detached a body of 4000, or, according to Appian, 8000 horſe from Ariminum, to reinforce his colleague in Etruria, Hannibal ſent out Maherbal, with all the cavalry, and ſome of the infantry, to attack him. The Roman detachment conſiſted of choſen men, and was commanded by Centenius a Patrician. Maherbal had the good fortune to meet with him, and after a ſhort diſpute entirely defeated him. Two thouſand of the Romans were laid dead on the ſpot; the reſt, retiring to a neighbouring eminence, were ſurrounded by Maherbal's forces, and obliged next day to ſurrender at diſcretion; and this diſaſter, happening within a few days after the defeat at the lake Thraſymenus, almoſt gave the finiſhing ſtroke to the Roman affairs.

The Carthaginian army was now ſo much troubled with a ſcorbutic diſorder, owing to the unwholeſome encampments they had been obliged to make, and the moraſſes they had paſſed through, that Hannibal found it abſolutely neceſſary to repoſe them for ſome time in the territory of Adria, a moſt pleaſant and fertile country. In his various engagements with the Romans, he had taken a great number of their arms, with which he now armed his men after the Roman manner. Being now likewiſe maſter of that part of the country bordering on the ſea, he found means to ſend an expreſs to Carthage with the news of the glorious progreſs of his arms. The citizens received this news with the moſt joyful acclamations, at the ſame time coming to a reſolution to reinforce their armies both in Italy and Spain with a proper number of troops.

115
Fabius Maximus named dictator.

The Romans being now in the utmoſt conſternation, named a dictator, as was their cuſtom in times of great danger. The perſon they choſe to this office was Fabius Maximus, ſurnamed *Verrucoſus*; a man as cool and cautious as Sempronius and Flaminius were warm and impetuous. He ſet out with a deſign not to engage Hannibal, but only to watch his motions, and cut off his proviſions, which he knew was the moſt proper way to deſtroy him in a country ſo far from his own. Accordingly he followed him through Umbria and Picenum, into the territory of Adria, and then through the territories of the Marrucini and Frentani into Apulia. When the enemy marched, he followed them; when they encamped, he did the ſame; but for the moſt part on eminences, and at ſome diſtance from their camp, watching all their motions, cutting off their ſtragglers, and keeping them in a continual alarm. This cautious method of proceeding greatly diſtreſſed the Carthaginians, but at the ſame time raiſed diſcontents in his own army. But neither theſe diſcontents, nor the ravages committed by Hannibal, could prevail upon Fabius to alter his meaſures. The former, therefore, entered Campania, one of the fineſt countries of Italy. The ravages he committed there, raiſed ſuch complaints in the Roman army, that the dictator, for fear of irritating his ſoldiers, was obliged to pretend a deſire of coming to an engagement. Accordingly he followed Hannibal with more expedition than uſual; but at the ſame time avoided, under various pretences, an engagement with more care than the enemy ſought it. Hannibal finding he could not by any means bring the dictator to a battle, reſolved to quit Campania, which he found abounding more with fruit and wine than corn, and to return to Samnium through the paſs called Eribanus. Fabius concluding from his march that this was his deſign, got there before him, and encamped on Mount Callicula, which commanded the paſs, after having placed ſeveral bodies in all the avenues leading to it.

116
He is out-witted by Hannibal.

Hannibal was for ſome time at a loſs what to do; but at laſt contrived the following ſtratagem, which Fabius could not foreſee nor guard againſt. Being encamped at the foot of Mount Callicula, he ordered Aſdrubal to pick out of the cattle taken in the country, 2000 of the ſtrongeſt and nimbleſt oxen, to tie faggots to their horns, and to have them and the herdſmen ready without the camp. After ſupper, when all was quiet, the cattle were brought in good order to the hill, where Fabius had placed ſome Roman parties in ambuſh to ſtop up the paſs. Upon a ſignal given, the faggots on the horns of the oxen were ſet on fire; and the herdſmen, ſupported by ſome battalions armed with ſmall javelins, drove them on quietly. The Romans ſeeing the light of the fires, imagined that the Carthaginians were marching by torch-light. However, Fabius kept cloſe in his camp, depending on the troops he had placed in ambuſcade; but when the oxen, feeling the fire on their heads, began to run up and down the hills, the Romans in ambuſh thinking themſelves ſurrounded on all ſides, and climbing the ways where they ſaw leaſt light, returned to their camp leaving the paſs open to Hannibal. Fabius, though rallied by his ſoldiers for being thus over-reached by the Carthaginian, ſtill continued to purſue the ſame plan, marched directly after Hannibal, and encamped on ſome eminences near him.

117
Minucius in great danger is relieved by Fabius.

Soon after this, the dictator was recalled to Rome; and as Hannibal, notwithſtanding the terrible ravages he had committed, had all along ſpared the lands of Fabius, the latter was ſuſpected of holding a ſecret correſpondence with the enemy. In his abſence, Minucius, the general of the horſe, gained ſome advantages, which greatly tended to increaſe the diſcontent with the dictator, inſomuch that before his return Minucius was put upon an equal footing with himſelf. The general of the horſe propoſed that each ſhould command his day; but the dictator choſe rather to divide the army, hoping by that means to ſave at leaſt a part of it. Hannibal ſoon found means to draw Minucius to an engagement, and, by his maſterly ſkill in laying ambuſhes, the Roman general was ſurrounded on every ſide, and would have been cut off with all his troops, had not Fabius haſtened to his aſſiſtance, and relieved him. Then the two armies uniting, advanced in good order to renew the fight: but Hannibal, not caring to venture a ſecond action, ſounded a retreat, and retired to his camp; and Minucius, being aſhamed of his raſhneſs, reſigned the command of the army to Fabius.

118
The Romans utterly defeated at Cannæ.

The year following, the Romans augmented their army to 87,000 men, horſe and foot; and Hannibal being reduced to the greateſt ſtraits for want of proviſions, reſolved to leave Samnium, and penetrate into the heart of Apulia. Accordingly he decamped in the night; and by leaving fires burning, and tents ſtanding in his camp, made the Romans believe for ſome time that his retreat was only feigned. When the truth was diſcovered, Æmilius was againſt purſuing him: but Terentius, contrary to the opinion of all the officers in the army, except the proconſul Servilius, was obſtinately bent on following the enemy; and overtook them at Cannæ, till this time an obſcure village in Apulia*. A battle enſued in this place, as memorable as any mentioned in hiſtory; in which the Romans, though almoſt double in number to the Carthaginians, were put to flight with moſt terrible ſlaughter; at leaſt 45,000 of them being left dead on the field of battle, and 10,000 taken priſoners in the action or purſuit. The night was ſpent in Hannibal's camp in feaſting and rejoicings, and next day in ſtripping the dead bodies of the unhappy Romans: after which the victorious general inveſted their two camps, where he found 4000 men.

119
Conſequences of this victory.

120
Capua ſubmits to Hannibal.

The immediate conſequence of this victory, as Hannibal had foreſeen, was a diſpoſition of that part of Italy called the Old Province, Magna Grecia, Tarentum, and part of the territory of Capua, to ſubmit to him. The neighbouring provinces likewiſe diſcovered an inclination to ſhake off the Roman yoke, but wanted firſt to ſee whether Hannibal was able to protect them. His firſt march was into Samnium, being informed that the Hirpini and other neighbouring nations were diſpoſed to enter into an alliance with the Carthaginians. He advanced to Compſa, which opened its gates to him. In this place he left his heavy baggage, as well as the immenſe plunder he had acquired. After which he ordered his brother Mago, with a body of troops deſtined for that purpoſe, to poſſeſs himſelf of all the fortreſſes in Campania, the moſt delicious province of Italy. The humanity Hannibal had all along ſhown the Italian priſoners, as well as the fame of the complete victory he had lately obtained, wrought ſo powerfully upon the Lucani, Brutii, and Apulians, that they expreſſed an eager deſire of being taken under his protection. Nay, even the Campanians themſelves, a nation more obliged to the Romans than any in Italy, except the Latins, diſcovered an inclination to abandon their natural friends. Of this the Carthaginian general receiving intelligence, he bent his march towards Capua, not doubting, but that, by means of the popular faction there, he ſhould eaſily make himſelf maſter of it; which accordingly happened. Soon after this place had made its ſubmiſſion, many cities of the Brutii opened their gates to Hannibal, who ordered his brother Mago to take poſſeſſion of them. Mago was then diſpatched to Carthage, with the important news of the victory at Cannæ, and the conſequences attending it. Upon his

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* See *Cannæ*.

121 Mago's account of Hannibal's ſucceſs.

his arrival there, he acquainted the ſenate, that Hannibal had defeated ſix Roman generals, four of whom were conſuls, one dictator, and the other general of horſe to the dictator: that he had engaged ſix conſular armies, killed two conſuls, wounded one, and driven another out of the field with ſcarce 50 men to attend him: that he had routed the general of the horſe, who was of equal power with the conſuls; and that the dictator was eſteemed the only general fit to command an army, merely becauſe he had not the courage to engage him; and as a demonſtrative proof of what he advanced, he produced, according to ſome authors, three buſhels and a half of gold rings, taken from knights and ſenators who had been killed in the various engagements.

122 Hannibal ſuperior to every other general mentioned in hiſtory.

Hitherto we have ſeen Hannibal ſurpriſingly victorious: and, indeed, if we conſider what he had already done, we ſhall find his exploits ſuperior to thoſe of any other general, either ancient or modern. Other commanders have been celebrated for victories gained over barbarous and uncivilized nations. Alexander the Great invaded and over-ran the empire of Perſia; but that kingdom was then ſunk in ſloth and effeminacy, ſo as to be an eaſy conqueſt: but had the great commander turned his arms againſt the weſtern nations, who were of a more martial diſpoſition, it is more than probable he had not conquered ſo eaſily. Hannibal, on the other hand, lived at a time when the Romans were not only the moſt powerful, but the moſt warlike nation in the whole world. That nation he attacked with an army of only 26,000 men, without reſources either for recruits, money, or proviſions, except what he could procure in the enemies country. With theſe he had for three years reſiſted the Roman armies, which had been hitherto invincible by all other nations. Their armies had been commanded by generals of different tempers, diſpoſitions, and abilities: the loſſes they ſuſtained are by the Roman writers imputed to the faults of the generals themſelves; but experience had abundantly ſhown, that theſe commanders, with all their faults, were able to conquer the moſt warlike nations, when commanded by another than Hannibal. In the battles fought with the Romans he had deſtroyed 200,000 of their men, and taken 50,000 priſoners; yet from the time of the battle of Cannæ, the affairs of this great man totally declined. The reaſon of this is, by the Roman hiſtorians, ſaid to be, that when he put his army into winter-quarters in Capua, he ſo enervated himſelf and his army by debaucheries in that place, that he became no longer capable of coping with the Roman forces. But this ſeems by no means to have been the caſe; for the Roman hiſtorians themſelves own, that, after the battle of Cannæ, he gave their armies many and terrible defeats, and took a great number of towns in their ſight.

123 Cauſe of the decline of his affairs.

The true reaſon of that reverſe of fortune which Hannibal now experienced, was his not having ſufficient reſources for recruiting his army. On the firſt news, indeed, of his ſucceſs at Carthage, a body of 4000 Numidian cavalry, 40 elephants, and 1000 talents of ſilver, were granted by the ſenate. A large detachment of Spaniſh forces was alſo appointed to follow them; and that theſe laſt might be ready in due time, Mago ſet out immediately for Spain to raiſe 20,000 foot and 4000 horſe there. Had this ample ſupply been ſent with proper expedition, it is by no means probable that the Romans would have had any occaſion to reflect upon Hannibal's conduct at Capua. That general would undoubtedly have obliged the haughty republic to ſubmit to the ſuperior force of his arms the next campaign. But, notwithſtanding the influence of the Barcinian faction at Carthage, Hanno and his adherents found means not only to retard the march of the ſupplies intended, but even to diminiſh their number. Mago, through the artifices of that infatuated party, could obtain an order for only 12,000 foot and 2500 horſe, and even with this inconſiderable body of troops he was ſent into Spain. Hannibal being thus deſerted by his country, found himſelf obliged to act on the defenſive; his army amounting to no more now than 26,000 foot and 9000 horſe. But though obliged to act in this mannar, he was only hindred from conquering; the utmoſt efforts of the whole Roman power not being able to drive this ſmall army out of Italy for more than 14 years.

124 Meaſures taken by the Romans.

The Romans, though greatly reduced, were not yet exhauſted. They were able ſtill to ſend two conſular armies into the field, fully recruited and in good order; and as neither the Gauls nor Italians were natural allies of the Carthaginians, they did not fail to abandon them on the firſt reverſe of fortune. After the Romans had recovered from the conſternation into which they were thrown by the defeat at Cannæ, they choſe a dictator, and recalled Marcellus, the conqueror of Syracuſe, from Sicily. All the young Romans, above 17 years of age, of what rank ſoever, were obliged to inliſt themſelves; as were alſo thoſe who had already ſerved their legal time. By this means four legions and 10,000 horſe were ſoon raiſed in the city. The allies of Rome, the colonies, and the municipia, furniſhed the contingence as uſual. To theſe were added 8000 of the youngeſt and ſtrongeſt ſlaves in the city. The republic purchaſed them of their maſters, but did not oblige them to ſerve without their own conſent, which they gave, by anſwering *Volo*, "I am willing;" whence they were called *volones*, to diſtinguiſh them from the other troops. As the Romans, after the loſs of ſo many battles, had no ſwords, darts, or bucklers, left in their magazines, the *volones* were ſupplied with the arms which had been formerly taken from the enemy, and hung up in the public temples and porticoes. The finances of Rome were no leſs exhauſted; but this defect was ſupplied by the liberality of her citizens. The ſenators ſhowing the example, were followed firſt by the knights, and afterwards by all the tribes; who ſtripping themſelves of all the gold they had, brought it to the public treaſury. The ſenators only reſerved their rings, and the *bullæ* about their childrens necks. As for the ſilver coin, it was now, for the firſt time, alloyed with copper, and increaſed in its value. Thus the finances were put into a good condition, and a competent army raiſed.

This was plainly the laſt effort the Romans could make; and could Hannibal have procured a ſufficient ſupply of men and money to enable him to cope with this army, and to break it as he had done the others before, there could have been no more reſiſtance made on their part. He began, however, to be in want of money;

money; and to procure it gave the Roman priſoners leave to redeem themſelves. Theſe unhappy men agreed to ſend ten of their body to Rome to negociate their redemption; and Hannibal required no other ſecurity for their return but their oath.

125 They refuſe to treat of peace.

Carthalo was ſent at the head of them to make propoſals of peace; but upon the firſt news of his arrival, the dictator ſent a lictor to him, commanding him immediately to depart the Roman territory; and it was reſolved not to redeem the captives. Upon this Hannibal ſent the moſt conſiderable of them to Carthage; and of the reſt he made gladiators, obliging them to fight with one another, even relations with relations, for the entertainment of his troops.

126 Aſdrubal defeated by the Romans in Spain.

All this time Cneius and Publius Scipio had carried on the war in Spain with great ſucceſs againſt the Carthaginians. Aſdrubal had been ordered to enter Italy with his army to aſſiſt Hannibal; but being defeated by the Romans, was prevented. The dictator and ſenate of Rome, encouraged by this news, carried on the preparations for the next campaign with the greateſt vigour, whilſt Hannibal remained inactive at Capua. This inaction, however, ſeems to have proceeded from his expectation of ſuccours from Africa, which never came, and which delay occaſioned his ruin. The Roman dictator now releaſed from priſon all criminals, and perſons confined for debt, who were willing to inliſt themſelves. Of theſe he formed a body of 6000 foot, armed with the broad ſwords and bucklers formerly taken from the Gauls. Then the Roman army, to the number of about 25,000 men, marched out of the city, under the command of the dictator; while Marcellus kept the remains of Varro's army, amounting to about 15,000 men, at Caſilinum, in readineſs to march whenever there ſhould be occaſion.

Thus the Roman forces were ſtill ſuperior to thoſe of Hannibal; and as they now ſaw the neceſſity of following the example of Fabius Maximus, no engagement of any conſequence happened the firſt year after the battle of Cannæ.

127 Marcellus gains an advantage over Hannibal.

Hannibal made a fruitleſs attempt upon Nola, expecting it would be delivered up to him; but this was prevented by Marcellus, who had entered that city, and ſallying unexpectedly from three gates upon the Carthaginians, obliged them to retire in great confuſion with the loſs of 5000 men. This was the firſt advantage that had been gained by the Romans where Hannibal had commanded in perſon, and raiſed the ſpirits of the former not a little. They were, however, greatly dejected, on hearing that the conſul Poſthumius Albinus, with his whole army, had been cut off by the Boii, as he was croſſing a foreſt. Upon this it was reſolved to draw all the Roman forces out of Gaul and other countries, and turn them againſt Hannibal; ſo that the Carthaginian ſtood daily more and more in need of thoſe ſupplies, which yet never arrived from Carthage.

128 Hannibal takes ſeveral cities.

He reduced, however, the cities of Nuceria, Caſilinum, Petelia, Conſentia, Croton, Locri, and ſeveral others in Great Greece, before the Romans gained any advantage over him, except that before Nola already mentioned. The Campanians who had eſpouſed the Carthaginian intereſt, raiſed an army of 14,000 of their own nation in favour of Hannibal, and put one Marius Alfius at the head of it; but he was ſurpriſed by the conſul Sempronius, who defeated and killed him with 2000 of his men. It was now found, that Hannibal had concluded a treaty of alliance, offenſive and defenſive with Philip king of Macedon; but to prevent any diſturbance from that quarter, a Roman army was ſent to Macedon.

129 He is defeated by Marcellus.

Soon after this Marcellus defeated Hannibal in a pitched battle, having armed his men with long pikes uſed generally at ſea, and chiefly in boarding of ſhips; by which means the Carthaginians were pierced through, while they were totally unable to hurt their adverſaries with the ſhort javelins they carried. Marcellus purſued them cloſe; and, before they got to their camp, killed 5000, and took 600 priſoners; loſing himſelf about 1000 men, who were trod down by the Numidian horſe, commanded by Hannibal in perſon.

130 He is deſerted by a party of horſe.

After this defeat the Carthaginian general found himſelf deſerted by 1200 of his beſt horſe, partly Spaniards, and partly Numidians, who had croſſed the Alps with him. This touched him ſo ſenſibly, that he left Campania, and retired into Apulia.

The Romans ſtill continued to increaſe their forces; and Hannibal, not having the ſame reſources, found it impoſſible to act againſt ſo many armies at once. Fabius Maximus advanced into Campania, whither Hannibal was obliged to return in order to ſave Capua. He ordered Hanno, however, at the head of 17,000 foot and 1700 horſe, to ſeize Beneventum; but he was utterly defeated, ſcarce 2000 of his men being left alive.

131 He is again defeated and begins to loſe ground.

Hannibal himſelf, in the mean time advanced to Nola, where he was again defeated by Marcellus. He now began to looſe ground; the Romans retook Caſilinum, Accua in Apulia, Arpi, and Aternum; but the city of Tarentum was delivered up to him by its inhabitants. The Romans then entered Campania, and ravaged the whole country, threatening Capua with a ſiege. The inhabitants immediately acquainted Hannibal with their danger; but he was ſo intent upon reducing the citadel of Tarentum, that he could not be prevailed upon to come to their aſſiſtance. In the mean time Hanno was again utterly defeated by Fulvius, his camp taken, and he himſelf forced to fly into Brutium with a ſmall body of horſe. The conſuls then advanced with a deſign to beſiege Capua in form. But in their way, Sempronius Gracchus, a man of great bravery, and an excellent general, was betrayed by a Lucanian and killed, which proved a very great detriment to the republic.

132 Capua beſieged by the Romans.

Capua, however, was ſoon inveſted on all ſides; and the beſieged once more ſent to Hannibal, who now came to their aſſiſtance with his horſe, his light-armed infantry, and 33 elephants.

133 Hannibal, in vain, attempts to relieve it.

He found means to inform the beſieged of the time he deſigned to attack the Romans, ordering them to make a vigorous ſally at the ſame time. The Roman generals, Appius and Fulvius, upon the firſt news of the enemy's approach, divided their troops, Appius taking upon him to make head againſt the garriſon, and Fulvius to defend the intrenchments againſt Hannibal. The former found no difficulty in repulſing the garriſon; and would have entered the city with them, had he not been wounded at the very gate, which prevented him from purſuing his deſign. Fulvius found it more difficult to withſtand Hannibal, whoſe troops behaved themſelves with extraordinary reſolution. A body of Spaniards and

Numidians had even the boldneſs to paſs the ditch, and, in ſpite of all oppoſition, climbing the ramparts, penetrated into the Roman camp; but not being properly ſeconded by the reſt, they were all to a man cut in pieces. The Carthaginian general was ſo diſheartened at this, eſpecially after the garriſon was repulſed, that he ſounded a retreat, which was made in good order.

134
He marches to Rome.

His next attempt for the relief of Capua was to march to Rome, where he hoped his approach would ſtrike ſo much terror, that the armies would be called from before Capua; and that the Capuans might not be diſheartened by his ſudden departure, he found means to acquaint them with his deſign. The news of his approach cauſed great conſternation in the metropolis. Some of the ſenators were for calling all the armies in Italy into the neighbourhood of Rome, as thinking nothing leſs was able to reſiſt the terrible Carthaginian. But Fabius told them that Hannibal's deſign was not to take Rome, but relieve Capua; upon which Fulvius was recalled to Rome with 15,000 foot, and 1000 horſe; and thus obliged Hannibal again to retire.

135
He ſurpriſes and defeats Appius.

He then returned before Capua ſo ſuddenly that he ſurpriſed Appius in his camp, drove him out of it with the loſs of a great number of men, and obliged him to entrench himſelf on ſome eminences, where he expected to be ſoon joined by his colleague Fulvius.

136
Capua ſubmits to the Romans.

As Hannibal, however, now expected to have all the Roman forces upon him, he could do nothing more for the relief of Capua, which was, of conſequence, obliged to ſubmit to the Romans.

137
Centenius Penula defeated by Hannibal,

A little before the ſurrender of Capua, Hannibal came up with a Roman army commanded by one M. Centenius Penula, who had ſignalized himſelf on many occaſions as a centurion. This raſh man being introduced to the ſenate, had the aſſurance to tell them, that if they would truſt him with a body of only 5000 men, he would give a good account of Hannibal. They gave him 8000, and his army was ſoon increaſed to double that number. He engaged the Carthaginians on Hannibal's firſt offering him battle; but after an engagement of two hours, was defeated, himſelf and all his men being ſlain, except about 1000.

138
As alſo the prætor Fulvius,

Soon after, having found means to draw the prætor Cneius Fulvius into an ambuſcade, Hannibal cut in pieces almoſt his whole army, conſiſting of 18,000 men. In the mean time Marcellus was making great progreſs in Samnium. The city of Salapia was betrayed to him; but he took other two by aſſault. In the laſt of theſe he found 3000 Carthaginians, whom he put to the ſword; and carried off 240,000 buſhels of wheat, and 110,000 of barley.

139
And the pro-conſul Fulvius Centumalus.

This, however, was by no means a compenſation for the defeat which Hannibal ſoon after gave the proconſul Fulvius Centumalus, whom he ſurpriſed and cut off, with 13,000 of his men.

After this defeat, the great Marcellus advanced with his army to oppoſe Hannibal. Various engagements happened without any thing deciſive. In one of them the Romans are ſaid to have been defeated, and in another Hannibal; but, notwithſtanding theſe, it was neither in the power of Marcellus, nor any other Roman general, totally to defeat or diſperſe the army commanded by Hannibal in perſon.

140
Marcellus drawn into an ambuſcade and killed.

Nay, in the eleventh year of the war, Hannibal found means to decoy into an ambuſcade, and cut off, the great Marcellus himſelf; the conſequence of which was, that the Romans were obliged to raiſe the ſiege of Locri, with the loſs of all their military engines.

141
Carthaginian affairs totally ruined by the defeat of Aſdrubal.

Hitherto the Carthaginians, though no longer the favourites of fortune had loſt but little ground; but now they met with a blow which totally ruined their affairs. This was the defeat of Aſdrubal, Hannibal's brother, who had left Spain, and was marching to his aſſiſtance. He croſſed the Pyrenees without any difficulty; and, as the ſilver mines had ſupplied him with a very conſiderable quantity of treaſure, he not only prevailed upon the Gauls to grant him a paſſage through their territories, but likewiſe to furniſh him with a conſiderable number of recruits. Meeting with many favourable circumſtances to expedite his march, he arrived at Placentia ſooner than the Romans, or even his brother Hannibal expected. Had he continued to uſe the ſame expedition with which he ſet out, and haſtened to join his brother, it would have been utterly impoſſible to have ſaved Rome; but, ſitting down before Placentia, he gave the Romans an opportunity of aſſembling all their forces to attack him. At laſt he was obliged to raiſe the ſiege, and began his march for Umbria. He ſent a letter to acquaint his brother of his intended motion: but the meſſenger was intercepted; and the two conſuls, joining their armies, with united forces fell upon the Carthaginians. As the latter were inferior both in numbers and reſolution, they were utterly defeated, and Aſdrubal was killed. About the ſame time, Hannibal himſelf is ſaid to have ſuffered ſeveral defeats, and was retired to Canuſium: but, on the fatal news of his brother's defeat and death, he was filled with deſpair, and retired to the extremity of Brutium; where, aſſembling all his forces, he remained for a conſiderable time in a ſtate of inaction, the Romans not daring to diſturb him, ſo formidable did they eſteem him alone, though every thing about him went to wreck, and the Carthaginian affairs ſeemed not far from the verge of deſtruction. Livy tells us, that it was difficult to determine whether his conduct was more wonderful in proſperity or in adverſity. Notwithſtanding which, Brutium being but a ſmall province, and many of its inhabitants being either forced into the ſervice, or forming themſelves into parties of banditti, ſo that a great part of it remained uncultivated, he found it a difficult matter to ſubſiſt there, eſpecially as no manner of ſupplies were ſent him from Carthage. The people there were as ſolicitous about preſerving their poſſeſſions in Spain, and as little concerned about the ſituation of affairs in Italy, as if Hannibal had met with an uninterrupted courſe of ſucceſs, and no diſaſter befallen him ſince he firſt entered that country.

142
The great progreſs of Scipio Africanus.

All their ſolicitude, however, about the affairs of Spain, was to no purpoſe: their generals, one after another, were defeated by the Romans. They had indeed cut off the two Scipios; but found a much more formidable enemy in the young Scipio, afterwards ſurnamed *Africanus*. He overthrew them in conjunction with Maſiniſſa king of Numidia; and the latter, thereafter, abandoned their intereſt. Soon after, Syphax, king of the Maſæſylii, was likewiſe perſuaded to abandon their party. Scipio alſo gave the Spaniſh Reguli a great overthrow; and reduced the cities of New Carthage, Gades, and many other important places. At laſt the Carthaginians began to open their eyes when it was too late. 143 Mago lands in Italy. Mago was ordered to abandon Spain, and ſail with all expedition to Italy. He landed on the coaſt of Liguria with an army of 12,000 foot and 200 horſe; where he ſurpriſed Genoa, and alſo ſeized upon the town and port of Savo. A reinforcement was ſent him to this place, and new levies went on very briſkly in Liguria; but the opportunity was paſſed, and could not be recalled. 144 Scipio lands in Africa. Scipio having carried all before him in Spain, paſſed over into Africa, where he met with no enemy capable of oppoſing his progreſs. The Carthaginians then, ſeeing themſelves on the brink of deſtruction, were obliged to recal their armies from Italy, in order to ſave their city. 145 Mago and Hannibal recalled. Mago, who had entered Inſubria, was defeated by the Roman forces there; and having retreated into the maritime parts of Liguria, met a courier who brought him orders to return directly to Carthage. At the ſame time, Hannibal was likewiſe recalled. When the meſſengers acquainted him with the ſenate's pleaſure, he expreſſed the utmoſt indignation and concern, groaning, gnaſhing his teeth, and ſcarce refraining from tears. Never baniſhed man, according to Livy, ſhowed ſo much regret in quitting his native country, as Hannibal did at going out of that of the enemy.

146 Hannibal's proceedings after his arrival in Africa. The Carthaginian general was no ſooner landed in Africa, then he ſent out parties to get proviſions for the army, and buy horſes to remount the cavalry. He entered into a league with the Regulus of the Areacidæ, one of the Numidian tribes. Four thouſand of Syphax's horſe came over in a body to him; but as he did not think proper to repoſe any confidence in them, he put them all to the ſword, and diſtributed their horſes among his troops. Vermina, one of Syphax's ſons, and Maſetulus, another Numidian prince, likewiſe joined him with a conſiderable body of horſe. Moſt of the fortreſſes in Maſiniſſa's kingdom either ſurrendered to him upon the firſt ſummons, or were taken by force. Narce, a city of conſiderable note there, he made himſelf maſter of by ſtratagem. Tychæus, a Numidian Regulus, and faithful ally of Syphax, whoſe territories were famous for an excellent breed of horſes, reinforcing him alſo with 2000 of his beſt cavalry, Hannibal advanced to Zama, a town about five day's journey diſtant from Carthage, where he encamped. He thence ſent out ſpies to obſerve the poſture of the Romans. Theſe being brought to Scipio, he was ſo far from inflicting any puniſhment upon them, which he might have done by the laws of war, that he commanded them to be led about the camp, in order to take an exact ſurvey of it, and then diſmiſſed them. 147 He has an interview with Scipio. Hannibal, admiring the noble aſſurance of his rival, ſent a meſſenger to deſire an interview with him; which, by means of Maſiniſſa, he obtained. The two generals, therefore, eſcorted by equal detachments of horſe, met at Nadagara, where, by the aſſiſtance of two interpreters, they held a private conference. Hannibal flattered Scipio in the moſt refined and artful manner, and expatiated upon all thoſe topics which he thought could influence that general to grant his nation a peace upon tolerable terms; amongſt other things, that the Carthaginians would willingly confine themſelves to Africa, ſince ſuch was the will of the gods, in order to procure a laſting peace, whilſt the Romans would be at liberty to extend their conqueſt to the remoteſt nations. Scipio anſwered, that the Romans were not prompted by ambition, or any ſiniſter views, to undertake either the former or preſent war againſt the Carthaginians; but by juſtice, and a proper regard for their allies. He alſo obſerved that the Carthaginians had, before his arrival in Africa, not only made him the ſame propoſals, but likewiſe agreed to pay the Romans 5000 talents of ſilver, reſtore all the Roman priſoners without ranſom, and deliver up all the galleys. He inſiſted on the perfidious conduct of the Carthaginians, who had broke a truce concluded with them; and told him, that, ſo far from granting them more favourable terms, they ought to expect more rigorous ones; which if Hannibal would ſubmit to, a peace would enſue; if not, the deciſion of the diſpute muſt be left to the ſword.

148 The battle of Zama. This conference, betwixt two of the greateſt generals the world ever produced, ending without ſucceſs, they both retired to their reſpective camps; where they informed their troops, that not only the fate of Rome and Carthage, but that of the whole world, was to be determined by them the next day. An engagement enſued*, in which, as Polybius informs us, the ſurpriſing military genius of Hannibal diſplayed itſelf in an extraordinary manner. Scipio likewiſe, according to Livy, paſſed an high encomium upon him, on account of his uncommon capacity in taking advantages, the excellent arrangement of his forces, and the manner in which he gave his orders during the engagement. The Roman general indeed, not only approved his conduct, but openly declared that it was ſuperior to his own. 149 Hannibal totally routed. Nevertheleſs, being vaſtly inferior to the enemy in horſe, and the ſtate of Carthage obliging him to hazard a battle with the Romans at no ſmall diſadvantage, Hannibal was utterly routed, and his camp taken. He fled firſt to Thon, and afterwards to Adrumentúm, from whence he was recalled to Carthage; where being arrived, he adviſed his countrymen to conclude a peace with Scipio on whatever terms he thought proper to preſcribe.

150 Peace concluded. Thus was the ſecond war of the Carthaginians with the Romans concluded. The conditions of peace were very humiliating to the Carthaginians. They were obliged to deliver up all the Roman deſerters, fugitive ſlaves, priſoners of war, and all the Italians whom Hannibal had obliged to follow him. They alſo delivered up all their ſhips of war, except ten triremes, all their tame elephants, and were to train up no more of theſe animals for the ſervice. They were not to engage in any war without the conſent of the Romans. They engaged to pay to the Romans, in 50 years, 10,000 Euboic talents, at equal payments. They were to reſtore to Maſiniſſa all they had uſurped from him or his anceſtors, and to enter into an alliance with him. They were alſo to aſſiſt the Romans both by ſea and land, whenever they were called upon ſo to do, and never to make any levies either in Gaul or Liguria. Theſe terms appeared ſo intolerable to the populace, that they threatened to plunder and burn the houſes of the nobility; but Hannibal having aſſembled a body of 6000 foot and 500 horſe at Marthama, prevented an

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* See *Zama*.

inſurrection, and by his influence completed the accommodation.

151 Carthaginians oppreſſed by Maſiniſſa.

The peace between Carthage and Rome was ſcarce ſigned, when Maſiniſſa unjuſtly made himſelf maſter of part of the Carthaginian dominions in Africa, under pretence that theſe formerly belonged to his family. The Carthaginians, through the villanous mediation of the Romans, found themſelves under a neceſſity of ceding theſe countries to that ambitious prince, and of entering into an alliance with him. The good underſtanding between the two powers continued for many years afterwards; but at laſt Maſiniſſa violated the treaties ſubſiſting betwixt him and the Carthaginian republic, and not a little contributed to its ſubverſion.

After the concluſion of the peace, Hannibal ſtill kept up his credit among his countrymen. He was intruſted with the command of an army againſt ſome neighbouring nations in Africa; but this being diſagreeable to the Romans, he was removed from it, and raiſed to the dignity of prætor in Carthage. Here he continued for ſome time, reforming abuſes, and putting the affairs of the republic into a better condition; but this likewiſe being diſagreeable to the Romans, he was obliged to fly to Antiochus king of Syria.

152 Hannibal flies to Antiochus.

After his flight, the Romans began to look upon the Carthaginians with a ſuſpicious eye; though, to prevent every thing of this kind, the latter had ordered two ſhips to purſue Hannibal, had confiſcated his effects, raſed his houſe, and by a public decree declared him an exile.

153 Iniquitous proceedings of Maſiniſſa and the Romans.

Soon after, diſputes ariſing between the Carthaginians and Maſiniſſa, the latter, notwithſtanding the manifeſt iniquity of his proceedings, was ſupported by the Romans. That prince, graſping at further conqueſts, endeavoured to embroil the Carthaginians with the Romans, by aſſerting that the former had received ambaſſadors from Perſeus king of Macedon; that the ſenate aſſembled in the temple of Æſculapius in the night-time in order to confer with them; and that ambaſſadors had been diſpatched from Carthage to Perſeus, in order to conclude an alliance with him. Not long after this, Maſiniſſa made an irruption into the province of Tyſca, where he ſoon poſſeſſed himſelf of 70, or, as Appian will have it, 50 towns and caſtles. This obliged the Carthaginians to apply with great importunity to the Roman ſenate for redreſs, their hands being ſo tied up by an article in the laſt treaty, that they could not repel force by force, in caſe of an invaſion, without their conſent. Their ambaſſadors begged, that the Roman ſenate would ſettle once for all what dominions they were to have, that they might from thenceforth know what they had to depend upon; or if their ſtate had any way offended the Romans, they begged that they would puniſh them themſelves, rather than leave them expoſed to the inſults and vexations of ſo mercileſs a tyrant. Then proſtrating themſelves on the earth, they burſt out into tears. But, notwithſtanding the impreſſion their ſpeech made, the matter was left undecided; ſo that Maſiniſſa had liberty to purſue his rapines as much as he pleaſed. But whatever villanous deſigns the Romans might have with regard to the republic of Carthage, they affected to ſhow a great regard to the principles of juſtice and honour. They thererefore ſent Cato, a man famous for committing enormities under the ſpecious pretence of public ſpirit, into Africa, to accommodate all differences betwixt Maſiniſſa and the Carthaginians. The latter very well knew their fate, had they ſubmitted to ſuch a mediation; and therefore appealed to the treaty concluded with Scipio, as the only rule by which their conduct and that of their adverſary ought to be examined. This *unreaſonable* appeal ſo incenſed the righteous Cato, that he pronounced them a devoted people, and from that time reſolved upon their deſtruction. For ſome time he was oppoſed by Scipio Naſica; but the people of Carthage, knowing the Romans to be their inveterate enemies, and reflecting upon the iniquitous treatment they had met with from them ever ſince the commencement of their diſputes with Maſiniſſa, were under great apprehenſions of a viſit from them. To prevent a rupture as much as poſſible, by a decree of the ſenate, they impeached Aſdrubal general of the army, and Carthalo commander of the auxiliary forces, together with their accomplices, as guilty of high treaſon, for being the authors of the war againſt the king of Numidia. They ſent a deputation to Rome, to diſcover what ſentiments were entertained there of their late conduct, and to know what ſatisfaction the Romans required. Theſe meſſengers meeting with a cold reception, others were diſpatched, who returned with the ſame ſucceſs. This made the unhappy citizens of Carthage believe that their deſtruction was reſolved upon; which threw them into the utmoſt deſpair. And indeed they had but too juſt grounds for ſuch a melancholy apprehenſion, the Roman ſenate now diſcovering an inclination to fall in with Cato's meaſures. About the ſame time, the city of Utica, being the ſecond in Africa, and famous for its immenſe riches, as well as its equally commodious and capacious port, ſubmitted to the Romans. Upon the poſſeſſion of ſo important a fortreſs, which, by reaſon of its vicinity to Carthage, might ſerve as a place of arms in the attack of that city, the Romans declared war againſt the Carthaginians without the leaſt heſitation.

154 War declared by the Romans againſt Carthage.

In conſequence of this declaration, the conſuls M. Manlius Nepos, and L. Marcius Cenſorinus, were diſpatched with an army and fleet to begin hoſtilities with the utmoſt expedition. The land forces conſiſted of 80,000 foot and 4000 choſen horſe; and the fleet of 50 quinqueremes, beſides a vaſt number of tranſports. The conſuls had ſecret orders from the ſenate not to conclude the operations but by the deſtruction of Carthage, without which, it was pretended, the republic could not but look upon all her poſſeſſions as inſecure. Purſuant to the plan they had formed, the troops were firſt landed at Lilybæum in Sicily, from whence, after receiving a proper refreſhment, it was propoſed to tranſport them to Utica.

155 Ambaſſadors ſent to Rome.

The anſwer brought by the laſt ambaſſadors to Carthage had not a little alarmed the inhabitants of that city. But they were not yet acquainted with the reſolutions taken at Rome. They therefore ſent freſh ambaſſadors thither, whom they inveſted with full powers to act as they thought proper for the good of the republic, and even to ſubmit themſelves without reſerve to the pleaſure of the Romans. But the moſt ſenſible perſons among them did not expect any great ſucceſs from this condeſcenſion, ſince the early

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ſubmiſſion of the Uticans had rendered it infinitely leſs meritorious than it would have been before. However, the Romans ſeemed to be in ſome meaſure ſatisfied with it, ſince they promiſed them their liberty, the enjoyment of their laws, and in ſhort every thing that was dear and valuable to them. This threw them into a tranſport of joy, and they wanted words to extol the moderation of the Romans.

156 The Romans demand 300 hoſtages,

But the ſenate immediately daſhed all their hopes, by acquainting them, that this favour was granted upon condition that they would ſend 300 young Carthaginian noblemen of the firſt diſtinction to the prætor Fabius at Lilybæum, within the ſpace of 30 days, and comply with all the orders of the conſuls. Theſe hard terms filled the whole city with inexpreſſible grief; but the hoſtages were delivered; and as they arrived at Lilybæum before the 30 days were expired, the ambaſſadors were not without hopes of ſoftening their hard-hearted enemy. But the conſuls only told them, that upon their arrival at Utica they ſhould learn the farther orders of the republic.

The miniſters no ſooner received intelligence of the Roman fleet appearing off Utica, then they repaired thither, in order to know the fate of their city. The conſuls, however, did not judge it expedient to communicate all the commands of their republic at once, leſt they ſhould appear ſo harſh and ſevere, that the Carthaginians would have refuſed to comply with them.

157 And all the Carthaginian arms, military machines, &c.

They firſt, therefore, demanded a ſufficient ſupply of corn for the ſubſiſtence of their troops. Secondly, That they ſhould deliver up into their hands all the triremes they were then maſters of. Thirdly, That they ſhould put them in poſſeſſion of all their military machines. And fourthly, That they ſhould immediately convey all their arms into the Roman camp.

As care was taken that there ſhould be a convenient interval of time betwixt every one of theſe demands, the Carthaginians found themſelves enſnared, and could not reject any one of them, though they ſubmitted to the laſt with the utmoſt reluctance and concern.

158 They command them to deſtroy their city.

Cenſorinus now imagining them incapable of ſuſtaining a ſiege commanded them to abandon their city, or, as Zonaras will have it, to demoliſh it; permitting them to build another 80 ſtadia from the ſea, but without walls or fortifications. This terrible decree threw the ſenate and every one elſe into deſpair; and the whole city became a ſcene of horror, madneſs, and confuſion. The citizens curſed their anceſtors for not dying glorioſly in the defence of their country, rather than concluding ſuch ignominious treaties of peace that had been the cauſe of the deplorable condition to which their poſterity was then reduced. At length, when the firſt commotion was a little abated, the ſenators aſſembled, and reſolved to ſuſtain a ſiege.

159 The Carthaginians reſolve to ſuſtain a ſiege.

They were ſtripped of their arms and diſtitute of proviſions; but deſpair raiſed their courage, and made them find out expedients. They took care to ſhut the gates of the city; and gathered together on the ramparts great heaps of ſtones, to ſerve them inſtead of arms in caſe of a ſurpriſe. They took the malefactors out of priſon, gave the ſlaves their liberty, and encorporated them in the militia. Aſdrubal was recalled, who had been ſentenced to die only to pleaſe the Romans; and he was invited to employ 20,000 men he had raiſed againſt his country, in defence of it. Another Aſdrubal was appointed to command in Carthage; and all ſeemed reſolute, either to ſave their city or periſh in its ruins.

160 They make new arms.

They wanted arms; but, by order of the ſenate, the temples, porticoes, and all public buildings were turned into workhouſes, where men and women were continually employed in making arms. As they encouraged one another in their work, and loſt no time in procuring to themſelves the neceſſaries of life, which were brought to them at ſtated hours, they every day made 144 bucklers, 300 ſwords, 1000 darts, and 500 lances and javelins. As to baliſtæ and catapultæ, they wanted proper materials for them; but their induſtry ſupplied that defect. Where iron and braſs were wanting, they made uſe of ſilver and gold, melting down the ſtatues, vaſes, and even the utenſils of private families; for, on this occaſion, even the moſt covetous became liberal. As tow and flax were wanting to make cords for working the machines, the women, even thoſe of the firſt rank, freely cut off their hair and dedicated it to that uſe. Without the walls, Aſdrubal employed the troops in getting together proviſions, and conveying them ſafe into Carthage; ſo that there was as great a plenty there as in the Roman camp.

In the mean time the conſuls delayed drawing near to Carthage, not doubting but the inhabitants, whom they imagined diſtitute of neceſſaries to ſuſtain a ſiege, would, upon cool reflection, ſubmit; but at length, finding themſelves deceived in their expectation, they came before the place and inveſted it. As they were ſtill perſuaded that the Carthaginians had no arms, they flattered themſelves that they ſhould eaſily carry the city by aſſault.

161 The city attacked by the Romans, who are repulſed.

Accordingly they approached the walls in order to plant their ſcaling-ladders; but to their great ſurpriſe they diſcovered a prodigious multitude of men on the ramparts, ſhining in the armour they had newly made. The legionaries were ſo terrified at this unexpected ſight, that they drew back, and would have retired, if the conſuls had not led them on to the attack: which, however, proved unſucceſsful; the Romans, in ſpite of their utmoſt efforts, being obliged to give over the enterprize, and lay aſide all thoughts of taking Carthage by aſſault. In the mean time Aſdrubal, having collected from all places ſubject to Carthage a prodigious number of troops, came and encamped within reach of the Romans, and ſoon reduced them to great ſtraits for want of proviſions. As Marcius, one of the Roman conſuls, was poſted near a marſh, the exhalations of the ſtagnating waters, and the heat of the ſeaſon, infected the air, and cauſed a general ſickneſs among his men. Marcius, therefore, ordered his fleet to draw as near the ſhore as poſſible, in order to tranſport his troops to an healthier place. Aſdrubal being informed of this motion, ordered all the old barks in the harbour to be filled with faggots, tow, ſulphur, bitumen, and other cumbuſtible materials; and then taking advantage of the wind, which blew towards the enemy, let them drive upon their ſhips, which were for the moſt part conſumed.

162 Part of the Roman fleet deſtroyed.

After this diſaſter, Marcius was called home to preſide at the elections; and the Carthaginians looking upon the abſence of one of the conſuls to be a good omen, made a briſk ſally in the night; and would have ſurpriſed the conſul's camp, had not Æmilianus, with ſome ſquadrons, marched out of the gate oppoſite to the place where the attack was made, and, coming round, fell unexpectedly on their rear, and obliged them to return in diſorder to the city.

Aſdrubal had poſted himſelf under the walls of a city named Nepheris, 24 miles diſtant from Carthage, and ſituated on an high mountain, which ſeemed inacceſſible on all ſides. From thence he made incurſions into the neighbouring country, intercepted the Roman convoys, fell upon their detachments ſent out to forage, and even ordered parties to inſult the conſular army in their camp. Hereupon the conſul reſolved to drive the Carthaginian from this advantageous poſt, and ſet out for Nepheris. As he drew near the hills, Aſdrubal ſuddenly appeared at the head of his army in order of battle, and fell upon the Romans with incredible fury. The conſular army ſuſtained the attack with great reſolution; and Aſdrubal retired in good order to his poſt, hoping the Romans would attack him there. But the conſul being now convinced of his danger, reſolved to retire. This Aſdrubal no ſooner perceived, than he ruſhed down the hill, and falling upon the enemy's rear, cut a great number of them in pieces. The whole Roman army was now ſaved by the bravery of Scipio Æmilianus. At the head of 300 horſe, he ſubſtained the attack of all the forces commanded by Aſdrubal, and covered the legions, while they paſſed a river in their retreat before the enemy. Then he and his companions threw themſelves into the ſtream and ſwam acroſs it. When the army had croſſed the river, it was perceived that four manipuli were wanting; and ſoon after they were informed that they had retired to an eminence, where they reſolved to ſell their lives as dear as poſſible. Upon this news Æmilianus, taking with him a choſen body of horſe, and proviſions for two days, croſſed the river, and flew to the aſſiſtance of his countrymen. He ſeized an hill over againſt that on which the four manipuli were poſted; and, after ſome hours repoſe, marched againſt the Carthaginians who kept them inveſted, fell upon them at the head of his ſquadron with the boldneſs of a man determined to conquer or die, and in ſpite of all oppoſition opened a way for his fellow-ſoldiers to eſcape. On his return to the army, his companions, who had given him over for loſt, carried him to his quarters in a kind of triumph; and the manipuli he had ſaved gave him a crown of *gramen*. By theſe and ſome other exploits, Æmilianus gained ſuch reputation, that Cato, who is ſaid never to have commended any body before, could not refuſe him the praiſes he deſerved; and is ſaid to have foretold that Carthage would never be reduced till Scipio Æmilianus was employed in that expedition.

165
The Roman army, in great danger, is ſaved by Scipio Æmilianus.

The next year, the war in Africa fell by lot to the conſul L. Calpurnius Piſo; and he continued to employ Æmilianus in ſeveral important enterpriſes, in which he was attended with uncommon ſucceſs. He took ſeveral caſtles; and in one of his excurſions, found means to have a private conference with Phameas, general, under Aſdrubal, of the Carthaginian cavalry, and brought him over, together with 2200 of his horſe to the Roman intereſt. Under the conſul Calpurnius Piſo himſelf, however, the Roman arms were unſucceſsful. He inveſted Clupea; but was obliged to abandon the enterpriſe, with the loſs of a great number of men killed by the enemy in their ſallies. From this place he went to vent his rage on a city newly built, and thence called *Neapolis*, which profeſſed a ſtrict neutrality, and had even a ſafeguard from the Romans. The conſul, however, plundered the place, and ſtript the inhabitants of all their effects. After this he laid ſiege to *Hippagreta*, which employed the Roman fleet and army the whole ſummer; and, on the approach of winter, the conſul retired to Utica, without performing a ſingle action worth notice during the whole campaign.

164
He gains over the Carthaginian general of horſe.

165
He is choſen conſul.

The next year Scipio Æmilianus was choſen conſul, and ordered to paſs into Africa; and upon his arrival, the face of affairs was greatly changed. At the time of his entering the port of Utica, 3500 Romans were in great danger of being cut in pieces before Carthage. Theſe had ſeized Megalia, one of the ſuburbs of the city: but as they had not furniſhed themſelves with proviſions to ſubſiſt there, and could not retire, being cloſely inveſted on all ſides by the enemy's troops, the prætor Mancinus, who commanded this detachment, ſeeing the danger into which he had brought himſelf, diſpatched a light boat to Utica, to acquaint the Romans there with his ſituation. Æmilianus received this letter a few hours after his landing; and immediately flew to the relief of the beſieged Romans, obliged the Carthaginians to retire within their walls, and ſafely conveyed his countrymen to Utica. Having then drawn together all the troops, Æmilianus applied himſelf wholly to the ſiege of the capital.

166
Cruelties of Aſdrubal.

His firſt attack was upon Megalia; which he carried by aſſault, the Carthaginian garriſon retiring into the citadel of Byrſa. Aſdrubal who had commanded the Carthaginian forces in the field, and was now governor of the city, was ſo enraged at the loſs of Megalia, that he cauſed all the Roman captives taken in the two years the war laſted, to be brought upon the ramparts and thrown headlong, in the ſight of the Roman army, from the top of the wall; after having, with an exceſs of cruelty, commanded their hands and feet to be cut off, and their eyes and tongues to be torn out. He was of a temper remarkably inhuman, and it is ſaid that he even took pleaſure in ſeeing ſome of theſe unhappy men flayed alive. Æmilianus, in the mean time was buſy in drawing lines of circumvallation and contravallation croſs the neck of land which joined the iſthmus on which Carthage ſtood to the continent. By this means, all the avenues on the land-ſide of Carthage being ſhut up, the city could receive no proviſions that way. His next care was to raiſe a mole in the ſea, in order to block up the old port, the new one being already ſhut up by the Roman fleet; and this great work he effected with immenſe labour. The mole reached from the weſtern neck of land, of which the Romans were maſters, to the entrance of the port; and was 90 feet broad at the bottom and 80 at the top. The beſieged, when the Romans firſt began this ſurpriſing work, laughed at the attempt; but were no leſs alarmed than ſurpriſed, when they beheld a vaſt mole appearing above water, and by that means the port rendered inacceſſible to ſhips, and quite uſeleſs. Prompted by deſpair, however, the Carthaginians, with incredible and moſt miraculous induſtry, dug a new baſon, and cut a paſſage into the ſea, by which they could receive the proviſions that were ſent them by their troops in the field. With the ſame diligence

167
Carthage blocked up by ſea and land.

168
The beſieged dig a new baſon.

ligence and expedition, they fitted out a fleet of 50 triremes; which, to the great ſurpriſe of the Romans, appeared ſuddenly advancing into the ſea through this new canal, and even ventured to give the enemy battle. The action laſted the whole day, with little advantage on either ſide. The day after, the conſul endeavoured to make himſelf maſter of a terrace which covered the city on the ſide next the ſea; and on this occaſion the beſieged ſignalized themſelves in a moſt remarkable manner.

169 They ſet fire to the Roman machines.

Great numbers of them, naked and unarmed, went into the water in the dead of the night, with unlighted torches in their hands; and having, partly by ſwimming, partly by wading, got within reach of the Roman engines, they ſtruck fire, lighted their torches, and threw them with fury againſt the machines. The ſudden appearance of theſe naked men, who looked like ſo many monſters ſtarted up out of the ſea, ſo terrified the Romans who guarded the machines, that they began to retire in the utmoſt confuſion. The conſul, who commanded the detachment in perſon, and had continued all night at the foot of the terrace, endeavoured to ſtop his men, and even ordered thoſe who fled to be killed. But the Carthaginians, perceiving the confuſion the Romans were in, threw themſelves upon them like ſo many wild beaſts; and having put them to flight only with their torches, they ſet fire to the machines, and entirely conſumed them. This, however, did not diſcourage the conſul: he renewed the attack a few days after, carried the terrace by aſſault, and lodged 4000 men upon it. As this was an important poſt, becauſe it pent in Carthage on the ſea-ſide, Æmilianus took care to fortify and ſecure it againſt the ſallies of the enemy; and then, winter approaching, he ſuſpended all further attacks upon the place till the return of good weather. During the winter ſeaſon, however, the conſul was not inactive. The Carthaginians had a very numerous army under the command of one Diogenes, ſtrongly encamped near Nepheris, whence convoys of proviſions were ſent by ſea to the beſieged, and brought into the new baſon. To take Nepheris, therefore, was to deprive Carthage of her chief magazine. This Æmilianus undertook, and ſucceeded in the attempt.

170 Vaſt ſlaughter of the Carthaginians.

He firſt forced the enemy's entrenchments, put 70,000 of them to the ſword, and made 10,000 priſoners; all the inhabitants of the country, who could not retire to Carthage, having taken refuge in this camp. After this, he laid ſiege to Nepheris, which was reduced in 22 days. Aſdrubal being diſheartened by the defeat of the army, and touched with the miſery of the beſieged now reduced to the utmoſt extremity for want of proviſions, offered to ſubmit to what conditions the Romans pleaſed, provided the city was ſpared; but this was abſolutely refuſed.

171 Cotho taken.

Early in the ſpring, Æmilianus renewed the ſiege of Carthage; and in order to open himſelf a way into the city, he ordered Lælius to attempt the reduction of Cotho, a ſmall iſland which divided the two ports. Æmilianus himſelf made a falſe attack on the citadel, in order to draw the enemy thither. This ſtratagem had the deſired effect; for the citadel being a place of the greateſt importance, moſt of the Carthaginians haſtened thither, and made their utmoſt efforts to repulſe their aggreſſors. But in the mean time Lælius having, with incredible expedition, built a wooden bridge over the channel which divided Cotho from the iſthmus, entered the iſland, ſcaled the walls of the fortreſs which the Carthaginians had built there, and made himſelf maſter of that important poſt.

172 Romans enter the city.

The proconſul, who was engaged before Byrſa, no ſooner underſtood, by the loud ſhouts of the troops of Lælius, that he had made himſelf maſter of Cotho, than he abandoned the falſe attack, and unexpectedly fell on the neighbouring gate of the city, which he broke down, notwithſtanding the ſhowers of darts that were inceſſantly diſcharged upon his men from the ramparts. As night coming on prevented him from proceeding farther, he made a lodgment within the gate, and waited there for the return of day, with a deſign to advance through the city to the citadel, and attack it on that ſide which was but indifferently fortified. Purſuant to this deſign, at day-break he ordered 4000 freſh troops to be ſent from his camp, and, having ſolemnly devoted to the infernal gods the unhappy Carthaginians, he began to advance at the head of his men, through the ſtreets of the city, in order to attack the citadel. Having advanced to the market-place, he found that the way to the citadel lay through three exceeding ſteep ſtreets. The houſes on both ſides were very high, and filled with Carthaginians, who overwhelmed the Romans as they advanced with darts and ſtones; ſo that they could not proceed till they had cleared them. To this end Æmilianus in perſon, at the head of a detachment, attacked the firſt houſe, and made himſelf maſter of it ſword in hand. His example was followed by the officers and ſoldiers, who went on from houſe to houſe, putting all they met with to the ſword. As faſt as the houſes were cleared on both ſides, the Romans advanced in order of battle towards the citadel; but met with a vigorous reſiſtance from the Carthaginians, who on this occaſion behaved with uncommon reſolution. From the market-place to the citadel, two bodies of men fought their way every ſtep, one above on the roofs of the houſes, the other below in the ſtreets. The ſlaughter was inexpreſſibly great and dreadful. The air rung with ſhrieks and lamentations. Some were cut in pieces, others threw themſelves down from the tops of the houſes; ſo that the ſtreets were filled with dead and mangled bodies.

173 Which is ſet on fire.

But the deſtruction was yet greater, when the proconſul commanded fire to be ſet to that quarter of the town which lay next to the citadel. Incredible multitudes, who had eſcaped the ſwords of the enemy, periſhed in the flames, or by the fall of the houſes. After the fire, which laſted ſix days, had demoliſhed a ſufficient number of houſes, Æmilianus ordered the rubbiſh to be removed, and a large area to be made, where all his troops might have room to act. Then he appeared with his whole army before Byrſa; which ſo terrified the Carthaginians, who had fled thither for refuge, that firſt of all 25,000 women, and then 30,000 men, came out of the gates in ſuch a condition as moved pity. They threw themſelves proſtrate before the Roman general, aſking no favour but life. This was readily granted, not only to them, but to all that were in Byrſa, except the Roman deſerters, whoſe number amounted to 900.

174 Cruelty and cowardice of Aſdrubal.

Aſdrubal's wife earneſtly intreated her huſband to ſuffer her to join the ſuppliants, and carry with her to the proconſul her two ſons, who were as yet very young; but

but the barbarian denied her requeſt, and rejected her remonſtrances with menaces. The Roman deſerters ſeeing themſelves excluded from mercy, reſolved to die ſword in hand, rather than deliver themſelves up to the vengeance of their countrymen. Then Aſdrubal, finding them all reſolved to defend themſelves to the laſt breath, committed to their care his wife and children; after which he, in a moſt cowardly and mean-ſpirited manner, came and privately threw himſelf at the conqueror's feet. The Carthaginians in the citadel no ſooner underſtood that their commander had abandoned the place, than they threw open the gates, and put the Romans in poſſeſſion of Byrſa. They had now no enemy to contend with but the 900 deſerters; who, being reduced to deſpair, retreated into the temple of Æſculapius, which was as a ſecond temple within the firſt. There the proconſul attacked them; and theſe unhappy wretches, finding there was no way to eſcape, ſet fire to the temple.

175 Aſdrubal's wife deſtroys herſelf and two children.

As the flames ſpread, they retreated from one part of the building to another, till they got to the roof. There Aſdrubal's wife appeared in her beſt apparel, and having uttered the moſt bitter imprecations againſt her huſband, whom ſhe ſaw ſtanding below with Æmilianus, "Baſe coward (ſaid ſhe), the mean things thou haſt done to ſave thy life ſhall not avail thee: thou ſhalt die this inſtant, at leaſt in thy two children." Having thus ſpoken, ſhe ſtabbed both the infants with a dagger; and while they were yet ſtruggling for life, threw them both from the top of the temple, and then leaped down after them into the flames.

176 Carthage, plundered.

Æmilianus delivered up the city to be plundered, but in the manner preſcribed by the Roman military law. The ſoldiers were allowed to appropriate to themſelves all the furniture, utenſils, and braſs money, they ſhould find in private houſes: but all the gold and ſilver, the ſtatues, pictures, &c. were reſerved to be put into the hands of the quæſtors. On this occaſion the cities of Sicily, which had been often plundered by the Carthaginian armies, recovered a number of ſtatues, pictures, and other valuable monuments: among the reſt, the famous braſen bull, which Phalaris had ordered to be caſt, and uſed as the chief inſtrument of his cruelty, was reſtored to the inhabitants of Agrigentum. As Æmilianus was greatly inclined to ſpare what remained of this ſtately metropolis, he wrote to the ſenate on the ſubject, from whom he he received the following orders: 1. The city of Carthage, with Byrſa, and Megalia, ſhall be entirely deſtroyed, and no traces of them left. 2. All the cities that have lent Carthage any aſſiſtance ſhall be diſmantled. 3. The territories of thoſe cities which have declared for the Romans, ſhall be enlarged with lands taken from the enemy. 4. All the lands between Hippo and Carthage ſhall be divided among the inhabitants of Utica. 5. All the Africans of the Carthaginian ſtate, both men and women, ſhall pay an annual tribute to the Romans at ſo much per head. 6. The whole country, which was ſubject to the Carthaginian ſtate, ſhall be turned into a Roman province, and be governed by a prætor, in the ſame manner as Sicily. Laſtly, Rome ſhall ſend commiſſioners into Africa, there to ſettle jointly with the proconſul the ſtate of the new province. Before Æmilianus deſtroyed the city, he performed thoſe religious ceremonies which were required on ſuch occaſions: he firſt ſacrificed to the gods, and then cauſed a plough to be drown round the walls of the city.

177 And utterly deſtroyed.

After this, the towers, ramparts, walls, and all the works which the Carthaginians had raiſed in the courſe of many ages, and at a vaſt expence, were levelled with the ground; and laſtly, fire was ſet to the edifices of the proud metropolis, which conſumed them all, not a ſingle houſe eſcaping the flames. Though the fire began in all quarters at the ſame time, and burnt with incredible fury, it contitinued for 17 days before all the buildings were conſumed.

Thus fell Carthage, about 146 years before the birth of Chriſt; a city whoſe deſtruction ought to be attributed more to the intrigues of an abandoned faction, compoſed of the moſt profligate part of its citizens, than to the power of its rival. The treaſure Æmilianus carried off, even after the city had been delivered up to be plundered by the ſoldiers, was immenſe, Pliny making it to amount to 4,470,000 pounds weight of ſilver. The Romans ordered Carthage never to be inhabited again, denouncing dreadful imprecations againſt thoſe who, contrary to this prohibition, ſhould attempt to rebuild any part of it, eſpecially Byrſa and Megalia.

178 Rebuilt.

Notwithſtanding this, however, about 24 years after, C. Gracchus, tribune of the people, in order to ingratiate himſelf with them, undertook to rebuild it; and, to that end, conducted thither a colony of 6000 Roman citizens. The workmen, according to Plutarch, were terrified by many unlucky omens at the time they were tracing the limits and laying the foundations of the new city; which the ſenate being informed of, would have ſuſpended the attempt. But the tribune, little affected with ſuch preſages, continued to carry on the work, and finiſhed it in a few days. From hence it is probable that only a ſlight kind of huts were errected; but, whether Gracchus executed his deſign, or the work was entirely diſcontinued, it is certain, that Carthage was the firſt Roman colony ever ſent out of Italy. According to ſome authors, Carthage was rebuilt by Julius Cæſar; and Strabo, who flouriſhed in the reign of Tiberius, affirms it in his time to have been equal if not ſuperior to any other city in Africa. It was looked upon as the capital of Africa for ſeveral centuries after the commencement of the Chriſtian æra. Maxentius laid it in aſhes about the ſixth or ſeventh year of Conſtantine's reign.

179 Utterly deſtroyed by the Saracens.

Genſeric, king of the Vandals, took it A. D. 439; but about a century afterwards it was re-annexed to the Roman empire by the renowned Beliſarius. At laſt the Saracens, under Mohammed's ſucceſſors, towards the cloſe of the ſeventh century, ſo completely deſtroyed it, that there are now ſcarce any traces remaining.

180 Its ancient grandeur.

At the commencement of the third Punic war, Carthage appears to have been one of the firſt cities in the world.—It was ſeated on a peninſula 360 ſtadia or 45 miles in circumference, joined to the continent by an iſthmus 23 ſtadia or three miles and a furlong in breadth. On the weſt ſide there projected from it a long tract of land half a ſtadium broad; which ſhooting out into the ſea, ſeparated it from a lake or moraſs, and was ſtrongly fortified on all ſides by rocks and a ſingle wall. In the middle of the city ſtood the citadel of Byrſa, having on the top of it a temple ſacred

Carthage.

to Æſculapius, ſeated upon rocks on a very high hill, to which the aſcent was by 60 ſteps. On the ſouth ſide the city was ſurrounded by a triple wall, 30 cubits high; flanked all round by parapets and towers, placed at equal diſtances of 480 feet. Every tower had its foundation ſunk 32 feet deep, and was four ſtories high, though the walls were but two: they were arched; and, in the lower part, correſponding in depth with the foundations abovementioned, were ſtalls large enough to hold 300 elephants with their fodder, &c. Over theſe were ſtalls and other conveniences for 4000 horſes; and there was likewiſe room for lodging 20,000 foot and 4000 cavalry, without in the leaſt incommoding the inhabitants. There were two harbours, ſo diſpoſed as to have a communication with one another. They had one common entrance 70 feet broad, and ſhut up with chains. The firſt was appropriated to the merchants; and included in it a vaſt number of places of refreſhment, and all kinds of accommodations for ſeamen. The ſecond, as well as the iſland of Cothon, in the midſt of it, was lined with large keys, in which were diſtinct receptacles for ſecuring and ſheltering from the weather 220 ſhips of war. Over theſe were magazines of all ſorts of naval ſtores. The entrance into each of theſe receptacles was adorned with two marble pillars of the Ionic order; ſo that both the harbour and iſland repreſented on each ſide two magnificent galleries. Near this iſland was a temple of Apollo, in which was a ſtatue of the god all of maſſy gold; and the inſide of the temple all lined with plates of the ſame metal, weighing 1000 talents. The city was 23 miles in circumference, and at the time we ſpeak of contained 700,000 inhabitants. Of their power we may have ſome idea, by the quantity of arms they delivered up to the Roman conſuls. The whole army was aſtoniſhed at the long train of carts loaded with them, which were thought ſufficient to have armed all Africa. At leaſt it is certain, that on this occaſion were put into the hands of the Romans, 2000 catapultæ, 200,000 complete ſuits of armour, with an innumerable quantity of ſwords, darts, javelins, arrows, and beams armed with iron which were thrown from the ramparts by the baliſtæ.

The character tranſmitted of the Carthaginians is extremely bad; but we have it only on the authority of the Romans, who being their implacable enemies cannot be much relied upon. As to their religion, manners, &c. being much the ſame with the Phœnicians, of which they were a colony, the reader is referred for an account of theſe things to the article PHOENICIA.

On the ruins of Carthage there now ſtands only a ſmall village called *Melcha*. The few remains of Carthage conſiſt only of ſome fragments of walls and 17 ciſterns for the reception of rain water.

There are three eminences, which are ſo many maſſes of fine marbles pounded together, and were in all probability the ſites of temples and other diſtinguiſhed buildings. The preſent ruins are by no means the remains of the ancient city deſtroyed by the Romans; who after taking it entirely eraſed it, and plowed up the very foundations: ſo truly they adhered to the well-known advice perpetually inculcated by Cato the Elder, *Delenda eſt Carthago*. It was again rebuilt by the Gracchi family, who conducted a colony to re-people it; and continually increaſing in ſplendour, it became at length the capital of Africa under the Roman emperors. It ſubſiſted near 700 years after its firſt demolition, until it was entirely deſtroyed by the Saracens in the beginning of the 7th century.

New-Carthage, Carthagena.

It is a ſingular circumſtance that the two cities of Carthage and Rome ſhould have been built juſt oppoſite one to the other; the bay of Tunis and the mouth of the Tiber being in a direct line.

> *Littora litteribus contraria, fluctibus undas,*
> *Arma armis.* VIRG. *Æn.* i. 4.

New-CARTHAGE, a conſiderable town of Mexico, in the province of Coſtarica. It is a very rich, trading place. W. Long. 86. 7. N. Lat. 9. 5.

CARTHAGENA, a province of South America, and one of the moſt conſiderable in New Caſtile, on account of the great trade carried on by the capital, for the country itſelf is neither fertile, rich, nor populous. The capital city, called likewiſe *Carthagena*, is ſituated in W. Long. 77. N. Lat. 11. on a ſandy iſland, by moſt writers called a peninſula; which, forming a narrow paſſage on the ſouth-weſt, opens a communication with that called *Tierra Bomba*, as far as *Bocca Chica*. The little iſland which now joins them was formerly the entrance of the bay: but it having been filled up by orders of the court, Bocca Chica became the only entrance: this, however, has been filled up ſince the attempt of Vernon and Wentworth, and the old paſſage again opened. On the north ſide the land is ſo narrow, that, before the wall was begun, the diſtance from ſea to ſea was only 35 toiſes; but afterwards enlarging, it forms another iſland on this ſide; ſo that, excepting theſe two places, the whole city is entirely ſurrounded by ſalt water. To the eaſtward it has a communication by means of a wooden bridge, with a large ſuburb called *Xemani*, built on another iſland, which is alſo joined to the continent by a bridge of the ſame materials. The fortifications both of the city and ſuburbs are built after the modern manner, and lined with free-ſtone; and, in time of peace, the garriſon conſiſts of ten companies of 77 men each, beſides militia. The city and ſuburbs are well laid out, the ſtreets ſtraight, broad, uniform, and well paved. All the houſes are built of ſtone or brick, only one ſtory high, well contrived, neat, and furniſhed with balconies and lattices of wood, which is more durable in that climate than iron, the latter being ſoon corroded by the acrimonious quality of the atmoſphere. The climate is exceedingly unhealthy. The Europeans are particularly ſubject to the terrible diſeaſe called the *black vomit*, which ſweeps off multitudes annually on the arrival of the galleons. It ſeldom continues above three or four days; in which time the patient is either dead or out of danger, and if he recovers is never ſubject to a return of the ſame diſtemper. —This diſeaſe has hitherto foiled all the art of the Spaniſh phyſicians; as has alſo the leproſy, which is very common here. At Carthagena, likewiſe, that painful tumour in the legs, occaſioned by the entrance of the *Dracunculus* or Guinea-worm, is very common and troubleſome. Another diſorder peculiar to this country, and to Peru, is occaſioned by a little inſect called *Nigua*, ſo extremely minute, as ſcarce to be viſible to the naked eye. This inſect breeds in the duſt, inſinuates itſelf into the ſoles of the feet and the legs, piercing the ſkin with ſuch ſubtilty, that there is no being aware of it, before it has made its way to the fleſh. If it is perceived in the beginning, it is extracted with little pain; but having once lodged its head, and pierced the ſkin, the patient muſt undergo the pain of an inciſion, without which a nodus would be formed, and a multitude of inſects ingendered, which would ſoon overſpread the foot and leg. One ſpecies of the *nigua* is venomous; and when it enters the toe, an inflammatory ſwelling, greatly reſembling a venereal bubo, takes place in the groin.

CARTHAGENA, a ſea-port town of Spain in the kingdom of Murcia, and capital of a territory of the ſame name; built by Aſdrubal, a Carthaginian general, and named after Carthage. It has the beſt harbour in all Spain, but nothing elſe very conſiderable; the biſhop's ſee being transferred to Toledo. In 1706 it was taken by Sir John Leak; but the Duke of Berwick retook it afterwards. W. Long. 0. 58. N. Lat. 37. 36.

CARTHAMUS, in botany: a genus of the order of polygamia æqualis, belonging to the ſyngeneſia claſs of plants, and in the natural method ranking under the 49th order, *Compoſitæ*. The calyx is ovate, imbricated with ſcales, cloſe below, and augmented with ſubovate foliaceous appendices at top.—Of this genus there are nine ſpecies; but the only remarkable one is the tinctorius, with a ſaffron-coloured flower. This is a native of Egypt and ſome of the warm parts of Aſia. It is at preſent cultivated in many parts of Europe, and alſo in the Levant, from whence great quantities of it are annually imported into Britain for the purpoſes of dyeing and painting. It is an annual plant, and riſes with a ſtiff ligneous ſtalk, about two feet and a half or three feet in height, dividing upwards into many branches, garniſhed with oval pointed leaves ſitting cloſe to the branches. The flowers grow ſingle at the extremity of each branch; the heads of the flowers are large, incloſed in a ſcaly impalement; each ſcale is broad at the baſe, flat and formed like a leaf of the plant, terminating in a ſharp ſpine. The lower part of the empalement ſpreads open; but the ſcales above cloſely embrace the florets, which are of a fine ſaffron colour, and are the part uſed for the purpoſes abovementioned. The good quality of this commodity is in the colour, which is of a bright ſaffron hue: and in this the Britiſh carthamus very often fails; for if there happens much rain during the time the plants are in flower, the flowers change to a dark or dirty yellow, as they likewiſe do if the flowers are gathered with any moiſture remaining upon them.—The plants are propagated by ſeeds, which ſhould be ſown in drills, at two feet and a half diſtance from one another, in which the ſeed ſhould be ſcattered ſingly. The plants will appear in leſs than a month; and in three weeks or a month after, it will be proper to hoe the ground; at which time the plants ſhould be left ſix inches diſtant: after this they will require a ſecond hoeing; when they muſt be thinned to the diſtance at which they are to remain. If after this they are hoed a third time, they will require no farther care till they come to flower; when, if the ſafflower is intended for uſe, the florets ſhould be cut off from the flowers as they come to perfection: but this muſt be performed when they are perfectly dry; and then they ſhould be dried in a kiln with a moderate fire, in the ſame manner as the true ſaffron But in thoſe flowers which are propagated for ſeed, the florets muſt be cut off, or the ſeeds will prove abortive.—The ſeeds of carthamus have been celebrated as a cathartic; but they operate very ſlowly, and for the moſt part diſorder the ſtomach and bowels, eſpecially when given in ſubſtance: triturated with diſtilled aromatic waters, they form an emulſion leſs offenſive, yet inferior in efficacy to the more common purgatives. They are eaten by a ſpecies of Egyptian parrot, which is very fond of them; to other birds or beaſts they would prove a mortal poiſon.

CARTHUSIANS, a religious order founded in the year 1080, by one Brudo. The Carthuſians, ſo called from the deſert *Chartreux*, the place of their inſtitution, are remarkable for the auſterity of their rule. They are not to go out of their cells, except to church, without leave of their ſuperior; nor ſpeak to any perſon without leave. They muſt not keep any portion of their meat or drink till next day; their beds are of ſtraw, covered with a felt; their cloathing two hair-cloths, two cowls, two pair of hoſe, and a cloke, all coarſe. In the refectory, they are to keep their eyes on the diſh, their hands on the table, their attention on the reader, and their hearts fixed on God. Women are not allowed to come into their churches. It is computed that there are 172 houſes of Carthuſians; whereof five are of *Nuns*, who practiſe the ſame auſterities as the Monks. They are divided into 16 provinces, each of which has two viſitors. There have been ſeveral canonized ſaints of this order, four cardinals, 70 archbiſhops and biſhops, and a great many very learned writers.

CARTHUSIAN Powder, the ſame with kermes-mineral. See KERMES.

CARTILAGE, in anatomy, a body approaching to the nature of bones; but lubricous, flexible, and elaſtic. See ANATOMY.

CARTILAGINOUS, in ichthyology, a title given to all fiſh whoſe muſcles are ſupported by cartilages inſtead of bones; and comprehends the ſame genera of fiſh to which Linnæus has given the name of *amphibia nantes*: but the word *amphibia* ought properly to be confined to ſuch animals as inhabit both elements; and can live, without any inconvenience, for a conſiderable time, either on land, or in water; ſuch as tortoiſes, frogs, and ſeveral ſpecies of lizards; and, among the quadrupeds, hippopatami, *&c. &c.*

Brit. Zool. III. 75.

Many of the cartilaginous fiſh are viviparous, being excluded from an egg, which is hatched within them. The egg conſiſts of a white and a yolk; and is lodged in a caſe formed of a thick tough ſubſtance, not unlike ſoftened horn; ſuch are the eggs of the *ray* and *ſhark* kinds. Some again differ in this reſpect, and are oviparous; ſuch are the *ſturgeon*, and others.

They breathe either through certain apertures beneath, as in the *rays*; on the ſides, as in the *ſharks*, &c. or on the top of the head, as in the *pipe-fiſh*: for they have not covers to their gills like the bony fiſh.

CARTMEL, a town of Lancaſhire in England. It is ſeated among the hills called Carmel-fells, not far from the ſea, and near the river Kent; adorned with a very handſome church, built in the form of a croſs like a cathedral. The market is well ſupplied with corn, ſheep, and fiſh. W. Long. 2. 43. N. Lat. 54. 15.

CARTON, or CARTOON, in painting, a deſign drawn

drawn on ſtrong paper, to be afterwards calked through, and transferred on the freſh plaſter of a wall to be printed in freſco. It is alſo uſed for a deſign coloured, for working in Moſaic, tapeſtry, *&c.* The word is from the Italian *Cartoni*, *(carti* " paper," and *oni* " large,") denoting many ſheets of paper paſted on canvas, on which large deſigns are made, whether coloured or with chalks only. Of theſe many are to be ſeen at Rome, particularly by Domenichino. Thoſe by Andrea Mantegna, which are at Hampton Court, were made for paintings in the old ducal palace at Mantua. But the moſt famous performances of this ſort are,

The *Cartoons of Raphael*, ſo deſervedly applauded throughout Europe by all authors of refined taſte, and all true admirers of the art of deſign, for their various and matchleſs merit, particularly with regard to the invention, and to the great and noble expreſſion of ſuch a variety of characters, countenances, and moſt expreſſive attitudes, as they are differently affected and properly engaged in every compoſition. Theſe cartoons are ſeven in number, and form only a ſmall part of the ſacred hiſtorical deſigns executed by this great artiſt, while engaged in the chamber of the Vatican under the auſpices of Popes Julius II. and Leo X. When finiſhed, they were ſent to Flanders, to be copied in tapeſtry, for adorning the pontifical apartments: which tapeſtries were not ſent to Rome till ſeveral years after the deceaſe of Raphael, and even in all probability were not finiſhed and ſent there before the terrible ſack of that city in the time of Clement VII. when Raphael's ſcholars were fled from thence, and none left to enquire after the original Cartoons, which lay neglected in the ſtore-rooms of the manufactory. The great revolution alſo which followed in the Low-Countries prevented their being noticed amidſt the entire neglect of the works of art. It was therefore a moſt fortunate circumſtance that theſe ſeven eſcaped the wreck of the others, which were torn in pieces, and remain diſperſed as fragments in diffeřnt collections. Theſe ſeven were purchaſed by Rubens for Charles I. and they have been ſo roughly handled from the firſt, that holes were pricked for the weavers to pounce the outlines, and other parts almoſt cut through in tracing alſo. In this ſtate perhaps they as fortunately eſcaped the ſale amongſt the royal collection, by the diſproportioned appraiſement of theſe ſeven at 300l. and the nine pieces, being the Triumph of Julius Cæſar, by Andrea Mantegna, appraiſed at 1000l. They ſeen to have been taken ſmall notice of till King William built a gallery, purpoſely to receive them, at Hampton Court; whence they were moved on their ſuffering from damps, to the Qeen's Palace. They are now at Windſor Caſtle, and open to public inſpection.

CARTOUCHE, in architecture and ſculpture, an ornament repreſenting a ſcroll of paper. It is uſually a flat member, with wavings, to repreſent ſome inſcription, device, cipher, or ornament of armoury. They are in architecture, much the ſame as modillions; only theſe are ſet under the cornice in wainſcotting, and thoſe under the cornice at the eaves of a houſe.

Cartouche, in the military art, a caſe of wood, about three inches thick at the bottom, girt with marlin, holding about four hundred muſket-balls, beſides ſix or eight balls of iron, of a pound weight, to be fired out of a hobit, for the defence of a paſs, *&c.*

A cartouche is ſometimes made of a globular form, and filled with a ball of a pound weight; and ſometimes it is made for the guns, being of a ball of half or quarter a pound weight, according to the nature of the gun, tied in form of a bunch of grapes, on a tompion of wood and coated over. Theſe were made in the room of partridge-ſhot.

CARTRIDE, in the military art, a caſe of paſteboard or parchment, holding the exact charge of a fire-arm. Thoſe for muſkets, carabines, and piſtols, hold both the powder and ball for the charge; and thoſe of cannon and mortars are uſually in caſes of paſteboard or tin, ſometimes of wood, half a foot long, and adapted to the caliber of the piece.

Cartridge-Box, a caſe of wood or turned iron, covered with leather, holding a dozen muſket-cartridges. It is wore upon a belt, and hangs a little lower than the right pocket-hole.

CARTWRIGHT, (William) an eminent divine and poet, born at Northway, near Tewkſbury, in Goueeſterſhire, in September 1611. He finiſhed his education at Oxford; afterwards went into holy orders, and became a moſt florid preacher in the univerſity. In 1642, he had the place of ſuccentor in the church of Saliſbury; and, in 1643, was choſen junior proctor in the univerſity. He was alſo metaphyſical reader there. Wit, judgment, elocution, a graceful perſon and behaviour, occaſioned that encomium of him from dean Fell, " That he was the utmoſt that " man could come to." He was an expert linguiſt; an excellent orator; and at the ſame time was eſteemed an admirable poet. There are extant of his, four plays, and ſome poems. He died in 1643, aged 33.

CARVAGE, *carvagium*, the ſame with Carrucage.

Henry III. is ſaid to have taken carvage, that is two marks of ſilver of every knight's fee, towards the marriage of his ſiſter Iſabella to the emperor. Carvage could only be impoſed on the tenants *in capite.*

Carvage alſo denotes a privilege whereby a man is exempted from the ſervice of carrucage.

CARUCATURIUS, in ancient law books, he that held land in ſoccage, or by plough tenure.

CARUCATE. See Carrucate.

CARVER, a cutter of figures or other devices in wood. See Carving.

Carvers anſwer to what the Romans called *ſculptores*, who were different from *cælotores*, or engravers, as theſe laſt wrought in metal.

Carver is alſo an officer of the table, whoſe buſineſs is to cut up the meat, and diſtribute it to the gueſts. The word is formed from the Latin *carptor*, which ſignifies the ſame. The Romans alſo called him *carpus*, ſometimes *ſciſſor*, *ſcindendi magiſter*, and *ſtructor.*

In the great families at Rome, the carver was an officer of ſome figure. There were maſters to teach them the art regularly, by means of figures of animals cut in wood. The Greeks alſo had their carvers, called διατροι, q. d. *deribitores* or *diſtributors.* In the primitive times, the maſter of the feaſt carved for all his gueſts. Thus in Homer, when Agamemnon's ambaſſadors were entertained at Achilles's table, the hero himſelf carved the meat. Of later times, the ſame office on ſolemn occaſions was executed by ſome of the chief men of Sparta. Some derive the cuſtom of diſtributing to every gueſt his portion, from thoſe early ages when the Greeks firſt left off feeding on acorns, and learned the uſe of corn: The new diet was ſo great a delicacy, that to prevent the gueſts from quarrelling about it, it was found neceſſary to make a fair diſtribution.

In Scotland, the king has a hereditary carver in the family of Anſtruther.

CARUI, or CARVI, in botany. See CARUM.

CARVING, in a general ſenſe, the art or act of cutting or faſhioning a hard body by means of ſome ſharp inſtrument, eſpecially a chiſſel. In this ſenſe carving includes ſtatuary and engraving, as well as cutting in wood.

CARVING, in a more particular ſenſe, is the art of engraving or cutting figures in wood. In this ſenſe *carving*, according to Pliny, is prior both to ſtatuary and painting.

To carve a figure or deſign, it muſt be firſt drawn or paſted on the wood; which done, the reſt of the block, not covered by the lines of the deſign, are to be cut away with little narrow-pointed knives. The wood fitteſt for the uſe is that which is hard, tough, and cloſe, as beech, but eſpecially box: to prepare it for drawing the deſign on, they waſh it over with white-lead tempered in water; which better enables it either to bear ink or the crayon, or even to take the impreſſion by chalking. When the deſign is to be paſted on the wood, this whitening is omitted, and they content themſelves with ſeeing the wood well planed. Then wiping over the printed ſide of the figure with gum tragacanth diſſolved in water, they clap it ſmooth on the wood, and let it dry; which done, they wet it ſlightly over, and fret off the ſurface of the paper gently, till all the ſtrokes of the figure appear diſtinctly. This done, they fall to cutting or carving, as above.

CARUM, in botany: a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The fruit is ovate, oblong, and ſtriated; the involucrum monophyllous; the petals are carinated or keel-ſhaped below, and emarginated by their inflection.

Species, &c. 1. The carui, or caraway of the ſhops, grows naturally in many places of Britain. It is a biennial plant, which riſes from ſeeds one year, flowers the next, and periſhes ſoon after the ſeeds are ripe. It hath a taper root like a parſnip, but much ſmaller, which runs deep into the ground, ſending out many ſmall fibres, and hath a ſtrong aromatic taſte. From the root ariſes one or two ſmooth, ſolid, channelled ſtalks, about two feet high, garniſhed with winged leaves, having long naked foot-ſtalks. 2. The hiſpanicum is alſo a biennial, and is a native of Spain. It riſes with a ſtronger ſtalk than the former, which ſeldom grows more than a foot and a half high; but is cloſely garniſhed with fine narrow leaves like thoſe of dill. Both theſe plants are propagated by ſeeds which ought to be ſown in autumn. Sheep, goats, and ſwine, eat this plant; cows and horſes are not fond of it. Parkinſon ſays, the young roots of caraway are better eating than parſnips. The tender leaves may be boiled with pot herbs. The ſeeds have an aromatic ſmell, and a warm pungent taſte. They are uſed in cakes, incruſted with ſugar, as ſweet-meats, and diſtilled with ſpirituous liquors, for the ſake of the flavour they afford. They are in the number of the four greater hot ſeeds; and frequently employed, as a ſtomachic and carminatives, in flatulent colics and the like.

CARUNCULA, or CARUNCLE, in anatomy, a term denoting a little piece of fleſh, and applied to ſeveral parts of the human body. Thus,

CARUNCULÆ *Myrtiforms*, in anatomy, fleſhy knobs about the ſize of a myrtle berry, ſuppoſed to owe their origin to the breaking of the hymen. See ANATOMY, n° 108.

CARUNCLES in the urethra, proceeding from a gonorrhœa, or an ulceration of the urethra, may be reduced by introducing the BOUGIE.

CARUS, a ſudden deprivation of ſenſe and motion, affecting the whole body. See (the *Index* ſubjoined to) MEDICINE.

CARUS, (Marcus Aurelius) was raiſed from a low ſtation, by his great merit, to be emperor of Rome in 282. He ſhowed himſelf worthy of the empire; ſubdued its enemies, and gave the Romans a proſpect of happy days, when he was unfortunately killed by lightning in 284.

CARWAR, a town of Aſia, on the coaſt of Malabar in the Eaſt-Indies, and where the Engliſh Eaſt-India company have a factory, fortified with two baſtions. The valleys about it abound in corn and pepper, which laſt is the beſt in the Eaſt-Indies. The woods on the mountains abound with quadrupeds, ſuch as tygers, wolves, monkeys, wild hogs, deer, elks, and a ſort of beeves of a prodigious ſize. The religion of the natives is Paganiſm; and they have a great many ſtrange and ſuperſtitious cuſtoms. E. Long. 73. 7. N. Lat. 15. 0.

CAYRA-AE, (Stephanus); *Caryæ, arum*, (Pauſanias) a town of Laconia, between Sparta and the borders of Meſſenia: where ſtood a temple of Diana, thence called *Caryatis, idis*; whoſe annual feſtival, called *Carya, orum*, was celebrated by Spartan virgins with dances. An inhabitant, *Caryates*, and *Caryatis*; *Caryatis apis* a Laconian bee, (Stephanus.)

CARYAE-arum, (anc. geog.) a place in Arcadia towards the borders of Laconia. Whether from this of Arcadia, or that of Laconia, the *Columnæ Caryatides* of Vitruvius and Pliny (which were ſtatues of matrons in ſtoles or long robes) took the appellation, is diſputed.

CARY, (Lucius) Lord viſcount Falkland, was born in Oxfordſhire, about the year 1610; a young nobleman of great abilities and accompliſhments. About the time of his father's death 1633, he was made gentleman of the privy chamber to king Charles I. and afterwards ſecretary of ſtate. Before the aſſembling of the long parliament, he had devoted himſelf to literature, and every pleaſure which a fine genius, a generous diſpoſition, and an opulent fortune, could afford: when called into public life, he ſtood foremoſt in all attacks on the high prerogatives of the crown; but when civil convulſions came to an extremity, and it was neceſſary to chooſe a ſide, he tempered his zeal, and defended the limited powers that remained to monarchy. Still anxious however for his country, he ſeems to have dreaded equally the proſperity of the royal party, or that of the parliament; and among his intimate friends, often ſadly reiterated the word *peace*. This excellent nobleman freely expoſed his perſon for the king in all hazardous enterprizes, and was killed in the 34th year of his age at the battle of Newberry. In Welwood's memoirs we are told, that whilſt he was with the king at Oxford, his majeſty went one day to ſee the public library, where he was ſhown among other books a Virgil, nobly printed, and exquiſitely bound. The lord Falkland, to divert the king, would have his majeſty make a trial of his fortune by the Sortes Virgilianæ, an uſual kind of divination in ages paſt, made by opening a Virgil. The king opening the book, the paſſage which happened to come up, was that part of Dido's imprecation againſt Æneas, iv. 615, &c. which is thus tranſlated by Dryden.

“ Oppreſs'd with numbers in th' unequal field,
“ His men diſcourag'd, and himſelf expell'd;
“ Let him for ſuccour ſue from place to place,
“ Torn from his ſubjects and his ſon's embrace,” &c.

King Charles ſeeming concerned at this accident, the lord Falkland, who obſerved it, would likewiſe try his own fortune in the ſame manner; hoping he might fall upon ſome paſſage that could have no relation to his caſe, and thereby divert the king's thoughts from any impreſſion the other might make upon him: but the place lord Falkland ſtumbled upon was yet more ſuited to his deſtiny than the other had been to the king's; being the following expreſſions of Evander, upon the untimely death of his ſon Pallas, Æn. xi. 152.

“ O Pallas! thou haſt fail'd thy plighted word.
“ To fight with caution, not to tempt the ſword,
“ I warn'd thee, but in vain: for well I knew
“ What perils youthful ardour would purſue;
“ That boiling blood would carry thee too far;
“ Young as thou wert in dangers, raw to war.
“ O curſt eſſay of arms, diſaſt'rous doom,
“ Prelude of bloody fields and fights to come!”

He wrote ſeveral things, both poetical and political; and in ſome of the king's declarations, ſuppoſed to be penned by lord Falkland, we find the firſt regular definition of the Engliſh conſtitution that occurs in any compoſition publiſhed by authority. His predeceſſor, the firſt viſcount Cary, was ennobled for being the firſt who gave king James an account of queen Elizabeth's death.

Cary, (Robert) a learned Engliſh chronologer, born in Devonſhire about the year 1615. On the reſtoration, he was preferred to the archdeaconry of Exeter; but on ſome pretext was ejected in 1664, and ſpent the reſt of his days at his rectory of Portlemouth, where he died in 1688. He publiſhed *Palælogia Chronica*, a chronology of ancient times, in three parts, didactical, apodeictical, and canonical; and tranſlated the hymns of the church into Latin verſe.

CARYATES, in antiquity, a feſtival in honour of Diana ſurnamed *Caryatis*, held at Caryum, a city of Laconia. The chief ceremony was a certain dance, ſaid to have been invented by Caſtor and Pollux, and performed by the virgins of the place. During Xerxes's invaſion, the Laconians not daring to appear and celebrate the cuſtomary ſolemnity, to prevent incurring the anger of the goddeſs by ſuch an intermiſſion, the neighbouring ſwains are ſaid to have aſſembled and ſung paſtorals or *bucoliſmi*, which is ſaid to have been the origin of *bucolic* poetry.

CARYATIDES, or Caraites. See Architecture, n° 56.

CARYL, (Joſeph) a divine of the laſt century, bred at Oxford, and ſome time preacher to the ſociety of Lincoln's inn, an employment he filled with much applauſe. He became a frequent preacher before the long parliaments, a licenſer of their books, one of the aſſembly of divines, and one of the triers for the approbation of miniſters; in all which capacities he ſhewed himſelf a man of conſiderable parts and learning, but with great zeal againſt the king's perſon and cauſe. On the reſtoration of Charles II. he was ſilenced by the act of uniformity, and lived privately in London, where, beſides other works, he diſtinguiſhed himſelf by a laborious *Expoſition of the Book of Job*; and died in 1672.

CARYLL, (John) a late Engliſh poet, was of the Roman Catholic perſuaſion, being ſecretary to queen Mary the wife of James II. and one who followed the fortunes of his abdicating maſter; who rewarded him, firſt with knighthood, and then with the honorary titles of earl Caryll and baron Dartford. How long he continued in that ſervice is not known; but he was in England in the reign of queen Anne, and recommended the ſubject of the “Rape of the Lock” to Mr Pope, who at its publication addreſſed it to him. He was alſo the intimate friend of Pope's “Unfortunate Lady.” He was the author of two plays: 1. “The Engliſh Princeſs, or the Death of Richard III. 1667,” 4to.; 2. “Sir Salomon, or the Cautious Coxcomb, 1671,” 4to.; and in 1700, he publiſhed “The Pſalms of David, tranſlated from the Vulgat,” 12mo. In Tonſon's edition of Ovid's Epiſtles, that of “Briſeis to Achilles” is ſaid to be by Sir John Caryll; and in Nichols's Select Collection of Miſcellany Poems, vol. II. p. 1. the firſt Eclogue of Virgil is tranſlated by the ſame ingenious poet. He was living in 1717, and at that time muſt have been a very old man. See three of his letters in the “Additions to Pope,” vol. II. p. 114.

CARYOCAR, in botany: A genus of the tetragynia order, belonging to the polyandria claſs of plants. The calyx is quinquepartite, the petals five, the ſtyles more frequently four. The fruit is a plum, with necleuſſes, and four furrows netted.

CARYOPHYLLÆI, in botany, the name of a very numerous family or order in Linnæus's fragments of a natural method: containing, beſides the claſs of the ſame name in Tournefort, many other plants, which from their general appearance ſeem pretty nearly allied to it. The following are the genera, *viz.* Agroſtema, Cucubalus, Dianthus, Drypis, Gypſophila, Lychnis, Saponaria, Silene, Velazia, Alſine, Arenaria, Bufonia, Ceraſtium, Cherleria, Glinus, Holeſteum, Leoflingia, Moehringia, Polycarpon, Sagina, Spergula, Stellaria, Minuartia, Mollugo, Ortegia, Pharnaceum, Queria. All the plants of this order are herbaceous, and moſtly annual. Some of the creeping kinds do not riſe an inch, and the talleſt exceed not ſeven or eight feet. See BOTANY, ſect. vi. 22.

CARYOPHYLLUS, the PINK, in botany. See DIANTHUS.

CARYOPHYLLUS, the CLOVE-TREE, in botany: A genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 19th order, *Heſperideæ*. The corolla is tetrapetalous; the calyx tetraphyllous; the berry monoſpermous below the receptacle of the flower. Of this there is but one ſpecies, viz. the aromaticus, which is a native of the Molucca iſlands, particularly of Amboyna, where it is principally cultivated. The clove-tree reſembles, in its bark, the olive; and is about the height of the laurel, which it alſo reſembles in its leaves. No verdure is ever ſeen under it. It has a great number of branches, at the extremities of which are produced vaſt quantities of flowers, that are firſt white, then green, and at laſt pretty red and hard. When they arrive at this degree of maturity, they are, properly ſpeaking, *cloves*. As they dry, they aſſume a dark yellowiſh caſt; and, when gathered, become of a deep brown. The ſeaſon for gathering the cloves is from October to February. The boughs of the trees are then ſtrongly ſhaken, or the cloves beat down with long reeds. Large cloths are ſpread to receive them, and they are aftewards either dried in the ſun or in the ſmoke of the bamboo-cane. The cloves which eſcape the notice of thoſe who gather them, or are purpoſely left upon the tree, continue to grow till they are about an inch in thickneſs; and theſe falling off, produce new plants, which do not bear in leſs than eight or nine years. Thoſe which are called *mother-cloves* are inferior to the common ſort; but are preſerved in ſugar by the Dutch; and, in long voyages, eat after their meals, to promote digeſtion.

The clove, to be in perfection, muſt be full ſized, heavy, oily, and eaſily broken; of a fine ſmell, and of a hot aromatic taſte, ſo as almoſt to burn the throat. It ſhould make the fingers ſmart when handled, and leave an oily moiſture upon them when preſſed. In the Eaſt Indies, and in ſome parts of Europe, it is ſo much admired as to be thought an indiſpenſable ingredient in almoſt every diſh. It is put into their food, liquors, wines, and enters likewiſe the compoſition of their perfumes. Conſidered as medicines, cloves are very hot, ſtimulating, aromatics; and poſſeſs in an eminent degree the general virtues of ſubſtances of this claſs. Their pungency reſides in their reſin; or rather in a combination of reſin with eſſential oil: for the ſpirituous extract is very pungent; but if the oil and the reſin contained in this extract are ſeparated from each other by diſtillation, the oil will be very mild; and any pungency which it does retain, proceeds from ſome ſmall portion of adhering reſin, and the remaining reſin will be inſipid. No plant, or part of any plant, contains ſuch a quantity of oil as cloves do. From 16 ounces Newman obtained by diſtillation two ounces and two drams, and Hoffman obtained an ounce and a half of oil from two ounces of the ſpice. The oil is ſpecifically heavier than water. Cloves acquire weight by imbibing water; and this they will do at ſome conſiderable diſtance. The Dutch, who trade in cloves, make a conſiderable advantage by knowing this ſecret. They ſell them always by weight; and when a bag of cloves is ordered, they hang it, for ſeveral hours before it is ſent in, over a veſſel of water, at about two feet diſtance from the ſurface. This will add many pounds to the weight, which the unwary purchaſer pays for on the ſpot. This is ſometimes practiſed in Europe, as well as in the ſpice iſlands: but the degree of moiſture muſt be more carefully watched in the latter; for there a bag of cloves will, in one night's time, attract ſo much water, that it may be preſſed out of them by ſqueezing them with the hand.

The clove-tree is never cultivated in Europe. At Amboyna the company have allotted the inhabitants 4000 parcels of land, on each of which they were at firſt allowed, and about the year 1720 compelled, to plant about 125 trees, amounting in all to 500,000. Each of theſe trees produces annually on an average more than two pounds of cloves; and conſequently the collective produce muſt weigh more than a million. The cultivator is paid with the ſpecie that is conſtantly returned to the company, and receives ſome unbleached cottons which are brought from Coromandel.

CARYOTA, in botany: A genus belonging to the natural order of *Palmæ*. The male calyx is common, the corolla tripartite; the ſtamina very numerous: the female calyx the ſame; the corolla tripertite; one peſtil, and a diſpermous berry.

CASA, in ancient and middle-age writers, is uſed to denote a cottage or houſe.

CASA Santa, denotes the chapel of the holy virgin at Loretto.—The *Santa Caſa* is properly the houſe, or rather chamber, in which the bleſſed virgin is ſaid to have been born, where ſhe was betrothed to her ſpouſe Joſeph, where the angel ſaluted her, the Holy Ghoſt overſhadowed her, and by conſequence where the Son of God was conceived or incarnated. Of this building the Catholics tell many wonderful ſtories too childiſh to tranſcribe. The *Santa Caſa* or holy chamber conſiſts of one room, forty-four ſpans long, eighteen broad, and twenty-three high. Over the chimney, in a niche, ſtands the image called the great *Madona* or Lady, four feet high, made of cedar, and, as they ſay, wrought by St Luke, who was a carver as well as a phyſician. The mantle or robe ſhe has on, is covered with innumerable jewels of ineſtimable value. She has a crown, given her by Louis XIII. of France, and a little crown for her ſon.

CASAL, a ſtrong town of Italy in Mountſerrat, with a citadel and a biſhop's ſee. It was taken by the French from the Spaniards in 1640; and the duke of Mantua ſold it to the French in 1681. In 1695 it was taken by the allies, who demoliſhed the fortifications; but the French retook it, and fortified it again. The king of Sardinia became maſter of it in 1706, from whom the French took it in 1745; however, the king of Sardinia got poſſeſſion again in 1746. It is ſeated on the river Po, in E. Long. 8. 37. N. Lat. 54. 7.

CASAL-Maggiore, a ſmall ſtrong town of Italy, in the duchy of Milan, ſeated on the river Po. E. Long. 11. 5. N. Lat. 45. 6.

CASA-NOVA, (Marc Antony) a Latin poet, born at at Rome, ſucceeded particularly in epigrams. The poems he compoſed in honour of the illuſtrious men of Rome are alſo much eſteemed. He died in 1527.

CASAN, a conſiderable town of Aſia, and capital of a kingdom of the ſame name in the Ruſſian empire, with a ſtrong caſtle, a citadel, and an archbiſhop's ſee. The country about it is very fertile in all ſorts of fruits, corn, and pulſe. It carries on a great trade in furs, and furniſhes wood for the building of ſhips. The kingdom of Caſan is bounded on the north by Permia, on the eaſt by Siberia, on the ſouth by the river Wolga, and on the weſt by the province of Moſcow. E. Long. 53. 25. N. Lat. 55. 38.

CASAS, (Bartholomew de las) biſhop of Chiapa, diſtinguiſhed for his humanity and zeal for the converſion of the Indians, was born at Seville in 1474; and went with his father, who ſailed to America, with Chriſtopher Columbus in 1493. At his return to Spain he embraced the ſtate of an eccleſiaſtic, and obtained a curacy in the iſland of Cuba; but ſome time after quitted his cure in order to procure liberty for the Indians, whom he ſaw treated by the Spaniards in the moſt cruel and barbarous manner, which naturally gave them an unconquerable averſion to Chriſtianity. Bartholomew exerted himſelf with extraordinary zeal, for 50 years together, in his endeavours to perſuade the Spaniards that they ought to treat the Indians with equity and mildneſs; for which he ſuffered a number of perſecutions from his countrymen. At laſt the court, moved by his continual remonſtrances, made laws in favour of the Indians, and gave orders to the governors to obſerve them, and ſee them executed*. He died at Madrid in 1566, aged 92. He wrote ſeveral works, which breathe nothing but humanity and virtue. The principal of them are, 1. An account of the deſtruction of the Indies. 2. Several treatiſes in favour of the Indies, againſt Dr Sepulveda, who wrote a book to juſtify the inhuman barbarities committed by the Spaniards. 3. A very curious, and now ſcarce, work in Latin, on this queſtion, "Whether kings or princes can, conſiſtently with conſcience, or in virtue of any right or title, alienate their ſubjects, and place them under the dominion of another ſovereign?"

* See the article *Mexico*.

CASATI, (Paul) a learned Jeſuit, born at Placentia in 1617, entered early among the Jeſuits; and, after having taught mathematics and divinity at Rome, was ſent into Sweden to queen Chriſtina, whom he prevailed on to embrace the popiſh religion. He wrote, 1. *Vacuum proſcriptum*. 2. *Terra machinis mota*. 3. *Mechanicorum, libri octo*. 4. *De Igne Diſſertationes*; which is much eſteemed. 5. *De Angelis Diſputatio Theolog.* 6. *Hydroſtaticæ Diſſertationes*. 7. *Opticæ Diſputationes*: It is remarkable that he wrote this treatiſe on optics at 88 years of age, and after he was blind. He alſo wrote ſeveral books in Italian.

CASAUBON, (Iſaac) was born at Geneva in 1559; and Henry IV. appointed him his library-keeper in 1603. After this prince's death, he went into England with Sir Henry Wotton, ambaſſador from King James I. where he was kindly received and engaged in writing againſt Baronius's annals: he died not long after this, in 1614; and was interred in Weſtminſter-abbey, where a monument was erected to him. He was greatly ſkilled in the Greek and in criticiſm; publiſhed ſeveral valuable commentaries; and received the higheſt elogiums from all his cotemporaries.

CASAUBON, (Meric) ſon of the preceding, was born at Geneva in 1599. He was bred at Oxford, and took the degree of maſter of arts in 1621. The ſame year he publiſhed a book in defence of his father againſt the calumnies of certain Roman Catholics; which gained him the favour of King James I. and a conſiderable reputation abroad. He was made prebendary of Canterbury by archbiſhop Laud. In the beginning of the civil war he loſt all his ſpiritual promotions, but ſtill continued to publiſh excellent works. Oliver Cromwell, then lieutenant-general of the parliament's forces, would have employed his pen in writing the hiſtory of the late war; but he declined it, owning that his ſubject would oblige him to make ſuch reflections as would be ungrateful, if not injurious, to his lordſhip. Notwithſtanding this anſwer, Cromwell, ſenſible of his worth, ordered three or four hundred pounds to be paid him by a bookſeller in London whoſe name was Cromwell, on demand, without requiring from him any acknowledgment of his benefactor. But this offer he rejected, though his circumſtances were then mean. At the ſame time it was propoſed by his friend Mr Greaves, who belonged to the library at St James's, that, if Caſaubon would gratify Cromwell in the requeſt abovementioned, all his father's books which were then in the royal library, having been purchaſed by King James, ſhould be reſtored to him, and a penſion of 300 *l.* a-year paid to the family as long as the youngeſt ſon of Dr Caſaubon ſhould live; but this alſo was refuſed. He likewiſe refuſed handſome offers from Chriſtina queen of Sweden, being determined to ſpend the remainder of his life in England. At the reſtoration he recovered all his preferments, and continued writing till his death in 1671. He was the author of an Engliſh tranſlation of Marcus Aurelius Antoninus's meditations, and of Lucius Florus; editions of ſeveral of the claſſics, with notes; a treatiſe of uſe and cuſtom; a treatiſe of enthuſiaſm: with many other works; and he left a number of MSS. to the univerſity of Oxford.

CASAURINA, in botany: A genus of the monandria order, belonging to the monoecia claſs of plants. The male has the calyx of the amentum; the corolla a bipartite ſmall ſcale. The female has a calyx of the amentum, no corolla; the ſtyle bipartite.

CASCADE, a ſteep fall of water from a higher into a lower place. The word is French, formed of the Italian *caſcata*, which ſignified the ſame; of *caſcare, to fall*; and that from the Latin *cadere*.

Caſcades are either natural, as that at Tivoli, &c. or artificial, as thoſe of Verſailles, &c. and either falling with gentle deſcent, as thoſe of Sceaux; or in form of a buffet, as at Trianon; or down ſteps, in form of a perron, as at St. Clou; or from baſon to baſon, &c.

CASCAIS, a town of Eſtremadura in Portugal, ſituated at the mouth of the river Tagus, 17 miles eaſt of Liſbon. W. Long. 10. 15. N. Lat. 38. 40.

CASCARILLA. See CLUTIA and CROTON.

CASE, among grammarians, implies the different inflections or terminations of nouns, ſerving to expreſs the different relations they bear to each other, and to the things they repreſent. See GRAMMAR.

CASE alſo denotes a receptacle for various articles; as a caſe of knives, of lancets, of piſtols, &c.

CASE, in printing, a large flat oblong frame placed aſlope, divided into ſeveral compartments or little ſquare cells; in each of which are lodged a number of types or letters of the ſame kind, whence the compoſitor takes them out, each as he needs it, to compoſe his matter. See PRINTING.

CASE is alſo uſed for a certain numerous quantity of divers things. Thus a caſe of crown-glaſs contains uſually 24 tables, each table being nearly circular, and about three feet ſix inches diameter; of Newcaſtle glaſs, 35 tables; of Normandy glaſs, 25.

CASE-Hardening of Iron, is a ſuperficial converſion of that metal into ſteel, by the ordinary method of converſion, namely by cementation with vegetable or animal coals. This operation is generally practiſed upon ſmall pieces of iron wrought into tools and inſtruments to which a ſuperficial converſion is ſufficient; and it may be performed conveniently by putting the pieces of iron to be caſe-hardened, together with the cement, into an iron box, which is to be cloſely ſhut and expoſed to a red heat during ſome hours. By this cementation a certain thickneſs from the ſurface of the iron will be converted into ſteel, and a proper hardneſs may be afterwards given by ſudden extinction of the heated pieces of converted iron in a cold fluid. See STEEL.

CASE-Shot, in the military art, muſket-balls, ſtones, old iron, &c. put into caſes, and ſhot out of great guns.

CASEMENT, or CASEMATE, in architecture, a hollow moulding, which ſome architects make one-ſixth of a circle, and others one-fourth.

CASEMENT is alſo uſed in building, for a little moveable window, uſually within a larger, being made to open or turn on hinges.

CASERN, in fortification, lodgings built in garriſon-towns, generally near the rampart, or in the waſte places of the town, for lodging ſoldiers of the garriſon. There are uſually two beds in each caſern for ſix ſoldiers to lie, who mount the guard alternately; the third part being always on duty.

CASERTA, an epiſcopal town of Italy in the kingdom of Naples, and in the Terra di-Lavoro, with the title of a duchy, ſeated at the foot of a mountain of the ſame name, in E. Long. 15. 5. N. Lat. 41. 5.

CASES, (Peter-James) of Paris, the moſt eminent painter of the French ſchool; the churches of Paris and of Verſailles abound with his works. He died in 1754, aged 79.

CASH, in a commercial ſtyle, ſignifies the ſtock or ready money which a merchant or other perſon has in his preſent diſpoſal to negociate; ſo called from the French term *caiſſe*, i. e. *cheſt* or *coffer* for the keeping of money.

M. Savary ſhows that the management of the caſh of a company is the moſt conſiderable article, and that whereon its good or ill ſucceſs chiefly depends.

CASH-Book. See BOOK-KEEPING.

CASHEL, or CASHIL, a town of Ireland in the county of Tipperary, and province of Munſter, with an archbiſhop's ſee. The ruins of the old cathedral teſtify its having been an extenſive as well as handſome Gothic ſtructure, boldly towering on the celebrated rock of Caſhel, which taken together form a magnificent oject, and bear honourable teſtimony to the labour and ingenuity, as well as the piety and zeal, of its former inhabitants. It is ſeen at a great diſtance, and in many directions. Adjoining it are the ruins of the chapel of Cormac M'Culinan, at once king and archbiſhop of Caſhel, ſuppoſed to be the firſt ſtone building in Ireland; and ſeems, by its rude imitation of pillars and capitals, to have been copied after the Grecian architecture, and long to have preceded that which is uſually called *Gothic*. Cormac M'Culinan was a prince greatly celebrated by the Iriſh hiſtorians for his learning, piety, and valour. He wrote, in his native language, a hiſtory of Ireland, commonly called the *Pſalter of Caſhel*, which is ſtill extant, and contains the moſt authentic account we have of the annals of the country to that period, about the year 900. On the top of the rock of Caſhel, and adjoining the cathedral, is a lofty round tower, which proudly defied the too ſucceſsful attempts of archbiſhop Price, who in this century unroofed and thereby demoliſhed the ancient cathedral founded by St Patrick. In the choir are the monuments of Myler Magrath, archbiſhop of this ſee in the reign of queen Elizabeth, and ſome other curious remains of antiquity. Caſhel was formerly the royal ſeat and metropolis of the kings of Munſter; and on the aſcent to the cathedral is a large ſtone on which every new king of Munſter was, as the inhabitants report from tradition, ſolemnly proclaimed. Caſhel is at preſent but ſmall to what we may ſuppoſe it to have been in ancient days. The archbiſhop's palace is a fine building. Here is a very handſome market houſe, a ſeſſions houſe, the county infirmary, a charter ſchool for twenty boys and the ſame number of girls, and a very good barrack for two companies of foot. The preſent archbiſhop Dr Agar hath finiſhed a very elegant church begun by his predeceſſor. W. Long. 7. 36. N. Lat. 52. 16.

CASHEW-NUT. See ANACARDIUM.

CASHIER, the caſh-keeper; he who is charged with the receiving and paying the debts of a ſociety.—In the generality of foundations, the caſhier is called *treaſurer*.

CASHIERS of the Bank, are officers who ſign the notes that are iſſued out, examine and mark them when returned for payment, &c.

CASHMIRE, a province of Aſia in the dominions of the Mogul. It is ſituated at the extremity of Hindoſtan, northward of Lahore, and is bounded on the one ſide by a ridge of the great Caucaſus, and on the other by the little Tartarian Thibet and Moultan. The extent of it is not very conſiderable; but being girt in by a zone of hills, and elevated very conſiderably above an arid plain, which ſtretches many miles around it, the ſcenes which it exhibits are wild and pictureſque. Rivers, hills, and valleys, charmingly diverſify the landſcape. Here, Mr Sullivan† informs us, a caſcade ruſhes from a foaming precipice; there a tranquil ſtream glides placidly along; the tinkling rill, too, ſounds amidſt the groves; and the feathered choriſters ſing the ſong of love, cloſe ſheltered in the glade.

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† *Philoſophical Rhapſodies.*

At what time Caſhmire came under the dominion of the Mogul government, and how long, and in what manner it was independent, before it was annexed to the territories of the houſe of Timur, are points that are beyond our preſent purpoſe. Though inconſiderable as to its revenues, it was uniformly held in the higheſt eſtimation by the emperors of Hindoſtan. Thither they repaired, in the plenitude of their greatneſs, when the affairs of ſtate would admit of their abſence; and there they diveſted themſelves of form and all the oppreſſive ceremony of ſtate. The royal manner of travelling to Caſhmire was grand, though tedious and unwieldy, and ſhowed, in an eminent degree, the ſplendour and magnificence of an eaſtern potentate. Aurungzebe, we are told, ſeldom began his march to that country, for a march certainly it was to be called, without an eſcort of 80,000 or 100,000 fighting men, beſides the gentlemen of his houſehold, the attendants of his ſeraglio, and moſt of his officers of ſtate. Theſe all continued with him during the time he was on the road, which generally was a month: but no ſooner was he arrived at the entrance of thoſe aërial regions, than, with a ſelect party of friends, he ſeparated from the reſt of his retinue, and with them aſcended the defiles which led him to his Eden.

The temperature of the air of Caſhmire, elevated as it is ſo much above the adjoining country, together with the ſtreams which continually pour from its mountains, enables the huſbandman to cultivate with ſucceſs the ſoil he appropriates to agriculture; whilſt the gardener's labour is amply repaid in the abundant produce of his fruit. In ſhort, nature wears her gayeſt cloathing in this enchanting ſpot. The rivers ſupply the inhabitants with almoſt every ſpecies of fiſh; the hills yield ſweet herbage for the cattle; the plains are covered with grain of different denominations; and the woods are ſtored with variety of game. The Caſhmireans, according to our author, ſeem a race diſtinct from all others in the Eaſt: their perſons are more elegant, and their complexions more delicate and more tinged with red.

On the decadence of the Mogul power in Hindoſtan, Caſhmire felt ſome of the ravages of war. It is now however in peace; and the inhabitants are deſirous of keeping it ſo. They are ſprightly and ingenious; and have ſeveral curious manufactures much valued in India. They are all Mahometans or Idolaters. Caſhmire is the capital town.

CASIMIR, the name of ſeveral kings of Poland. See *(Hiſtory of)* POLAND.

CASIMIR, (Matthias Sorbiewſki) a Poliſh Jeſuit, born in 1597. He was a moſt excellent poet; and is, ſays M. Baillet, an exception to the general rule of Ariſtotle and the other ancients, which teaches us to expect nothing ingenious and delicate from northern climates. His odes, epodes, and epigrams, have been thought not inferior to thoſe of the fineſt wits of Greece and Rome. Dr Watts has tranſlated one or two of his ſmall pieces, which are added to his Lyric Poems. He died at Warſaw in 1640, aged 43. There have been many editions of his poems, the beſt of which is that of Paris, 1759.

CASING *of* TIMBER-WORK, among builders, is the plaſtering the houſe all over the outſide with mortar, and then ſtriking it while wet by a ruler, with the corner of a trowel, to make it reſemble the joints of free-ſtone. Some direct it to be done upon heart-laths, becauſe the mortar would, in a little time, decay the ſap-laths; and to lay on the mortar in two thickneſſes, *viz.* a ſecond before the firſt is dry.

CASK, a piece of defenſive armour wherewith to cover the head and neck; otherwiſe called the *head-piece* and *helmet**. The word is French, *caſque*, from *caſſicum* or *caſſicus*, a diminutive of *caſſis* a helmet. Le Gendre obſerves, that anciently, in France, the gens d'arms all wore *caſks*. The king wore a *caſk* gilt; the dukes and counts ſilvered; gentlemen of extraction poliſhed ſteel; and the reſt plain iron.

The caſk is frequently ſeen on ancient medals, where we may obſerve great varieties in the form and faſhion thereof; as the Greek faſhion, the Roman faſhion, *&c.* F. Joubert makes it the moſt ancient of all the coverings of the head, as well as the moſt univerſal. Kings, emperors, and even gods themſelves, are ſeen therewith. That which covers the head of Rome has uſually two wings like thoſe of Mercury: and that of ſome kings is furniſhed with horns like thoſe of Jupiter Ammon; and ſometimes barely bulls or rams horns, to expreſs uncommon force.

CASK, in heraldry, the ſame with helmet. See HERALDRY, n° 45.

CASK, a veſſel of capacity, for preſerving liquors of divers kinds; and ſometimes alſo dry goods, as ſugar, almonds, *&c.*—A caſk of ſugar is a barrel of that commodity, containing from eight to eleven hundred weight. A caſk of almonds is about three hundred weight.

CASKET, in a general ſenſe, a little coffer or cabinet. See CABINET.

CASKETS, in the ſea language, are ſmall ropes made of ſinnet, and faſtened to gromets, or little rings upon the yards; their uſe is to make faſt the ſail to the yard when it is to be furled.

Biog. Brit. and *Anecdotes* of Bowyer, by Nichols.

CASLON, (William) eminent in an art of the greateſt conſequence to literature, the art of letter-founding, was born in 1692, in that part of the town of Hales Owen which is ſituated in Shropſhire. Tho' he juſtly attained the character of being the Coryphæus in that employment, he was not brought up to the buſineſs; and it is obſerved by Mr Mores, that this handy-work is ſo concealed among the artificers of it, that he could not diſcover that any one had taught it to another, but every perſon who had uſed it had learned it of his own genuine inclination. Mr Caſlon ſerved a regular apprenticeſhip to an engraver of ornaments on gun-barrels; and after the expiration of his term, carried on this trade in Vine-ſtreet, near the Minories. He did not, however, ſolely confine his ingenuity to that inſtrument; but employed himſelf likewiſe in making tools for the book-binders, and for the chaſing of ſilver plate. Whilſt he was engaged in this buſineſs, the elder Mr Bowyer accidentally ſaw, in a bookſeller's ſhop, the lettering of a book uncommonly neat; and enquiring who the artiſt was by whom the letters were made, was hence induced to ſeek an acquaintance with Mr Caſlon. Not long after, Mr Bowyer took Mr Caſlon to Mr James's foundery, in Bartholomew-cloſe. Caſlon had never before that time ſeen any part of the buſineſs; and being aſked by his friend, if he thought he could undertake to cut types,

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* See *Helmet.*

he requeſted a ſingle day to conſider the matter, and then replied that he had no doubt but he could. Upon this anſwer, Mr Bowyer, Mr Bettenham and Mr Watts had ſuch a confidence in his abilities, that they lent him 500l. to begin the undertaking, and he applied himſelf to it with equal aſſiduity and ſucceſs. In 1720, the ſociety for promoting Chriſtian knowledge, in conſequence of a repreſentation from Mr Solomon Negri, a native of Damaſcus in Syria, who was well ſkilled in the Oriental tongues, and had been profeſſor of Arabic in places of note, deemed it expedient to print, for the uſe of the Eaſtern churches, the New Teſtament and Pſalter in the Arabic language. Theſe were intended for the benefit of the poor Chriſtians in Paleſtine, Syria, Meſopotamia, Arabia, and Egypt, the conſtitution of which countries did not permit the exerciſe of the art of printing. Upon this occaſion Mr Caſlon was pitched upon to cut the fount; in his ſpecimens of which he diſtinguiſhed it by the name of Engliſh Arabic. Under the farther encouragement of Mr Bowyer, Mr Bettenham, and Mr Watts, he proceeded with vigour in his employment; and he arrived at length to ſuch perfection, that he not only freed England from the neceſſity of importing types from Holland, but in the beauty and elegance of thoſe made by him he ſo far exceeded the productions of the beſt artificers, that his workmanſhip was frequently exported to the Continent. In ſhort, his foundery became, in proceſs of time, the moſt capital one that exiſted in that or in any other country. Having acquired opulence in the courſe of his employment, he was put into the commiſſion of the peace for the county of Middleſex. Towards the latter end of his life, his eldeſt ſon being in partnerſhip with him, he retired in a great meaſure from the active execution of buſineſs. His death happened in January 1766.

CASPIAN SEA, a large lake of ſalt water in Aſia, bounded by the province of Aſtrakan on the north, and by part of Perſia on the ſouth, eaſt, and weſt. It is upwards of 400 miles long from ſouth to north, and 300 broad from eaſt to weſt. This ſea forms ſeveral gulfs, and embraces between Aſtrakan and Aſtrabad an incredible number of ſmall iſlands. Its bottom is mud, but ſometimes mixed with ſhells. At the diſtance of ſome German miles from land it is 500 fathoms deep; but on approaching the ſhore it is every where ſo ſhallow, that the ſmalleſt veſſels, if loaded, are obliged to remain at a diſtance.

When we conſider that the Caſpian is incloſed on all ſides by land, and that its banks are in the neighbourhood of very high mountains, we eaſily ſee why the navigation in it ſhould be perfectly different from that in every other ſea. There are certain winds that domineer over it with ſuch abſolute ſway, that veſſels are often deprived of every reſource; and in the whole extent of it there is not a port that can truly be called ſafe. The north, north-eaſt, and eaſt winds, blow moſt frequently, and occaſion the moſt violent tempeſts. Along the eaſtern ſhore the eaſt winds prevail; for which reaſon veſſels bound from Perſia to Aſtrakan always direct their courſe along this ſhore.

Although the extent of the Caſpian Sea is immenſe, the variety of its productions is exceedingly ſmall. This undoubtedly proceeds from its want of communication with the ocean, which cannot impart to it any portion of its inexhauſtible ſtores. But the animals which this lake nouriſhes multiply to ſuch a degree, that the Ruſſians, who alone are in condition to make them turn to account, juſtly conſider them as a never failing ſource of profit and wealth. It will be underſtood that we ſpeak of the fiſh of the Caſpian and of its fiſheries, which make the ſole occupation and principal trade of the people inhabiting the banks of the Wolga and of the Jaïk. This buſineſs is diſtinguiſhed into the great and leſſer fiſheries. The fiſh compehended under the firſt diviſion, ſuch as the ſturgeon and others, abound in all parts of the Caſpian as well as in the rivers that communicate with it, and which they aſcend at ſpawning-time. The ſmall fiſhes, ſuch as the ſalmon and many others, obſerve the general law of quitting the ſalt waters for the freſh, nor is there an inſtance of one of them remaining conſtantly in the ſea.

Seals are the only quadrupeds that inhabit the Caſpian; but they are there in ſuch numbers as to afford the means of ſubſiſtence to many people in that country as well as in Greenland. The varieties of the ſpecies are numerous, diverſified, however, only by the colour. Some are quite black, others quite white; there are ſome whitiſh, ſome yellowiſh, ſome of a mouſe-colour, and ſome ſtreaked like a tiger. They crawl by means of their fore-feet upon the iſlands, where they became the prey of the fiſhermen, who kill them with long clubs. As ſoon as one is diſpatched, he is ſucceeded by ſeveral who come to the aſſiſtance of their unhappy companion, but come only to ſhare his fate. They are exceedingly tenacious of life, and endure more than thirty hard blows before they die. They will even live for ſeveral days after having received many mortal wounds. They are moſt terrified by fire and ſmoke; and as ſoon as they perceive them, retreat with the utmoſt expedition to the ſea. Theſe animals grow ſo very fat, that they look rather like oil-bags than animals. At Aſtrakan is made a ſort of grey ſoap with their fat mixed with pot-aſhes, which is much valued for its property of cleanſing and taking greaſe from woollen ſtuffs. The greateſt numbers of them are killed in ſpring and autumn. Many ſmall veſſels go from Aſtrakan merely to catch ſeals.

If the Caſpian has few quadrupeds, it has in proportion ſtill fewer of thoſe natural productions which are looked upon as proper only to the ſea. There have never been found in it any zoophytes, nor any animal of the order of moluſca. The ſame may almoſt be ſaid of ſhells; the only ones found being three or four ſpecies of cockle, the common muſcle, ſome ſpecies of ſnails, and one or two others.

But to compenſate this ſterility, it abounds in birds of different kinds. Of thoſe that frequent the ſhores there are many ſpecies of the gooſe and duck kind, of the ſtork and heron, and many others of the wader tribe. Of birds properly aquatic, it contains the grebe, the creſted diver, the pelican, the cormorant, and almoſt every ſpecies of gull. Crows are ſo fond of fiſh, that they haunt the ſhores of the Caſpian in prodigious multitudes.

The waters of this lake are very impure, the great numbers of rivers that run into it, and the nature of its bottom, affecting it greatly. It is true, that in general the waters are ſalt; but though the whole weſtern ſhore extends

extends from the 46th to the 35th degree of north latitude, and though one might conclude from analogy that theſe waters would contain a great deal of ſalt, yet experiments prove the contrary: and it is certain that the ſaltneſs of this ſea is diminiſhed by the north, north-eaſt, and north-weſt winds; although we may with equal reaſon conclude, that it owes its ſaltneſs to the mines of ſalt which lie along its two banks, and which are either already known or will be known to poſterity. The depth of theſe waters alſo diminiſhes gradually as you approach the ſhores, and their ſaltneſs in the ſame way grows leſs in proportion to their proximity to the land, the north winds not unfrequently cauſing the rivers to diſcharge into it vaſt quantities of troubled water impregnated with clay. Theſe variations which the ſea is expoſed to are more or leſs conſiderable according to the nature of the winds; they affect the colour of the river waters to a certain diſtance from the ſhore, till theſe mixing with thoſe of the ſea, which then reſume the aſcendency, the fine green colour appears, which is natural to the ocean, and to all thoſe bodies of water that communicate with it.

It is well known, that beſides its ſalt taſte, all ſea-water has a ſenſible bitterneſs, which muſt be attributed not only to the ſalt itſelf, but to the mixture of different ſubſtances that unite with it, particularly to different ſorts of alum, the ordinary effect of different combinations of acids. Beſides this, the waters of the Caſpian have another taſte, bitter too, but quite diſtinct, which affects the tongue with an impreſſion ſimilar to that made by the bile of animals; a property which is peculiar to this ſea, though not equally ſenſible at all ſeaſons. When the north and north-weſt winds have raged for a conſiderable time, this bitter taſte is ſenſibly felt; but when the wind has been ſouth, very imperfectly. We ſhall endeavour to account for this phenomenon.

The Caſpian is ſurrounded on its weſtern ſide by the mountains of Caucaſus, which extend from Derbent to the Black Sea. Theſe mountains make a curve near Aſtrakan, and directing their courſe towards the eaſtern ſhore of the Caſpian, loſe themſelves near the mouth of the Jaïk, where they become ſecondary mountains, being diſpoſed in ſtrata. As Caucaſus is an inexhauſtible magazine of combuſtible ſubſtances, it conſequently lodges an aſtoniſhing quantity of metals in its bowels. Accordingly, along the foot of this immenſe chain of mountains, we ſometimes meet with warm ſprings, ſometimes ſprings of naphtha of different quality; ſometimes we find native ſulphur, mines of vitriol, or lakes heated by internal fires. Now the foot of mount Caucaſus forming the immediate weſtern ſhore of the Caſpian Sea, it is very eaſy to imagine that a great quantity of the conſtituent parts of the former muſt be communicated to the latter: but it is chiefly to the naphtha, which abounds ſo much in the countries which ſurround this ſea, that we muſt attribute the true cauſe of the bitterneſs peculiar to its waters; for it is certain that this bitumen flows from the mountains, ſometimes in all its purity, and ſometimes mixed with other ſubſtances which it acquires in its paſſage through ſubterranean channels, from the moſt interior parts of theſe mountains to the ſea, where it falls to the bottom by its ſpecific gravity. It is certain too, that the north and north-weſt winds detach the greateſt quantities of this naphtha; whence it is evident that the bitter taſte muſt be moſt ſenſible when theſe winds prevail. We may alſo comprehend why this taſte is not ſo ſtrong at the ſurface or in the neighbourhood of the ſhore, the waters there being leſs impregnated with ſalt, and the naphtha which is united with the water by the ſalt, being then either carried to a diſtance by the winds or precipitated to the bottom.

But it is not a bitter taſte alone that the naphtha communicates to the waters of the Caſpian: theſe waters were analyſed by M. Gmelian, and found to contain, beſides the common ſea-ſalt, a conſiderable proportion of Glauber-ſalt, intimately united with the former; and which is evidently a production of the naphtha.

As the waters of the Caſpian have no outlet, they are diſcharged by ſubterranean canals through the earth, where they depoſit beds of ſalt; the ſurface of which correſponds with that of the level of the ſea. The two great deſarts which extend from it to the eaſt and weſt are chiefly compoſed of a ſaline earth, in which the ſalt is formed by effloreſcence into regular cryſtals; for which reaſon ſalt ſhowers and dews are exceedingly common in that neighbourhood. The ſalt of the marſhes at Aſtrakan, and that found in effloreſcence in the deſarts, is by no means pure ſea-ſalt, but much debaſed by the bitter Glauber ſalt we mentioned above. In many places indeed it is found with cryſtals of a lozenge ſhape, which is peculiar to it, without any cubical appearance, the form peculiar to cryſtals of ſea-ſalt.

A great deal has been written on the ſucceſſive augmentation and decreaſe of the Caſpian ſea, but with little truth. There is indeed to be perceived in it a certain riſe and fall of its waters; in which, however, no obſervation has ever diſcovered any regularity.

Many ſuppoſe (and there are ſtrong preſumptions in favour of the ſuppoſition), that the ſhores of the Caſpian were much more extenſive in ancient times than they are at preſent, and that it once communicated with the Black Sea. It is probable too, that the level of this laſt ſea was once much higher than it is at preſent. If then it be allowed, that the waters of the Black Sea, before it procured an exit by the Straits of Conſtantinople, roſe ſeveral fathoms above their preſent level, which from many concurring circumſtances may eaſily be admitted; it will follow, that all the plains, of the Crimea, of the Kuman, of the Wolga, and of the Jaïk, and thoſe of Great Tartary beyond the lake of Arat, in ancient times formed but one ſea, which embraced the northern extremity of Caucaſus by a narrow ſtrait of little depth; the veſtiges of which are ſtill obvious in the river Mantyſch.

CASSADA. See Jatropha.

CASSANA, (Nicolo) called Nicoletto, an eminent Italian painter, was born at Venice in 1659; and became a diſciple of his father Giovanni Franceſco Caſſano, a Genoeſe, who had been taught the art of painting by Bernardino Strozzi. He ſoon diſtinguiſhed himſelf not only by the beauty of his colouring, but by the gracefulneſs of his figures in hiſtorical compoſitions, as well as in portrait. The moſt eminent perſonages ſolicited him to enrich their cabinets with ſome of his performances; and were more particularly deſirous to obtain their portraits, becauſe in that branch he excelled beyond competition. The Grand Duke of Tuſcany, who was an excellent judge of merit in all profeſſions, and as liberal an encourager of it, invited Nicoletto to his court; and he there painted the portraits of that prince and the princeſs Violante his conſort. Thoſe performances procured him uncommon applauſe, as well as a noble gratuity, and he was employed and careſſed by the principal nobility of Florence. Beſides ſeveral hiſtorical ſubjects painted by this maſter while he reſided in that city, one was a very capital deſign: The ſubject of it was the *Conſpiracy of Catiline*; it conſiſted of nine figures as large as life, down to the knees; and the two principal figures were repreſented as with one hand joined in the preſence of their companions, and in their other hand holding a cup of blood. Some of the Engliſh nobility on their travels ſat to him for their portraits; which being ſent to London, and highly admired, Nicoletto was invited to England, with ſtrong aſſurances of a generous reception; and on his arrival he experienced the kindneſs, the reſpect, and the liberality, ſo peculiar to the natives of that kingdom. He had the honour of being introduced to the preſence of queen Anne, and to paint her portrait; in which he ſucceeded ſo happily, that the queen diſtinguiſhed him by many marks of favour and honour; but he had not the happineſs to enjoy his good fortune for any length of time, dying in London, univerſally regretted, in the year 1713.

Cassana, (Giovanni Agoſtino) called *L'Abate Caſſana*, was brother to the preceding, and born in 1664. He was educated along with him by their father Franceſco Caſſana; and he finiſhed his ſtudies at Venice, where his brother Nicolo reſided for ſome time. Although he compoſed and deſigned hiſtorical ſubjects with expertneſs, and with a correctneſs of outline equal to his brother; yet from prudence and fraternal affection, he declined to interfere with him, and choſe therefore to deſign and paint all ſorts of animals and fruits. In that ſtyle he arrived at a high degree of excellence, imitating nature with exactneſs, beauty, and truth; expreſſing the various plumage of his birds, and the hairs of the different animals with ſuch tenderneſs and delicacy as rendered them eſtimable to all judges and lovers of the art. His works were admitted into the collections of thoſe of the firſt rank, and accounted ornaments of thoſe repoſitories of what is curious or valuable. He alſo painted fruits of thoſe kinds which were the moſt uncommon, or naturally of odd and ſingular colours; and ſuch fiſhes as ſeemed worthy to excite admiration by their unuſual form, colour, or appearance. But beſides thoſe ſubjects, he ſometimes painted the portraits of particular perſons of diſtinction, which he deſigned, coloured, and touched, with the ſame degree of merit that was viſible in all his other performances. At laſt he determined to viſit Genoa, where his family had lived in eſteem; and took with him ſeveral pictures which he had already finiſhed. His intention was to diſplay his generoſity, and to appear as a perſon of more wealth and of greater conſequence than he really was; and to ſupport that character, he beſtowed his pictures to ſeveral of the principal nobility of that city. But, unhappily, he experienced no grateful return for all that prodigal munificence: he reduced himſelf by that vain liberality to the moſt neceſſitous circumſtances; was deprived of the means to procure for himſelf even the common neceſſaries of life; and waſted away the remainder of his days in the bitterneſs of poverty, miſery, and neglect.

CASSANDER, king of Macedon after Alexander the Great, was the ſon of Antipater. He made ſeveral conqueſts in Greece, aboliſhed democracy at Athens, and gave the government of that ſtate to the orator Demetrius. Olympias, the mother of Alexander, having cauſed Aridæus and his wife Euridyce, with others of Caſſander's party, to be put to death; he beſieged Pydne, whither the queen had retired, took it by a ſtratagem, and cauſed her to be put to death. He married Theſſalonica the ſiſter of Alexander the Great; and killed Roxana and Alexander, the wife and ſon of that conqueror. At length he entered into an alliance with Seleucus and Lyſimachus, againſt Antigonus and Demetrius; over whom he obtained a great victory near Ipſus in Phrygia, 301 years before the Chriſtian æra, and died three years after, in the 19th year of his reign.

CASSANDRA, in fabulous hiſtory, the daughter of Priam and Hecuba, was beloved of Apollo, who promiſed to beſtow on her the ſpirit of prophecy, provided ſhe would conſent to his love. Caſſandra ſeemed to accept the propoſal; but had no ſooner obtained that gift, than ſhe laughed at the tempter, and broke her word. Apollo, being enraged, revenged himſelf by cauſing no credit to be given to her predictions; hence ſhe in vain propheſied the ruin of Troy. Ajax, the ſon of Oileus, having raviſhed her in the temple of Minerva, he was ſtruck with thunder. She fell into the hands of Agamemnon, who loved her to diſtraction; but in vain did ſhe predict that he would be aſſaſſinated in his own country. He was killed, with her, by the intrigues of Clytemneſtra; but their death was avenged by Oreſtes.

CASSANO, a town of Italy in the duchy of Milan, rendered remarkable by an obſtinate battle fought there between the Germans and French in 1705. It is ſubject to the Houſe of Auſtria, and is ſeated on the river Adda. in E. Long. 10. 0. N. Lat. 45. 20.

Cassano, a town of Italy in Calabria citerior, in the kingdom of Naples, with a biſhop's ſee. E. Long. 16. 30. N. Lat. 39. 55.

CASSAVI, or **Cassada**. See Jatropha.

CASSEL, a town of French Flanders, and capital of a chatellany of the ſame name: It is ſeated on a mountain, where the terrace of the caſtle is ſtill to be ſeen; and from whence there is one of the fineſt proſpects in the world; for one may ſee no leſs than 32 towns, with a great extent of the ſea, from whence it is diſtant 15 miles. E. Long. 2. 27. N. Lat. 50. 48.

Cassel, the capital city of the landgravate of Heſſe-caſſel, in the circle of the Upper Rhine in Germany; (ſee Hesse-cassel). It is divided into the Old, New, and High towns. The New Town is beſt built, the houſes being of ſtone, and the ſtreets broad. The houſes of the Old Town, which is within the walls, are moſtly of timber; but the ſtreets are broad, and the market-places ſpacious. The place is ſtrongly fortified, but the fortifications are not regular. It contains about 32,000 inhabitants, of whom a great proportion are French Proteſtants. Theſe have eſtabliſh-

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ed ſeveral manufactories in the place, particularly in the woollen branch. It is ſeated on the declivity of a hill near the rivet Fulva, in E. Long. 9. 20. N. Lat. 51. 20.

CASSIA, in botany: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 33d order, *Lomentaceæ*. The calyx is pentaphyllous: petals five; antheræ upper, three barren; lower, three-beaked: a leguminous plant. There are 30 ſpecies, all of them natives of warm climates. The moſt remarkable are,

1. The fiſtula or purging caſſia of Alexandria. It is a native of Egypt and both Indies, where it riſes to the height of 40 or 50 feet, with a large trunk, dividing into many branches, garniſhed with winged leaves, compoſed of five pair of ſpear-ſhaped lobes, which are ſmooth, having many tranſverſe nerves from the midrib to the border. The flowers are produced in long ſpikes at the end of the branches, each ſtanding upon a pretty long foot-ſtalk; theſe are compoſed, like the former, of fine yellow concave petals, which are ſucceeded by cylindrical pods from one to two feet long, with a dark brown woody ſhell, having a longitudinal ſeam on one ſide, divided into many cells by tranſverſe partitions, each containing one or two oval, ſmooth, compreſſed ſeeds, lodged in a blackiſh pulp, which is uſed in medicine. There are two ſorts of this drug in the ſhops; one brought from the Eaſt-Indies, the other from the Weſt: the canes or pods of the latter are generally large, rough, thick-rinded, and the pulp nauſeous; thoſe of the former are leſs, ſmoother, the pulp blacker, and of a ſweeter taſte; this ſort is preferred to the other. Such pods ſhould be chooſen as are weighty, new, and do not make a rattling noiſe (from the ſeeds being looſe within them) when ſhaken. The pulp ſhould be of a bright ſhining black colour, and a ſweet taſte, not harſh, which happens from the fruit being gathered before it has grown fully ripe, or ſouriſh, which it is apt to turn upon keeping: it ſhould neither be very dry nor very moiſt, nor at all mouldy; which, from its being kept in damp cellars or moiſtened, in order to increaſe its weight, it is very ſubject to be. Greateſt part of the pulp diſſolves both in water and in rectified ſpirit; and may be extracted from the cane by either. The ſhops employ water, boiling the bruiſed pod therein, and afterwards evaporating the ſolution to a due conſiſtence. This pulp is a gentle laxative medicine, and frequently given in a doſe of ſome drams, in coſtive habits. Some direct a doſe of two ounces or more as a cathartic, in inflammatory caſes, where the more acrid purgatives have no place; but in theſe large quantities it generally nauſeates the ſtomach, produces flatulencies, and ſometimes gripings of the bowels, eſpecially if the caſſia be not of a very good kind: theſe effects may be prevented by the addition of aromatics, and exhibiting it in a liquid form. Geoffroy ſays, it does excellent ſervice in the painful tenſion of the belly, which ſometimes follows the imprudent uſe of antimonials; and that it may be advantageouſly acuated with the more acrid purgatives, or antimonial emetics, or employed to abate their force. Valliſnieri relates that the purgative virtue of this medicine is remarkably promoted by manna; that a mixture of four drams of caſſia, and two of manna, purges as much as twelve drams of caſſia or thirty-two of manna alone. Senertus obſerves, that the urine is apt to be turned of a green colour by the uſe of caſſia: and ſometimes, where a large quantity has been taken, blackiſh. This drug gives name to an officinal electuary, and is an ingredient alſo in another.

2. The caſſia ſenna is a ſhrubby plant cultivated in Perſia, Syria, and Arabia, for the leaves, which form a conſiderable article of commerce. They are of an oblong figure, ſharp-pointed at the ends, about a quarter of an inch broad, and not a full inch in length, of a lively yellowiſh green colour, a faint not very diſagreeable ſmell, and a ſubacrid, bitteriſh, nauſeous taſte. They are brought from the above places, dried and picked from the ſtalks, to Alexandria in Egypt, and thence imported into Europe. Some inferior ſorts are brought from Tripoli and other places; theſe may eaſily be diſtinguiſhed by their being either narrower, longer, and ſharper pointed; or larger, broader, and round pointed, with ſmall prominent veins; or large and obtuſe, of a freſh green colour, without any yellow caſt. Senna is a very uſeful cathartic, operating mildly, and yet effectually; and, if judiciouſly doſed and managed, rarely occaſioning the ill conſequences which too frequently follow the exhibition of the ſtronger purges. The only inconveniences complained of in this drug are, its being apt to gripe, and its nauſeous flavour. The griping quality depends upon a reſinous ſubſtance, which, like the other bodies of this claſs, is naturally diſpoſed to adhere to the coats of the inteſtines. The more this reſin is divided by ſuch matters as take off its tenacity, the leſs adheſive, and conſequently the leſs irritating and griping it will prove; and the leſs it is divided, the more griping: hence ſenna given by itſelf, or infuſions made in a very ſmall quantity of fluid, gripe ſeverely, and purge leſs than when diluted by a large portion of ſuitable menſtruum, or divided by mixing the infuſion with oily emulſions. The ill flavour of this drug is ſaid to be abated by the greater water-figwort: but we cannot conceive that this plant, whoſe ſmell is manifeſtly fetid and its taſte nauſeous and bitter, can at all improve thoſe of ſenna: others recommend bohea tea, though neither has this any conſiderable effect. The ſmell of ſenna reſides in its moſt volatile parts, and may be diſcharged by lightly boiling infuſions of it made in water: the liquor thus freed from the peculiar flavour of the ſenna, may be eaſily rendered grateful to the taſte, by the addition of any proper aromatic tincture or diſtilled water. The colleges both of London and Edinburgh have given ſeveral formulæ for the exhibition of this article, ſuch as thoſe of infuſion, powder, tincture, and electuary. The doſe of ſenna in ſubſtance, is from a ſcruple to a dram: in infuſion, from one to three or four drams. It has been cuſtomary to reject the pedicles of the leaves of ſenna as of little or no uſe: Geoffroy however obſerves, that they are not much inferior in efficacy to the leaves themſelves. The pods or ſeed veſſels met with among the ſenna brought to us, are by the college of Bruſſels preferred to the leaves: they are leſs apt to gripe, but proportionably leſs purgative.

CASSIA-Lignea. See LAURUS.

CASSIDA, in botany. SCUTELARIA.

CASSIDA, in zoology, a genus of inſects belonging

Plate CXVI.

to the order of coleoptera. The feelers are like threads, but thicker on the outſide; the elytra are marginated; and the head is hid under the thorax; from which laſt circumſtance is derived the name of the genus. Foreign countries afford many fine ſpecies of them. Thoſe we meet with in theſe parts have ſomething ſingular. Their larva, by the help of the two prongs which are to be found at its hinder extremity, makes itſelf, with it own excrements, a kind of umbrella, that ſhelters it from the ſun and rain. When this umbrella grows over-dry, it parts with it for a new one. This larva caſts its ſlough ſeveral times. Thiſtles and verticilated plants are inhabited by theſe inſects. There is one ſpecies, of which the remarkable chryſalis reſembles an armorial eſcutcheon. It is that which produces our variegated caſſida, and is a very ſingular one. Numbers of them are found on the ſide of ponds, upon the wild elecampane.

CASSIMER, or Casimer, the name of a thin tweeled woollen cloth, much in faſhion for ſummer uſe.

CASSIMIRE or Cashmire. See Cashmire.

CASSINE, in botany: A genus of the trigynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 23d order, *Dumoſæ*. The calyx is quinquepartite; the petals are five; and the fruit is a triſpermous berry. There are three ſpecies, all of them natives of warm climates.

Of theſe the moſt remarkable is the *yapon*, which is a native of the maritime parts of Virginia and Carolina. It riſes to the height of ten or twelve feet, ſending out branches from the ground upward, garniſhed with ſpear ſhaped leaves placed alternately, which continue green through the year. The flowers are produced in cloſe whorls round the branches, at the footſtalks of the leaves; they are white, and divided into five parts, almoſt to the bottom. The berries are of a beautiful red colour, and as they continue moſt part of the winter upon the plants without being touched by the birds, we may reaſonably conclude that they are poſſeſſed of a poiſonous quality; as few of the wholeſome innocent fruits eſcape their depredations. The Indians, however, have a great veneration for this plant, and at certains ſeaſons of the year come in great numbers to fetch away the leaves. On ſuch occaſions their uſual cuſtom, ſays Miller, is to make a fire upon the ground, and, putting on it a great kettle full of water, they throw in a large quantity of yapon leaves; and when the water has boiled ſufficiently, they drink large draughts of the decoction out of the kettle; which ſeldom fails to vomit them very ſeverely. In this manner, however, they continue drinking and vomiting for three days together, until they imagine themſelves ſufficiently cleanſed; they then gather every one a bundle of the ſhrub, and carry it home with them.—In the operation of theſe leaves by vomiting, thoſe who have taſted of them ſay, that there is no uneaſy ſenſation or pain. The matter diſcharged comes away in a full ſtream by the mouth, without any violence, or ſo much as diſpoſing the patient to reach, or decline his head. The Spaniards who live near the gold mines of Peru, are frequently obliged to drink an infuſion of this herb in order to moiſten their breaſts; without which they are liable to a ſort of ſuffocation, from the ſtrong metallic exhalations that are continually proceeding from the mines. In Paraguay, the Jeſuits make a great revenue by importing the leaves of this plant into many countries under the name of Paraguay or South-ſea tea, which is there drank in the ſame manner as that of China or Japan is with us. It is with difficulty preſerved in England.

CASSINI, (Johannes Dominicus) a moſt excellent aſtronomer, born at Piedmont, in 1635. His early proficiency in aſtronomy procured him an invitation to be mathematical profeſſor at Bologna when he was no more than 15 years of age: and a comet appearing in 1652, he diſcovered that comets were not accidental meteors, but of the ſame nature, and probably governed by the ſame laws, as the planets. In the ſame year he ſolved a problem given up by Kepler and Bullialdus as inſolvable, which was, to determine geometrically the apogee and eccentricity of a planet from its true and mean place. In 1663, he was appointed inſpector-general of the fortifications of the caſtle of Urbino, and had afterwards the care of all the rivers in the eccleſiaſtical ſtate: he ſtill however proſecuted his aſtronomical ſtudies, by diſcovering the revolution of Mars round his own axis; and, in 1666, publiſhed his theory of Jupiter's ſatellites. Caſſini was invited into France by Louis XIV. in 1669, where he ſettled as the firſt profeſſor in the royal obſervatory. In 1677 he demonſtrated the line of Jupiter's diurnal rotation; and in 1684 diſcovered four more ſatellites belonging to Saturn, Huygens having found one before. He inhabited the royal obſervatory at Paris more than forty years; and when he died in 1712, was ſucceeded by his only ſon James Caſſini.

CASSIODORUS, (Marcus Aurelius) ſecretary of ſtate to Theodoric king of the Goths, was born at Squillace, in the kingdom of Naples, about the year 470. He was conſul in 514, and was in great credit under the reigns of Athalaric and Vitiges; but at ſeventy years of age retired into a monaſtery in Calabria, where he amuſed himſelf in making ſun-dials, water hour-glaſſes, and perpetual lamps. He alſo formed a library; and compoſed ſeveral works, the beſt edition of which is that of father Garret, printed at Rouen in 1679. Thoſe moſt eſteemed are his Divine Inſtitutions, and his Treatiſe on the Soul. He died about the year 562.

CASSIOPEIA, in fabulous hiſtory, wife to Cepheus king of Æthiopia, and mother of Andromeda. She thought herſelf more beautiful than the Nereides, who deſired Neptune to revenge the affront; ſo that he ſent a ſea-monſter into the country, which did much harm. To appeaſe the god, her daughter Andromeda was expoſed to the monſter, but was reſcued by Perſeus; who obtained of Jupiter, that Caſſiopeia might be placed after his death among the ſtars: hence the conſtellation of that name.

Cassiopeia, in aſtronomy, one of the conſtellations of the northern hemiſphere, ſituated next to Cepheus. In 1672, there appeared a new ſtar in this conſtellation, which firſt ſurpaſſed in magnitude and brightneſs Jupiter himſelf; but it diminiſhed by degrees, and at laſt diſappeared at the end of eighteen months. It alarmed all the aſtronomers of that age, many of whom wrote diſſertations on it; among the reſt Tycho Brahe, Kepler, Maurolycus, Lycetus, Gramineus, &c. Beza, the landgrave of Heſſe, Roſa, &c. wrote to prove it a comet, and the ſame which appeared to the Magi at the birth of Jeſus Chriſt, and that it came to declare his ſecond coming: they were anſwered on this ſubject by Tycho. The ſtars in the conſtellation Caſſiopeia, in Ptolemy's catalogue, are thirteen: in Hevelius's, thirty-ſeven; in Tycho's, forty-ſix; but in the Britannic catalogue, Mr Flamſtead makes them fifty-five.

CASSIS, in antiquity, a plated or metalline helmet; different from the *galea*, which was of leather.

CASSITERIA, in the hiſtory of foſſils, a genus of cryſtals, the figures of which are influenced by an admixture of ſome particles of tin.

The caſſiteria are of two kinds; the whitiſh pellucid caſſiterion, and the brown caſſiterion. The firſt is a tolerable bright and pellucid cryſtal, and ſeldom ſubject to the common blemiſhes of cryſtal: it is of a perfect and regular form, in the figure of a quadrilateral pyramid; and is found in Devonſhire and Cornwall principally. The brown caſſiterion is like the former in figure: it is of a very ſmooth and gloſſy ſurface, and is alſo found in great plenty in Devonſhire and Cornwall.

CASSITERIDES, (anc. geog.) a cluſter of iſlands to the weſt of the Land's End; oppoſite to Celtiberia, (Pliny); famous for their tin, which he calls *candidum plumbum*; formerly open to none but the Phœnicians; who alone carried on this commerce from Gades, concealing the navigation from the reſt of the world, (Strabo.) The appellation is from *Caſſiteros*, the name for tin in Greek. Now thought to be the Scilly Iſlands, or Sorlings, (Camden).

CASSIUS, (Spurius) a renowned Roman general and conſul, whoſe enemies accuſing him of aſpiring to royalty, he was thrown down from the Tarpeian rock, 485 years before Chriſt; after having thrice enjoyed the conſular dignity, been once general of the horſe under the firſt dictator that was created at Rome, and twice received the honour of a triumph.

Cassius, (Longinus) a celebrated Roman lawyer, flouriſhed 113 years before Chriſt. He was ſo inflexible a judge, that his tribunal was called the *Rock of the impeached*. It is from the judicial ſeverity of this Caſſius, that very ſevere judges have been called *Caſſiani*.

Cassius, (Caius) one of the murderers of Julius Cæſar: after his defeat by Mark Anthony at the battle of Philippi, he ordered one of his freed-men to put him to death with his own ſword, 41 years before Chriſt. See Rome.

CASSOCK, or Cassula, a kind of robe or gown, wore over the reſt of the habit, particularly by the clergy. The word caſſock comes from the French *caſaque*, an horſeman's coat.

CASSONADE, in commerce, caſk ſugar, or ſugar put into caſks or cheſts, after the firſt purification, but which has not been refined. It is ſold either in powder or in lumps; the whiteſt, and that of which the lumps are largeſt, is the beſt. Many imagine it to ſweeten more than loaf ſugar; but it is certain that it yields a great deal more ſcum.

CASSOWARY, in ornithology. See Struthio.

CASSUMAR, in the Materia Medica, a root approaching to that of zedoary.

It is cardiac and ſudorific, and famous in nervous caſes; it is alſo an ingredient in many compoſitions, and is preſcribed in powders, boluſes, and infuſions. Its doſe is from five to fifteen grains.

CASSUMBAZAR, a town of India, in Aſia, ſituated on the river Ganges, in the province of Bengal. E. Long. 87. and N. Lat. 24.

CAST is peculiarly uſed to denote a figure or ſmall ſtatue of bronze. See Bronze.

Cast, among the founders, is applied to tubes of wax fitted in divers parts of a mould of the ſame matter; by means of which, when the wax of the mould is removed, the melted metal is conveyed into all the parts which the wax before poſſeſſed.

Cast, alſo denotes a cylindrical piece of braſs or copper, ſlit in two, lengthwiſe, uſed by the founders in ſand, to form a canal or conduit in their moulds, whereby the metal may be conveyed to the different pieces intended to be caſt.

Cast, among plumbers, denotes a little brazen funnel at one end of a mould, for caſting pipes without ſoldering, by means of which the melted metal is poured into the mould.

Cast, or *Caſte*, in ſpeaking of the eaſtern affairs, denotes a tribe, or number of families, of the ſame rank and profeſſion. The diviſion of a nation into caſts chiefly obtains in the dominions of the Great Mogul, kingdom of Bengal, iſland of Ceylon, and the great peninſula oppoſite thereto. In each of theſe there are, according to father Martin, four principal caſts, *viz.* the caſt of the *bramins*, which is the firſt and moſt noble; the caſt of the *rajas*, or princes, who pretend to be deſcended from divers royal families; the caſt of the *choutres*, which comprehends all the artificers; and that of the *parias*, the loweſt and moſt contemptible of all: though Henry Lord, it muſt be obſerved, divides the Indians about Surat into four *caſts*, ſomewhat differently from Martin, *viz.* into *bramins*, or prieſts; *cuttery*, or ſoldiers; *ſhuddery*, which we call banians, or merchants; and *wyſe*, the mechanics or artificers. Every art and trade is confined to its proper *caſt*, nor is allowed to be exerciſed by any but thoſe whoſe fathers profeſſed the ſame. So that a taylor's ſon can never riſe to be a painter, nor a painter's ſon fall to be a taylor; though there are ſome employments that are proper to all the caſts, *e.g.* every body may be a ſoldier, or a merchant. There are alſo divers caſts which are allowed to till the ground, but not all. The caſt of *parias* is held infamous, in ſo much that it is a diſgrace to have any dealings or converſation with them; and there are ſome trades in the caſt of *choutres*, which debaſe their profeſſors almoſt to the ſame rank. Thus ſhoemakers, and all artificers in leather, as alſo fiſhermen, and even ſhepherds, are reputed no better than *parias*

CASTAGNO, (Andrea Dal) hiſtorical painter, was born at a ſmall village called Caſtagno, belonging to the territory of Tuſcany, in 1409; and being deprived of his parents, was employed by his uncle to attend the herds of cattle in the fields; but, having accidentally ſeen an ordinary painter at work in the country, he obſerved him for ſome time with ſurpriſe and attention, and afterwards made ſuch efforts to imitate him, as aſtoniſhed all who ſaw his productions. The extraordinary genius of Andrea, became at laſt a common topic of diſcourſe in Florence; and ſo far excited the curioſity of Bernardetto de Medici, that he ſent for Andrea; and perceiving that he had promiſing talents, he placed him under the care of the beſt

beſt maſters who were at that time in Florence. Andrea diligently purſued his ſtudies, devoted himſelf entirely to practice under the direction of his inſtructors, became particularly eminent in deſign, and in a few years made ſo great a progreſs, that he found as much employment as he could poſſibly execute. He painted only in diſtemper, and freſco, with a manner of colouring that was not very agreeable, being rather dry and hard; till he learned the ſecret of painting in oil from Domenico Venetiano, who had derived his knowledge of that new diſcovery from Antonello da Meſſina. Andrea was the firſt of the Florentine artiſts who painted in oil; but although he was in the higheſt degree indebted to Domenico for diſcloſing the ſecret, yet he ſecretly envied the merit of the man who taught him the art; and becauſe his own works ſeemed to be much leſs admired than thoſe of Domenico, he determined to aſſaſſinate his friend and benefactor. He executed his deſign with the utmoſt ingratitude and treachery (for Domenico at that time lived with him, and painted in partnerſhip with him), and he ſtabbed him at a corner of a ſtreet ſo ſecretly, that he eſcaped unobſerved, and unſuſpected, to his own houſe, where he compoſedly ſat down to work; and thither Domenico was ſoon after conveyed, to die in the arms of his murderer. The real author of ſo inhuman a tranſaction, was never diſcovered, till Andrea, through remorſe of conſcience, diſcloſed it on his death-bed, in 1480. He finiſhed ſeveral conſiderable works at Florence, by which he gained great riches, and as great a reputation; but when his villanous miſconduct became public, his memory was ever after held in the utmoſt deteſtation. The moſt noted work of this maſter is in the hall of juſtice at Florence, repreſenting the execution of the conſpirators againſt the houſe of Medici.

CASTALIO, (Sebaſtian) was born at Chetillon, on the Rhone, in the year 1515. Calvin conceived ſuch an eſteem and friendſhip for him, during the ſtay he made at Straſburg in 1540 and 1541, that he lodged him ſome days at his houſe, and procured him a regent's place in the college of Geneva. Caſtalio, after continuing in this office near three years, was forced to quit it in the year 1544, on account of ſome particular opinions which he held concerning Solomon's ſong, and Chriſt's deſcent into hell. He retired to Baſil, where he was made Greek profeſſor, and died in that place in 1564, aged 48. He incurred the high diſpleaſure of Calvin and Theodore Beza, for differing with them concerning predeſtination and the puniſhment of heretics. His works are very conſiderable both on account of their quality and number. In 1545, he printed at Baſil four books of dialogues, containing the principal hiſtories of the Bible in elegant Latin; ſo that youth might thereby make a proficiency in piety and in the Latin tongue at the ſame time. But his principal work is a Latin and French tranſlation of the ſcriptures. He began the Latin tranſlation at Geneva in 1542, and finiſhed it at Baſil in 1550. It was printed at Baſil in 1551, and dedicated by the author to Edward VI. king of England. The French verſion was dedicated to Henry II. of France, and printed at Baſil in 1555. The fault which has been moſt generally condemned in his Latin tranſlation, is the affectation of uſing only claſſical terms.

CASTALIUS FONS, (Strabo, Pauſanias); *Caſtalia*, (Pindar, Virgil): A fountain at the foot of mount Parnaſſus, in Phocis, near the temple of Apollo, or near Delphi; ſacred to the Muſes, thence called *Caſtalides*. Its murmurs were thought prophetic, (Nonnus, Lucian).

CASTANEA, in botany. See FAGUS

CASTANETS, CASTAGNETTES, or CASTANETTAS, a kind of muſical inſtrument, wherewith the Moors, Spaniards, and Bohemians, accompany their dances, ſarabands, and guittars. It conſiſts of two little round pieces of wood dried, and hollowed in manner of a ſpoon, the concavities whereof are placed on one another, faſtened to the thumb, and beat from time to time with the middle finger, to direct their motion and cadences. The *caſtanets* may be beat eight or nine times in the ſpace of one meaſure, or ſecond of a minute.

CASTANOVITZ, a town of Croatia, ſituated on the river Unna, which divides Chriſtendom from Turkey. E. Long. 17. 20. N. Lat. 45. 40. It is ſubject to the Houſe of Auſtria.

CASTEL, (Lewis Betrand), a learned Jeſuit, was born at Montpellier in 1688, and entered among the Jeſuits in 1703. He ſtudied polite literature in his youth; and at length applied himſelf entirely to the ſtudy of mathematics and natural philoſophy. He diſtinguiſhed himſelf by writing on gravity; the mathematics; and on the muſic of colours, a very whimſical idea, which he took great pains to reduce to practice. His piece on gravity, entitled *Traitê de la Penſateur univerſelle*, was printed at Paris, in 1724. He afterwards publiſhed his *Mathematique univerſelle*; which occaſioned his being unanimouſly choſen a fellow of the Royal Society of London, without the leaſt ſolicitation. He was alſo a member of the academies of Bourdeaux and Rouen: but his *Clavecin oculaire* made the moſt noiſe; and he ſpent much time and expence in making an harpſichord for the eye, but without ſucceſs. He alſo wrote for and againſt Sir Iſaac Newton, and publiſhed ſeveral other works; the principal of which are, *Le Plan du Mathematique abregée*, and a treatiſe entitled *Optique des Colours*. He led a very exemplary life, and died in 1757.

CASTELAMARA, a town of Italy, in the kingdom of Naples, and in the hither Principato, with a biſhop's ſee and a good harbour. E. Long. 14. 25. N. Lat. 41. 40.

CASTEL-ARAGONESE, a ſtrong town of Italy, in the iſland of Sardinia, with a biſhop's ſee, and a good harbour. It is ſeated on the N. W. coaſt of the iſland, in E. Long. 8. 57. N. Lat. 40. 56.

CASTEL-Branco, a town of Portugal, and capital of the province of Beria; ſeated on the river Lyra, 35 miles N. W. of Alcantara. W. Long. 8. 0. N. Lat. 39. 35.

CASATEL-Franco, a very ſmall, but well-fortified frontier town of the Bologneſe, in Italy, belonging to the Pope.

CASTEL-de-Vide, a ſmall ſtrong town of Alentejo. It was taken by Philip V. W. Long. 6. 25. N. Lat. 39. 15.

CASTEL-Folit, a town of Spain, in Catalonia, ſeated on an inacceſſible eminence, between Gironne and Campredon,

Campredon, about 15 miles from each, and near the river Fulvia.

Castel-Gandolpho, a town of Italy, in the territory of the church, with a caſtle, to which the Pope retires in the ſummer ſeaſon; 10 miles S. by E. of Rome. E. Long. 12. 46. N. Lat. 41. 44.

Castel-Novo, a ſtrong town of Dalmatia, ſubject to the Venetians; ſeated on the gulph of Cataio, in E. Long. 18. 45. N. Lat. 42. 25.

Castel-Rodrigo, a town of Portugal, in the province of Tra-los-Montes, in W. Long. 7. 1. N. 41. 0.

Castel-Novo-de-Carfagnana, a town of Italy, in the Modeneſe, with a ſtrong fortreſs. It is the capital of the valley of Carfagnana; and ſeated on the river Serchio, 17 miles above Lucca.

Castel del Ovo, a ſmall iſland in the Tuſcan Sea, in the gulph of Naples, near a town of that name, to which it is joined by a ſtone bridge. The fortreſs is called Caſtel del Ovo, in which there is always a good garriſon.

CASTELBAR, a town in Ireland, in the county of Mayo, and province of Connaught, 35 miles N. of Galway. W. Long. 9. 25. N. Lat. 53. 45.

CASTELL, (Edmund) D. D. a learned Engliſh divine of the 17th century, diſtinguiſhed by his ſkill in the eaſtern languages. He was educated at Cambridge; where he was maſter of Catherine hall, and Arabic profeſſor; and was at length canon of Canterbury. He had the greateſt ſhare in the Polyglott bible of London; and wrote the *Heptaglotton pro ſeptem Orientalibus, &c.* On this excellent work, which occupied a great part of his life, he beſtowed incredible pains and expence, even to the breaking of his conſtitution, and exhauſting of his fortune, having expended no leſs that 12,000 l. upon that work. At length, when it was printed, the copies remained unſold upon his hands. He died in 1685; and lies buried in the church-yard of Higham Gobyon in Bedfordſhire, of which he was rector. It appears from the inſcription on his monument, which he erected in his lifetime, that he was chaplain to Charles II. He bequeathed all his oriental manuſcripts to the univerſity of Cambridge, on condition that his name ſhould be written on every copy in the collection.

CASTELLA, a town of the Mantuan, in Italy, about five miles north-eaſt of the city of Mantua. E. Long. 11. 15. N. Lat. 45. 30.

CASTELLAN, the name of a dignity or charge in Poland: The caſtellans are ſenators of the kingdom, but ſenators only of the lower claſs, who, in diets, ſit on low ſeats, behind the palatines, or great ſenators. They are a kind of lieutenants of provinces, and command a part of the palatinate under the palatine.

CASTELLANY, the territory belonging to any city or town, chiefly uſed in France and Flanders: Thus we ſay, the caſtellany of Liſle, Ypres, &c.

CASTELLARIUS, the keeper or curator, of a caſtellum. Gruter gives an ancient ſepulchral inſcription in memory of a *caſtellarius.*

CASTELLATIO, in middle age writers, the act of building a caſtle, or fortifying a houſe, and rendering it a caſtle.—By the ancient Engliſh laws, caſtellation was prohibited without the king's eſpecial licence.

CASTELLI, (Bernard) an Italian painter, was born at Genoa, in 1557; and excelled in colouring and in portraits. He was the intimate friend of Taſſo, and took upon himſelf the taſk of deſigning and etching the figures of his Jeruſalem Delivered. He died at Genoa in 1629.

Valerio Caſtelli, one of his ſons, was born at Genoa in 1625, and ſurpaſſed his father. He particularly excelled in painting battles; which he compoſed with ſpirit, and executed them with ſo pleaſing a variety, and ſo great freedom of hand, as gained him univerſal applauſe. His horſes are admirably drawn, thrown into attitudes that are natural and becoming, full of motion, action, and life. In that ſtyle of painting he ſhowed all the fire of Tintoretto, united with the fine taſte of compoſition of Paolo Veroneſe. He died in 1659. The works of this maſter are not very frequent; but they are deſervedly held in very high eſteem. It is believed that a greater number of his eaſel pictures are in the collections of the nobility and gentry of England, than in any other part of Europe.

CASTELLORUM OPERATIO, caſtle-work, or ſervice and labour done by inferior tenants for the building and upholding of caſtles of defence; towards which ſome gave perſonal aſſiſtance, and others paid their contributions. This was one of the three neceſſary charges to which all lands among the Anglo-Saxons were expreſsly ſubject.

CASTELVETRO, (Lewis) a native of Modena, of the 16th century, famous for his *Comment on Ariſtotle's Poetics.* He was proſecuted by the inquiſition for a certain book of Melancthon, which he had tranſlated into Italian. He retired to Baſil, where he died.

CASTIGATION, among the Romans, the puniſhment of an offender by blows, or beating with a wand or ſwitch. Caſtigation was chiefly a military puniſhment; the power of inflicting which on the ſoldiery was given to the tribunes. Some make it of two kinds; one with a ſtick or cane called *faſtigatio*; the other with rods, called *flagellatio*: the latter was the moſt diſhonourable.

CASTIGATORY *for* SCOLDS. A woman indicted for being a common ſcold, if convicted, ſhall be placed in a certain engine of correction, called the *trebucket, caſtigatory,* or *cucking-ſtool;* which, in the Saxon language, ſignifies the *ſcolding-ſtool;* though now it is frequently corrupted into the *ducking-ſtool*; becauſe the reſidue of the judgment is, that, when ſhe is placed therein, ſhe ſhall be plunged in water for her puniſhment.

CASTIGLIONE, (Giovanni Benedetto) a celebrated painter, was born at Genoa in 1616. His firſt maſter was Gio-Battiſta Paggi. Afterwards he ſtudied under Andrea Ferrari; and laſtly perfected himſelf from the inſtructions of Anthony Vandyck, who at that time reſided at Genoa. He painted portraits, hiſtorical pieces, landſcapes, and caſtles: In the latter of which he is ſaid chiefly to have excelled; as alſo in fairs, markets, and all kinds of rural ſcenes. By this maſter we have alſo a great number of etchings, which are all ſpirited, free, and full of taſte. The effect is, in general, powerful and pleaſing; and many of them have a more harmonized and finiſhed appearance, than is uſual from the point, ſo little aſſiſted by the graver. His drawing of the naked figure, though by no means correct, is notwithſtanding managed in a ſtyle that indicates the hand of the maſter.

His ſon, *Franceſco*, was bred under himſelf, and excelled in the ſame ſubjects; and it is thought that many good paintings which are aſcribed to Benedetto, and are frequently ſeen at ſales, or in modern collections, are copies after him by his ſon Franceſco, or perhaps originals of the younger Caſtiglione.

CASTIGLIONE, a ſmall, but ſtrong town of Italy, in Mantua, with a caſtle. It was taken by the Germans in 1701, and the French defeated the Imperialiſts near it in 1706. E. Long. 10. 29. N. Lat 43. 23.

CASTIGLIONI, (Balthazar) an eminent Italian nobleman, deſcended from an illuſtrious and ancient family, and born at his own villa at Caſalico in the duchy of Milan in 1478. He ſtudied painting, ſculpture, and architecture, as appears from a book he wrote in favour of theſe arts; and excelled ſo much in them that Raphael Urbino, and Buonaroti, though incomparable artiſts, never thought their works complete without the approbation of Count Caſtiglioni. When he was 26 years of age, Guido Ubaldo, Duke of Urbino, ſent him ambaſſador to Pope Julius II. He was ſent upon a ſecond embaſſy to Louis XII. of France, and upon a third to Henry VII. of England. After he had diſpatched his buſineſs here, he returned, and began his celebrated work intitled *the Courtier;* which he completed at Rome in 1516. This work is full of moral and political inſtruction: and if we ſeek for the Italian tongue in perfection, it is ſaid to be no where better found than in this performance. A verſion of this work, together with the original Italian, was publiſhed at London in 1727, by A. P. Caſtiglioni, a gentleman of the ſame family, who reſided there under the patronage of Dr Gibſon biſhop of London. Count Caſtiglioni was ſent by Clement VII. to the court of the Emperor Charles V. in quality of legate, and died at Toledo in 1529.

CASTILE, (New) or THE KINGDOM OF TOLEDO, a province of Spain, bounded on the north by Old Caſtile, on the eaſt by the kingdoms of Arragon and Valencia, on the ſouth by that of Murcia and Andaluſia, and on the weſt by the kingdom of Leon. It is divided into three parts; Argaria to the north, Mancha to the eaſt, and Sierra to the ſouth. Madrid is the capital. Both theſe provinces are very well watered with rivers, and the air is generally pure and healthy; but the land is mountainous, dry, and uncultivated, through the lazineſs of the inhabitants. The north part produces fruits and wine, and the ſouth good paſtures and fine wool. Theſe provinces are divided by a long chain of mountains, which run from eaſt to weſt.

CASTILE, (Old) a province of Spain, with the title of a kingdom. It is about 192 miles in length, and 115 in breadth; bounded on the ſouth by New Caſtile, on the eaſt by Arragon and Navarre, on the north by Biſcay and Aſturia, and on the weſt by the kingdom of Leon. Burgos is the capital town.

CASTILE-de-Oro, a large and fertile country in South America, lying to the weſt of Oroonoko. It comprehends eight governments; viz. Terra Firma, Proper Carthagena, St Martha, Rio de la Hacha, Veniſuela, New Andaluſia, Popayan, and the new kingdom of Grenada.

CASTILLAN, or CASTILLANE, a gold coin, current in Spain, and worth fourteen rials and ſixteen deniers.

CASTILLAN is alſo a weight uſed in Spain for weighing gold. It is the hundredth part of a pound Spaniſh weight. What they commonly call a weight of gold in Spain, is always underſtood of the caſtillan.

CASTILLARA, a town of the Mantuan in Italy, ſituated ſix miles north-eaſt of the city of Mantua. E. Long. 11. 25. N. Lat. 45. 20.

CASTILLON, a town of Perigort, in the province of Guienne in France, ſituated on the river Dordonne, 16 miles eaſt of Bourdeaux. W. Long. 2. 40. N. Lat. 44. 50.

CASTING, in foundery, the running a metal into a mould, prepared for that purpoſe.

CASTING of Metals, of Letters, Bells, &c. See the article FOUNDREY.

CASTING in Sand or Earth is the running of metals between two frames, or molds, filled with ſand or earth, wherein the figure that the metal is to take has been impreſſed *en creux*, by means of the pattern.

CASTING, among ſculptors, implies the taking of caſts and impreſſions of figures, buſts, medals, leaves, &c.

The method of taking of caſts of figures and buſts is moſt generally by the uſe of plaſter of Paris, *i. e.* alabaſter calcined by a gentle heat. The advantage of uſing this ſubſtance preferably to others, is, that notwithſtanding a ſlight calcination reduces it to a pulverine ſtate, it becomes again a tenacious and cohering body, by being moiſtened with water, and afterwards ſuffered to dry; by which means either a concave or a convex figure may be given by a proper mold or model to it when wet, and retained by the hardneſs it acquires when dry: and from theſe qualities, it is fitted for the double purpoſe of making both caſts, and molds for forming thoſe caſts. The particular manner of making caſts depends on the form of the ſubject to be taken. Where there are no projecting parts, it is very ſimple and eaſy; as likewiſe where there are ſuch as form only a right or any greater angle with the principal ſurface of the body: but where parts project in leſſer angles, or form a curve inclined towards the principal ſurface of the body, the work is more difficult.

The firſt ſtep to be taken is the forming the mold. In order to this, if the original or model be a baſs relief, or any other piece of a flat form, having its ſurface firſt well greaſed, it muſt be placed on a proper table, and ſurrounded by a frame, the ſides of which muſt be at ſuch a diſtance from it as will allow a proper thickneſs for the ſides of the mold. As much plaſter as will be ſufficient to cover and riſe to ſuch a thickneſs as may give ſufficient ſtrength to the mold, as alſo to fill the hollow betwixt the frame and the model, muſt be moiſtened with water, till it be juſt of ſuch conſiſtence as will allow it to be poured upon the model. This muſt be done as ſoon as poſſible; or the plaſter would concrete or ſet, ſo as to become more troubleſome in the working, or unfit to be uſed. The whole muſt then be ſuffered to remain in this condition, till the plaſter has attained its hardneſs; and then the frame being taken away, the preparatory caſt

caſt or mold thus formed may be taken off from the ſubject entire.

Where the model or original ſubject is of a round or erect form, a different method muſt be purſued; and the mold muſt be divided into ſeveral pieces: or if the ſubject conſiſts of detached and projecting parts, it is frequently moſt expedient to caſt ſuch parts ſeparately, and afterwards join them together.

Where the original ſubject or mold forms a round, or ſpheroid, or any part of ſuch round or ſpheroid, more than one half the plaſter muſt be uſed without any frame to keep it round the model; and muſt be tempered with water to ſuch a conſiſtence, that it may be wrought with the hand like very ſoft paſte; but though it muſt not be ſo fluid as when prepared for flat figured models, it muſt yet be as moiſt as is compatible with its cohering ſufficiently to hold together: and being thus prepared, it muſt be put upon the model, and compreſſed with the hand, or any flat inſtrument, that the parts of it may adapt themſelves in the moſt perfect manner, to thoſe of the ſubject, as well as be compact with reſpect to themſelves. When the model is ſo covered to a convenient thickneſs, the whole muſt be left at reſt till the plaſter be ſet and firm, ſo as to bear dividing without falling to pieces, or being liable to be put out of its form by ſlight violence; and it muſt then be divided into pieces, in order to its being taken off from the model, by cutting it with a knife with a very thin blade; and being divided, muſt be cautiouſly taken off, and kept till dry: but it muſt be always carefully obſerved, before the ſeparation of the parts be made, to notch them croſs the joints, or lines of the diviſion, at proper diſtances, that they may with eaſe and certainty be properly conjoined again; which would be much more precarious and troubleſome without ſuch directive marks. The art of properly dividing the molds, in order to make them ſeparate from the model, requires more dexterity and ſkill than any other thing in the art of caſting; and does not admit of rules for the moſt advantageous conduct of it in every caſe. Where the ſubject is of a round or ſpheroidal form, it is beſt to divide the mold into three parts, which will then eaſily come off from the model; and the ſame will hold good of a cylinder, or any regular curve figure.

The mold being thus formed, and dry, and the parts put together, it muſt be firſt greaſed, and placed in ſuch a poſition that the hollow may lie upwards, and then filled with plaſter mixed with water, in the ſame proportion and manner as was directed for the caſting the mold: and when the caſt is perfectly ſet and dry, it muſt be taken out of the mold, and repaired where it is neceſſary; which finiſhes the operation.

This is all that is required with reſpect to ſubjects where the ſurfaces have the regularity abovementioned: but where they form curves which interſect each other, the conduct of the operation muſt be varied with reſpect to the manner of taking the caſt of the mold from off the ſubject or model; and where there are long projecting parts, ſuch as legs or arms, they ſhould be wrought in ſeparate caſts. The operator may eaſily judge from the original ſubjects, what parts will come off together, and what require to be ſeparated; the principle of the whole conſiſts only in this, that where under-workings, as they are called, occur, that is, wherever a ſtraight line drawn from the baſis or inſertion of any projection, would be cut or croſſed by any part of ſuch projection, ſuch part cannot be taken off without a diviſion; which muſt be made either in the place where the projection would croſs the ſtraight line; or, as that is frequently difficult, the whole projection muſt be ſeparated from the main body, and divided alſo lengthwiſe into two parts: and where there are no projections from the principal ſurfaces, but the body is ſo formed as to render the ſurface a compoſition of ſuch curves, that a ſtraight line being drawn parallel to the ſurface of one part would be cut by the outline, in one or more places, of another part, a diviſion of the whole ſhould be made, ſo as to reduce the parts of it into regular curves, which muſt then be treated as ſuch.

In larger maſſes, where there would otherwiſe be a great thickneſs of the plaſter, a corps or body may be put within the mold, in order to produce a hollow in the caſt: which both ſaves the expence of the plaſter, and renders the caſt lighter.

This corps may be of wood, where the forming a hollow of a ſtraight figure, or a conical one with the baſis outward, will anſwer the end: but if the cavity require to be round, or of any curve figure, the corps cannot be then drawn while entire; and conſequently ſhould be of ſuch matter as may be taken out piecemeal. In this caſe, the corps is beſt formed of clay; which muſt be worked upon wires to give it tenacity, and ſuſpended in the hollow of the mold, by croſs wires lying over the mouth; and when the plaſter is ſufficiently ſet to bear handling, the clay muſt be picked out by a proper inſtrument.

Where it is deſired to render the plaſter harder, the water with which it is tempered ſhould be mixed with parchment ſize properly prepared, which will make it very firm and tenacious.

In the ſame manner, figures, buſts, &c. may be caſt of lead, or any other metal, in the molds of plaſter: only the expence of plaſter, and the tediousneſs of its becoming ſufficiently dry, when in a very large maſs, to bear the heat of melted metal, render the uſe of clay, compounded with ſome other proper materials, preferable where large ſubjects are in queſtion. The clay, in this caſe, ſhould be waſhed over till it be perfectly free from gravel or ſtones; and then mixed with a third or more of fine ſand to prevent its cracking; or, inſtead of ſand, coal-aſhes ſifted fine may be uſed. Whether plaſter or clay be employed for the caſting in metal, it is extremely neceſſary to have the mold perfectly dry; otherwiſe the moiſture being rarified, will make an exploſion that will blow the metal out of the mold, and endanger the operator, or at leaſt crack the mold in ſuch a manner as to fruſtrate the operation. Where the parts of a mold are larger, or project much, and conſequently require a greater tenacity of the matter they are formed of to keep them together, flocks of cloth, prepared like thoſe deſigned for paper-hangings, or fine cotton plucked or cut till it is very ſhort, ſhould be mixed with the aſhes or ſand before they are added to the clay to make the compoſition for the mold. The proportion ſhould be according to the degree of coheſion required: but a ſmall quantity will anſwer the end, if the other ingredients of of the compoſition be good, and the parts of the mold properly linked together by means of the wires above directed.

There is a method of taking caſts in metals from ſmall animals, and the parts of vegetables, which may be practiſed for ſome purpoſes with advantage: particularly for the decorating grottoes or rock-work, where nature is imitated. The proper kinds of animals are lizards, ſnakes, frogs, birds, or inſects; the caſts of which, if properly coloured, will be exact repreſentations of the originals.

This is to be performed by the following method. A coffin or proper cheſt for forming the mold being prepared of clay, or four pieces of boards fixed together, the animal or parts of vegetables muſt be ſuſpended in it by a ſtring; and the leaves, tendrils, or other detached parts of the vegetables, or the legs, wings, *&c.* of the animals, properly ſeparated and adjuſted in their right poſition by a ſmall pair of pincers; a due quantity of plaſter of Paris and calcined talc, in equal quantities, with ſome alumen plumoſum, muſt then be tempered with water to the proper conſiſtence for caſting; and the ſubject from whence the caſt is to be taken, as alſo the ſides of the coffin, moiſtened with ſpirit of wine. The coffin or cheſt muſt then be filled with the tempered compoſition of the plaſter and talc, putting at the ſame time a piece of ſtraight ſtick or wood to the principal part of the body of the ſubject, and pieces of thick wire to the extremities of the other parts, in order that they may form, when drawn out after the matter of the mold is properly ſet and firm, a channel for pouring in the melted metal, and vents for the air; which otherwiſe, by the rarefaction it would undergo from the heat of the metal, would blow it out or burſt the mold. In a ſhort time the plaſter and talc will ſet and become hard, when the ſtick and wires may be drawn out, and the frame or coffin in which the mold was caſt taken away; and the mold muſt then be put firſt into a moderate heat, and afterwards, when it is as dry as can be rendered by that degree, removed into a greater; which may be gradually increaſed till the whole be red-hot. The animal, or part of any vegetable, which was included in the mold, will then be burnt to a coal; and may be totally calcined to aſhes, by blowing for ſome time gently into the channel and paſſages made for pouring in the metal, and giving vent to the air, which will, at the ſame time that it deſtroys the remainder of the animal or vegetable matter, blow out the aſhes. The mold muſt then be ſuffered to cool gently; and will be perfect; the deſtruction of the ſubſtance of the animal or vegetable having produced a hollow of a figure correſpondent to it: but it may be nevertheleſs proper to ſhake the mold, and turn it upſide down, as alſo to blow with the bellows into each of the air-vents, in order to free it wholly from any remainder of the aſhes; or, where there may be an opportunity of filling the hollow with quickſilver without expence, it will be found a very effectual method of clearing the cavity, as all duſt, aſhes, or ſmall detached bodies will neceſſarily riſe to the ſurface of the quickſilver, and be poured out with it. The mold being thus prepared, it muſt be heated very hot when uſed, if the caſt be made with copper or braſs: but a leſs degree will ſerve for lead or tin; and the matter being poured in, the mold muſt be gently ſtruck: and then ſuffered to reſt till it be cold: at which time it muſt be carefully taken from the caſt, but without the leaſt force; for ſuch parts of the matter as appear to adhere more ſtrongly, muſt be ſoftened by ſoaking in water, till they be entirely looſened, that none of the more delicate parts of the caſt may be broken off or bent.

Where the alumen plumoſum, or talc, cannot eaſily be procured, the plaſter may be uſed alone; but it is apt to be calcined by the heat uſed in burning the animal or vegetable from whence the caſt is taken, and to become of too incohering and crumbly a texture: or, for cheapneſs, Sturbridge or any other good clay, waſhed over till it be perfectly fine, and mixed with an equal part of ſand, and ſome flocks cut ſmall, may be employed. Pounded pumice ſtone and plaſter of Paris, taken in equal quantities, and mixed with waſhed clay in the ſame proportion, is ſaid to make excellent molds for this and parallel uſes.

Caſts of metals, or ſuch ſmall pieces as are of a ſimilar form, may be made in plaſter by the method directed for baſs relievos.

Indeed there is nothing more required than to form a mold by laying them on a proper board; and having ſurrounded them by a rim made of a piece of a card, or any other paſteboard, to fill the rim with ſoft tempered plaſter of Paris; which mould, when dry, will ſerve for ſeveral caſts. It is nevertheleſs a better method to form the mold of melted ſulphur; which will produce a ſharper impreſſion in the caſt, and be more durable than thoſe made of plaſter.

The caſts are likewiſe frequently made of ſulphur, which being melted muſt be treated exactly in the ſame manner as the plaſter.

Philoſoph. Commerce of Arts.

For taking caſts from medals, Dr Lewis recommends a mixture of flowers of brimſtone and red lead: equal parts of theſe are to be put over the fire in a laddle, till they ſoften to the conſiſtence of pap; then they are kindled with a piece of paper, and ſtirred for ſome time. The veſſel being afterwards covered cloſe, and continued on the fire, the mixture grows fluid in a few minutes. It is then to be poured on the metal, previouſly oiled and wiped clean. The caſts are very neat; their colour ſometimes a pretty deep black, ſometimes a dark grey: they are very durable; and when ſoiled, may be waſhed clean in ſpirits of wine.

Naturaliſt's Companion.

Dr Letſom recommends tin-foil for taking off caſts from medals. The thinneſt kind is to be uſed. It ſhould be laid over the ſubject from which the impreſſion is to be taken, and then rubbed with a bruſh, the point of a ſkewer, or a pin, till it has perfectly received the impreſſion. The tin-foil ſhould now be pared cloſe to the edge of the medal, till it is brought to the ſame circumference: the medal muſt then be reverſed, and the tin-foil will drop off into a chip-box or mold placed ready to receive it. Thus the concave ſide of the foil will be uppermoſt, and upon this plaſter of Paris, prepared in the uſual manner may be poured. When dry, the whole is to be taken out, and the tin-foil ſticking on the plaſter will give a perfect repreſentation of the medal, almoſt equal in beauty to ſilver. If the box or mold is a little larger than the medal, the plaſter running round the tin-foil will give the appearance of a white frame or circular border;

border; whence the new made medal will appear more neat and beautiful.

Caſts may be made likewiſe with iron, prepared in the following manner: "Take any iron bar, or piece of a ſimilar form; and having heated it red-hot, hold it over a veſſel containing water, and touch it very ſlightly with a roll of ſulphur, which will immediately diſſolve it, and make it fall in drops into the water. As much iron as may be wanted being thus diſſolved, pour the water out of the veſſel; and pick out the drops formed by the melted iron from thoſe of the ſulphur, which contain little or no iron, and will be diſtinguiſhable from the other by their colour and weight." The iron will, by this means, be rendered ſo fuſible, that it will run with leſs heat than is required to melt lead; and may be employed for making caſts of medals, and many other ſuch purpoſes, with great convenience and advantage.

Impreſſions of medals, having the ſame effect as caſts, may be made alſo of iſinglaſs glue, by the following means. Melt the iſinglaſs, beaten, as when commonly uſed, in an earthen pipkin, with the addition of as much water as will cover it, ſtirring it gently till the whole is diſſolved: then with a bruſh of camel's hair, cover the medal, which ſhould be previouſly well cleanſed and warmed, and then laid horizontally on a board or table, greaſed in the part around the medal. Let them reſt afterwards till the glue be properly hardened; and then, with a pin, raiſe the edge of it; and ſeparate it carefully from the medal: the caſt will be thus formed by the glue as hard as horn; and ſo light, that a thouſand will ſcarcely weigh an ounce. In order to render the relief of the medal more apparent, a ſmall quantity of carmine may be mixed with the melted inſinglaſs; or the medal may be previouſly coated with leaf-gold by breathing on it, and then laying it on the leaf, which will by that means adhere to it: but the uſe of leaf-gold is apt to impair a little the ſharpneſs of the impreſſion.

Impreſſions of medals may be likewiſe taken in putty; but it ſhould be the true kind made of calx of tin, and drying oil. Theſe may be formed in the molds, previouſly taken in plaſter or ſulphur; or molds may be made in its own ſubſtance, in the manner directed for thoſe of the plaſter. Theſe impreſſions will be very ſharp and hard; but the greateſt diſadvantage that attends them, is their drying very ſlowly, and being liable in the mean time to be damaged.

Impreſſions of prints, or other engravings, may be taken from copper-plates, by cleanſing them thoroughly, and pouring plaſter upon them: but the effect in this way is not ſtrong enough for the eye; and therefore the following method is preferable, where ſuch impreſſions on plaſter are deſired.

Take vermilion, or any other coloured pigment, finely powdered, and rub it over the plate: then paſs a folded piece of paper, or the flat part of the hand, over the plate, to take off the colour from the lights or parts where there is no engraving: the proceeding muſt then be the ſame as where no colour is uſed. This laſt method is alſo applicable to the making of impreſſions of copper-plates on paper with dry colours; for the plate being prepared as here directed, and laid on the paper properly moiſtened, and either paſſed under the rolling-preſs, or any other way ſtrongly forced down on the paper, an impreſſion of the engraving will be obtained.

Impreſſions may be likewiſe taken from copper-plates, either on plaſter or paper, by means of the ſmoke of a candle or lamp: if, inſtead of rubbing them with any colour, the plate be held over the candle or lamp till the whole ſurface become black, and then wiped off by the flat of the hand, or paper.

Theſe methods are not, however, of great uſe in the caſe of copper-plates, except where impreſſions may be deſired on occaſions where printing-ink cannot be procured: but as they may be applied likewiſe to the taking impreſſions from ſnuff-boxes, or other engraved ſubjects, by which means deſigns may be inſtantly borrowed by artiſts or curious perſons, they may in ſuch inſtances be very uſeful.

The expedient of taking impreſſions by the ſmoke of a candle or lamp may be employed alſo for botanical purpoſes in the caſe of leaves, as a perfect and durable repreſentation of not only the general figure, but the contexture and diſpoſition of the larger fibres, may be extemporaneouſly obtained at any time. The ſame may be neverthele ſs done in a more perfect manner, by the uſe of linſeed oil, either alone, or mixed with a ſmall proportion of colour, where the oil can be conveniently procured: but the other method is valuable on account of its being practicable at almoſt all ſeaſons, and in all places, within the time that the leaves will keep freſh and plump. In taking theſe impreſſions, it is proper to bruiſe the leaves, ſo as to take off the projections of the large ribs, which might prevent the other parts from plying to the paper.

Leaves, as alſo the petals, or flower-leaves, of plants, may themſelves be preſerved on paper, with their original appearance, for a conſiderable length of time, by the following means.—Take a piece of paper, and rub it over with iſinglaſs glue, treated as above directed for taking impreſſions from medals; and then lay the leaves in a proper poſition on the paper. The glue laid on the paper being ſet, bruſh over the leaves with more of the ſame; and that being dry likewiſe, the operation will be finiſhed, and the leaves ſo ſecured from the air and moiſture, that they will retain their figure and colour much longer than by any other treatment.

Butterflies, or other ſmall animals of a flat figure, may alſo be preſerved in the ſame manner.

Casting is alſo ſometimes uſed for the quitting, laying, or throwing aſide any thing; thus deer caſt their horns, ſnakes their ſkins, lobſters their ſhells, hawks their feathers, *&c.* annually.

Caſting of feathers is more properly called *moulting* or *mewing*.

A horſe *caſts* his hair, or coat, at leaſt once a-year, viz. in the ſpring when he caſts his winter coat; and ſometimes, at the cloſe of autumn, he caſts his ſummer coat, in caſe he has been ill kept. Horſes alſo ſometimes *caſt* their hoofs, which happens frequently to coach-horſes brought from Holland: theſe, being bred in a moiſt marſhy country, have their hoofs too flabby: ſo that coming into a drier ſoil, and leſs juicy provender, their hoofs fall off, and others that are firmer ſucceed.

Casting a Colt, denotes a mare's proving abortive.

Casting-Net, a ſort of fiſhing-net ſo called, becauſe it is to be *caſt*, or thrown out; which when exactly done, nothing eſcapes it, but weeds and every thing within its extent are brought away.

CASTLE, a fortreſs, or place rendered defenſible either by nature or art. It frequently ſignifies in Britain the principal manſion of noblemen. In the time of Henry II. there were no leſs than 1115 caſtles in England, each of which contained a manor.

Castles, walled with ſtone, and deſigned for reſidence as well as defence, are, for the moſt part, according to Mr Groſe, of no higher antiquity than the conqueſt: for although the Saxons, Romans, and even, according to ſome writers on antiquity, the ancient Britons, had caſtles built with ſtone; yet theſe were both few in number, and, at that period, through neglect or invaſions, either deſtroyed, or ſo much decayed, that little more than their ruins were remaining. This is aſſerted by many of the hiſtorians and antiquaries, and aſſigned as a reaſon for the facility with which William made himſelf maſter of that country.

Groſe's Antiquities of England and Wales, Vol. I. Preface.

This circumſtance was not overlooked by ſo good a general as the Conqueror; who, effectually to guard againſt invaſions from without, as well as to awe his newly acquired ſubjects, immediately began to erect caſtles all over the kingdom, and likewiſe to repair and augment the old ones. Beſides, as he had parcelled out the lands of the Engliſh amongſt his followers, they, to protect themſelves from the reſentment of thoſe ſo deſpoiled, built ſtrong holds and caſtles on their eſtates. This likewiſe cauſed a conſiderable increaſe of theſe fortreſſes; and the turbulent and unſettled ſtate of the kingdom in the ſucceeding reigns, ſerved to multiply them prodigiouſly, every baron or leader of a party building caſtles; inſomuch, that towards the latter end of the reign of king Stephen, they amounted to the almoſt incredible number of 1115.

As the feudal ſyſtem gathered ſtrength, theſe caſtles became the heads of baronies. Each caſtle was a manor: and its caſtelain, owner, or governor, the lord of that manor. Markets and fairs were directed to be held there; not only to prevent frauds in the king's duties or cuſtoms, but alſo as they were eſteemed places where the laws of the land were obſerved, and as ſuch had a very particular privilege. But this good order did not long laſt: for the lords of caſtles began to arrogate to themſelves a royal power, not only within their caſtles, but likewiſe its environs; exerciſing judicature both civil and criminal, coining of money, and arbitrarily ſeizing forage and proviſion for the ſubſiſtence of their garriſons, which they afterwards demanded as a right: at length their inſolence and oppreſſion grew to ſuch a pitch, that according to William of Newbury, "there were in England as many kings, or rather tyrants, as lords of caſtles;" and Matthew Paris ſtyles them, very neſts of devils and dens of thieves. Caſtles were not ſolely in the poſſeſſion of the crown and the lay barons, but even biſhops had theſe fortreſſes; though it ſeems to have been contrary to the canons, from a plea made uſe of in a general council, in favour of king Stephen, who had ſeized upon the ſtrong caſtles of the biſhops of Lincoln and Saliſbury. This prohibition (if ſuch exiſted) was however very little regarded; as in the following reigns many ſtrong places were held, and even defended, by the eccleſiaſtics: neither was more obedience afterwards paid to a decree made by the Pope at Viterbo, the fifth of the kalends of June 1220, wherein it was ordained, that no perſon in England ſhould keep in his hands more than two of the king's caſtles.

The licentious behaviour of the garriſons of theſe places becoming intolerable, in the treaty between king Stephen and Henry II. when only duke of Normandy, it was agreed, that all the caſtles built within a certain period ſhould be demoliſhed; in conſequence of which many were actually raſed, but not the number ſtipulated.

The few caſtles in being under the Saxon government, were probably, on occaſion of war or invaſions, garriſoned by the national militia, and at other times ſlightly guarded by the domeſtics of the princes or great perſonages who reſided therein; but after the conqueſt, when all the eſtates were converted into baronies held by knight's ſervice, caſtle-guard coming under that denomination, was among the duties to which particular tenants were liable. From theſe ſervices the biſhops and abbots, who till the time of the Normans had held their lands in frank almoign, or free alms, were, by this new regulation, not exempted; they were not indeed, like the laity, obliged to perſonal ſervice, it being ſufficient that they provided fit and able perſons to officiate in their ſtead. This was however at firſt ſtoutly oppoſed by Anſelm archbiſhop of Canterbury; who being obliged to find ſome knights to attend king William Rufus in his wars in Wales, complained of it as an innovation and infringement of the rights and immunities of the church.

It was no uncommon thing for the Conqueror and the kings of thoſe days, to grant eſtates to men of approved fidelity and valour, on condition that they ſhould perform caſtle-guard in the royal caſtles, with a certain number of men, for ſome ſpecified time; and ſometimes they were likewiſe bound by their tenures to keep in repair and guard ſome particular tower or bulwark, as was the caſe at Dover caſtle.

In proceſs of time theſe ſervices were commuted for annual rents, ſometimes ſtyled *ward-penny*, and waytfee, but commonly *caſtle-guard* rents, payable on fixed days, under prodigious penalties called *ſurſizes*. At Rocheſter, if a man failed in the payment of his rent of caſtle-guard on the feaſt of St Andrew, his debt was doubled every tide during the time for which the payment was delayed. Theſe were afterwards reſtrained by an act of parliament made in the reign of king Henry VIII. and finally annihilated, with the tenures by knight's ſervice, in the time of Charles II. Such caſtles as were private property were guarded either by mercenary ſoldiers, or the tenants of the lord or owner.

Caſtles which belonged to the crown, or fell to it either by forfeiture or eſcheat (circumſtances that frequently happened in the diſtracted reigns of the feudal times), were generally committed to the cuſtody of ſome truſty perſon, who ſeems to have been indifferently ſtyled governor and conſtable. Sometimes alſo they were put into the poſſeſſion of the ſheriff of the county, who often

often converted them to priſons. That officer was then accountable at the exchequer, for the farm or produce of the lands belonging to the places entruſted to his care, as well as all other profits: he was likewiſe in caſe of war or invaſion, obliged to victual and furniſh them with munition out of the iſſues of his county; to which he was directed by writ of privy ſeal.

The materials of which caſtles were built, varied according to the places of their erection; but the manner of their conſtruction ſeems to have been pretty uniform. The outſide of the walls were generally built with the ſtones neareſt at hand, laid as regularly as their ſhapes would admit; the inſides were filled up with the like materials, mixed with a great quantity of fluid mortar, which was called by the workmen grout-work.

The general ſhape or plan of theſe caſtles depended entirely on the caprice of the architects, or the form of the ground intended to be occupied: neither do they ſeem to have confined themſelves to any particular figure in their towers; ſquare, round, and poligonal, oftentimes occurring in the original parts of the ſame building.

The ſituation of the caſtles of the Anglo-Norman kings and barons, was moſt commonly on an eminence, and near a river; a ſituation on ſeveral accounts eligible. The whole ſite of the caſtle (which was frequently of great extent and irregular figure) was ſurrounded by a deep and broad ditch, ſometimes filled with water, and ſometimes dry, called the *foſſe*. Before the great gate was an outwork, called a *barbacan*, or *antemural*, which was a ſtrong and high wall, with turrets upon it, deſigned for the defence of the gate and draw-bridge. On the inſide of the ditch ſtood the wall of the caſtle, about eight or ten feet thick, and between 20 and 30 feet high, with a parapet, and a kind of embraſures, called *crennels*, on the top. On this wall at proper diſtances ſquare towers of two or three ſtories high were built, which ſerved for lodging ſome of the principal officers of the proprietor of the caſtle, and for other purpoſes; and on the inſide were erected lodgings for the common ſervants or retainers, granaries, ſtorehouſes, and other neceſſary offices. On the top of this wall, and on the flat roofs of theſe buildings, ſtood the defenders of the caſtle, when it was beſieged and from thence diſcharged arrows, darts, and ſtones, on the beſiegers. The great gate of the caſtle ſtood in the courſe of this wall, and was ſtrongly fortified with a tower on each ſide, and rooms over the paſſage, which was cloſed with thick folding-doors of oak, often plated with iron, and with an iron portcullis or grate let down from above. Within this outward wall was a large open ſpace or court called, in the largeſt and moſt perfect caſtles, the *outer bayle*, or *ballium*, in which ſtood commonly a church or chapel. On the inſide of this outer bayle was another ditch, wall, gate, and towers, incloſing the inner bayle or court, within which the chief tower or *keep* was built. This was a very large ſquare fabric, four or five ſtories high, having ſmall windows in prodigious thick walls, which rendered the apartments within it dark and gloomy. This great tower was the palace of the prince, prelate, or baron, to whom the caſtle belonged, and the reſidence of the conſtable or governor. Under ground were diſmal dark vaults, for the confinement of priſoners, which made it ſometimes be called the *dungeon*. In this building alſo was the great hall, in which the owner diſplayed his hoſpitality, by entertaining his numerous friends and followers. At one end of the great halls of caſtles, palaces, and monaſteries, there was a place raiſed a little above the reſt of the floor, called the *deis*, where the chief table ſtood, at which perſons of the higheſt rank dined. Though there was unqueſtionably great variations in the ſtructure of caſtles, yet the moſt perfect and magnificent of them ſeem to have been conſtructed nearly on the above plan. Such, to give one example, was the famous caſtle of Bedford, as appears from the following account of the manner in which it was taken by Henry III. A. D. 1224. The caſtle was taken by four aſſaults. "In the firſt was taken the barbican; in the ſecond the outer ballia; at the third attack, the wall by the old tower was thrown down by the miners, where, with great danger, they poſſeſſed themſeves of the inner ballia, through a chink; at the fourth aſſault the miners ſet fire to the tower, ſo that the ſmoke burſt out, and the tower itſelf was cloven to that degree, as to ſhow viſibly ſome broad chinks: whereupon the enemy ſurrendered." See a repreſentation of a caſtle in Plate CXXVII. where 1 is the barbacan, 2, the ditch or moat, 3 the wall of the outer ballium, 4 outer ballium, 5 the artificial mount, 6 the wall of the inner ballium, 7 the inner ballium, 8, the keep or dungeon.

Before the acceſſion of James VI. to the throne of England, the ſituation of Scotland was ſuch, that every baron's houſe was more or leſs fortified, according to the power and conſequence of its lord, or according to the ſituation of the caſtle. Near Edinburgh or Stirling, where the inhabitants were more poliſhed in their manners, and overawed by the ſeat of government, no more was neceſſary than towers capable of reſiſting the curſory attack of robbers and thieves, who never durſt ſtop to make a regular inveſtment, but plundered by ſurpriſe, and, if repulſed, inſtantly fled away. Such was Melville Caſtle. It anciently conſiſted of a ſtrong built tower of three ſtories, embattled at the top, and was ſufficiently ſtrong to reſiſt a ſudden attack, unaided by artillery, or other engines of war. But, when further removed, as in Perthſhire, Inverneſsſhire, or Aberdeenſhire, then it was neceſſary to be better defended, and the aids of a peel or dungeon, with outer walls, moat, and wet ditch, barnakin, &c. added to enable the powerful lord to reſiſt the formidable attack of his powerful adverſary. The hiſtory of Scotland, ſo late as the reign of the Stewart family, affords a number of melancholy inſtances of inveterate feuds among the greater and leſſer barons of that period; by which every mode of fortification then in uſe was ſeldom adequate to the defence of the caſtle againſt the ſtorm or blockade of the enraged chieftain. The caſtle of Doun ſeems to anſwer this deſcription of fortification, and has made ſeveral gallant defences, in the annals of Scotland. The third kind of fortreſſes we meet with in Scotland are thoſe ſituated on the borders of England, or on the ſea-coaſts of the kingdom, and in the weſtern iſles, and very remote places. Many of the old caſtles in Scotland were ſituated on an iſland, in a deep lake, or on a peninſula, which by a broad deep cut was made an iſland. Of this kind was Lochmaben, in the

ſtewartry

ſtewartry of Annandale, the caſtle of Cloſeburn in the ſhire of Nithſdale, the caſtle of the Rive, ſituated on the river Dee, in the ſhire of Galloway, Lochleven caſtle, and many others.

This kind of fortreſs was only acceſſible in a hard froſt or by boats which were not eaſily tranſported, by a people diſtitute of good roads and wheel-carriages. In fact, they could only be taken by ſurpriſe or blockade; the firſt very difficult, the ſecond very tedious; ſo that, before the uſe of artillery, they might be deemed almoſt impregnable. On that account, their ſituation was very deſirable in the inland parts of Scotland.

On the ſea-coaſts of Scotland we generally find the ſtrongeſt and moſt ancient, as well as the moſt impregnable caſtles. Theſe had to defend themſelves from the invaſion of the foreign enemy, as well as the attacks of the domeſtic foe. Thus we find the barons, whoſe lands extended to the ſea-coaſt, perched, like the eagle, on the moſt inacceſſible rocks that lay within their poſſeſſions. Of this kind were Slains caſtle, Tantallon, and Dunotter on the eaſt coaſt, and Dunvegan in the iſle of Sky, with Dunolly on the weſt coaſt. Theſe muſt have been moſt uncomfortable retreats, except to a barbarous people, or when a preſſing danger forced the baron to ſeek his ſafety in the only poſſible retreat left him.

Castle, in ancient writers, denotes a town or village ſurrounded with a ditch and wall, furniſhed with towers at intervals, and guarded by a body of troops. The word is originally Latin, *caſtellum*, a diminutive from *caſtrum*. *Caſtellum* originally ſeems to have ſignified a ſmaller fort for a little garriſon: though Suetonius uſes the word where the fortification was large enough to contain a cohort. The *caſtella*, according to Vegetius, were often like towns, built on the borders of the empire, and where there were conſtant guards and fences againſt the enemy. Horſley takes them for much the ſame with what were otherwiſe denominated *ſtations*.

Castle, or *Caſtle-ſteed*, is alſo an appellation given by the country-people in the north of Britain to the Roman *caſtella*, as diſtinguiſhed from the *caſtra ſtativa* which they uſually call *cheſters*. Horſley repreſents this as an uſeful criterion, whereby to diſcover or diſtinguiſh a Roman camp or ſtation. There are ſeveral of theſe caſtella on Severus's wall: they are generally 60 feet ſquare; their north ſide is formed by the wall itſelf which falls in with them; the intervals between them are from ſix furlongs and an half to ſeven; they ſeem to have ſtood cloſeſt where the ſtations are wideſt. The neighbouring people call them *caſtles* or *caſtle-ſteed*, by which it ſeems probable that their ancient Latin name had been *caſtellum*. Some modern writers call them *mile-caſtles*, or military *caſtellæ*: Horſley ſometimes *exploratory caſtles*. In theſe *caſtella* the *areans* had their ſtations, who were an order of men whoſe buſineſs was to make incurſions into the enemies country, and give intelligence of their motions.

Castle, in the ſea language, is a part of the ſhip, of which there are two: the forecaſtle, being the elevation at the prow, or the uppermoſt deck towards the mizen, the place where the kitchens are. Hindcaſtle is the elevation wich reigns on the ſtern, over the laſt deck, where the officers cabins and places of aſſembly are.

Castle, (Edmund). See Castle.

Castle-Bar, a borough and market-town, capital of the county of Mayo in Ireland, is a well-inhabited place, and carries on a briſk tade: it has a barrack for a troop of horſe; and there is here a charter-ſchool capable of receiving fifty children, and endowed with two acres of land, rent-free, by the Right Honourable Lord Lucan, who has alſo granted a leaſe of twenty acres more at a pepper-corn yearly.

Castle-Cary, a remarkable Roman ſtation about four miles weſt from Falkirk on the borders of Stirlingſhire in Scotland. It comprehends ſeveral acres of ground, is of a ſquare form, and is ſurrounded with a wall of ſtone and mortar: all the ſpace within the walls has been occupied by buildings, the ruins of which have raiſed the earth eight or ten feet above its natural ſurface; ſo that the fort now ſeems like an hill-top ſurrounded with a ſunk fence. In 1770, ſome workmen employed in ſearching for ſtones for the great canal which paſſes very near it, diſcovered ſeveral apartments of ſtone; and in one of them a great number of ſtones about two feet in length, and ſtanding erect, with marks of fire upon them, as if they had been employed in ſupporting ſome veſſels under which fire was put. In a hollow of the rock near this place, in 1771, a conſiderable quantity of wheat quite black with age was found, with ſome wedges and hammers ſuppoſed to be Roman.

Castle-Riſing, a borough-town of Norfolk in England, which ſends two members to parliament. E. Long. 0. 40. 40. N. Lat. 52. 46.

Castle-work, ſervice or labour done by inferior tenants for the building and upholding caſtles of defence, toward which ſome gave their perſonal aſſiſtance and others paid their contributions. This was one of the three neceſſary charges to which the Anglo-Saxons were expreſsly ſubject.

CASTLETOWN, the capital of the iſle of Man, ſeated on the ſouth-weſt part of the iſland. It has a ſtrong caſtle; but of no great importance, on account of its diſtance from the rocky and ſhallow harbour. W. Long. 4. 39. N. Lat 53. 30.

CASTOR, the Beaver, in zoology, a genus of quadrupeds belonging to the order of glires. The fore-teeth of the upper jaw are truncated, and hollowed in a tranſverſe angular direction. The tops of the fore-teeth of the lower jaw lie in a tranſverſe direction; and the tail is depreſſed. There are three ſpecies of caſtor, viz.

1. The fiber or common beaver, with a plain ovated tail, is found on the banks of the rivers in Europe, Aſia, and America. It has ſhort ears hid in the fur: a blunt noſe; the fore-feet ſmall, the hinder large: its length from noſe to tail about three feet, tail about one foot. It is from the inguinal glands of this animal that the caſtor is obtained; it is contained in cods or pouches reſembling a dog's teſticles. Nothing equals the art with which theſe animals conſtruct their dwellings. They chooſe a level piece of ground, with a ſmall rivulet running through it. This they form into a pond, by making a dam acroſs; firſt by driving into the ground ſtakes of five or ſix feet in length, placed in rows, wattling each row with pliant twigs, and filling the interſtices with clay, ramming it down cloſe. The ſide next the water is ſloped, the other perpendicular;

Plate. CXXXI.

cular; the bottom is from ten to twelve feet thick; but the thickneſs gradually diminiſhes to the top, which is about two or three: the length of theſe dams is ſometimes not leſs than 100 feet.

Their houſes are made in the water collected by means of the dam, and are placed near the edge of the ſhore. They are built on piles; are either round or oval; but their tops are vaulted, ſo that their inſide reſembles an oven, the top a dome. The walls are two feet thick, made of earth, ſtones, and ſticks, moſt artificially laid together; and the walls within as neatly plaſtered as if with a trowel. In each houſe are two openings, the one into the water, the other towards the land. The height of theſe houſes above the water is eight feet. They often make two or three ſtories in each dwelling, for the convenience of change in caſe of floods. Each houſe contains from 20 to 30 beavers; and the number of houſes in each pond is from 10 to 25. Each beaver forms its bed of moſs; and each family forms its magazine of winter proviſions, which conſiſt of bark and boughs of trees. Thoſe they lodge under water, and fetch into their apartments as occaſion requires. Lawſon ſays, they are fondeſt of the ſaſſafras, aſh, and ſweet gum. Their ſummer food is leaves, fruits, and ſometimes crabs and craw fiſh; but they are not fond of fiſh.

To effect theſe works, a community of two or three hundred aſſembles; each bears his ſhare in the labour; ſome fall to gnawing with their teeth trees of great ſize, to form beams or piles; others roll the pieces along to the water; others dive, and with their feet ſcrape holes in order to place them in; while others exert their efforts to rear them in their proper places: another party is employed in collecting twigs to wattle the piles with; a third in collecting earth, ſtones, and clay; a fourth is buſied in beating and tempering the mortar; others in carrying it on their broad tails to proper places, and with the ſame inſtrument ram it between the piles, or plaſter the inſide of their houſes. A certain number of ſmart ſtrokes given with their tails, is a ſignal made by the overſeer for repairing to ſuch and ſuch places, either for mending any defects, or at the approach of an enemy; and the whole ſociety attend to it with the utmoſt aſſiduity. Their time of building is early in ſummer; for in winter they never ſtir but to their magazines of proviſions, and during that ſeaſon are very fat. They breed once a-year, and bring forth at the latter end of the winter two or three young at a birth.

Beſides theſe aſſociated beavers, is another ſort called *terriers*, which either want induſtry or ſagacity to form houſes like the others. They burrow in the banks of rivers, making their holes beneath the freezing depth of the water, and work up for a great number of feet. Theſe alſo form their winter ſtock of proviſion.

Beavers vary in their colours; the fineſt are black, but the general colour is a cheſnut brown, more or leſs dark: ſome have been found, but very rarely, white. The ſkins are a prodigious article of trade, being the foundation of the hat-manufactory. In 1763, were ſold, in a ſingle ſale of the Hudſon's bay company, 54,670 ſkins. They are diſtinguiſhed by different names. *Coat-beaver* is what has been worn as coverlets by the Indians: *Parchment-beaver*, becauſe the lower ſide reſembles it: *Stage-beaver* is the worſt, and is that which the Indians kill out of ſeaſon, on their ſtages or journeys.

In hunting the beavers, the ſavages ſometimes ſhoot them, always getting on the contrary ſide of the wind; for they are very ſhy, quick in hearing, and of a keen ſcent. This is generally done when the beavers are at work, or on ſhore feeding on poplar bark. If they hear any noiſe when at work, they immediately jump into the water, and continue there ſome time; and when they riſe, it is at a diſtance from the place where they went in.

They ſometimes are taken with traps: theſe are nothing but poplar ſticks laid in a path near the water; which when the beaver begins to feed upon, they cauſe a large log of wood to fall upon their necks, which is put in motion by their moving of the ſticks, and conſequently requires an ingenious contrivance. The ſavages generally prefer this way of taking them, becauſe it does not damage their ſkins.

In the winter time they break the ice in two places at a diſtance from the houſe, the one behind the other. Then they take away the broken ice with a kind of racket, the better to ſee where to place their ſtakes. They faſten their nets to theſe, which have large meſhes, and ſometimes are eighteen or twenty yards in length. When theſe are fixed, they proceed to demoliſh the houſe, and turn a dog therein; which terrifying the beaver, he immediately leaves it, and takes to the water; after which, he is ſoon entangled by the net.

2. The moſchatus, with a long, compreſſed, lanceolated tail, and palmated feet. It has a long ſlender noſe like that of a ſhrew-mouſe; no external ears, and very ſmall eyes. Length from noſe to tail, ſeven inches; of the tail, eight. It is the water-rat of Cluſius; and inhabits Lapland, Ruſſia, the banks of the rivers Wolga and the Yaick. It never wanders far from the ſides; is very ſlow in its pace; makes holes in the cliffs, with the entrance far beneath the loweſt fall of the water; works upwards, but never to the ſurface, only high enough to be beyond the higheſt flow of the river: feeds on fiſh; is devoured by the pikes and *ſiluri*, and gives thoſe fiſh ſo ſtrong a flavour of muſk as to render them not eatable; has the ſame ſcent as the former, eſpecially about the tail, out of which is expreſſed a ſort of muſk very much reſembling the genuine kind. The ſkins are put into cheſts among clothes, to drive away moths. At Orenburgh the ſkins and tails ſell for 15 or 20 copees *per* hundred. They are ſo common near Nizney Novogorod, that the peaſants bring 500 a-piece to market, where they are ſold for one ruble *per* hundred. The German name for theſe animals is *bieſemratze*: the Ruſſian *wychozhol*.

3. The zibethicus, or muſk-rat, with a long, compreſſed, lanceolated tail, and the toes of the feet ſeparated from each other. Length from noſe to tail, one foot; of the tail, nine inches. This ſpecies inhabits North America, breeds three or four times in a year, and brings from three to ſix young ones at a time: during ſummer the male and female conſort together: at the approach of winter they unite in families, and retire into ſmall round edifices covered with a dome, formed of herbs and reeds cemented

with clay : at the bottom are ſeveral pipes through which they paſs in ſearch of food ; for they do not form magazines like the beavers : during winter their habitations are covered many feet deep with ſnow and ice ; but they creep out and feed on the roots beneath : they quit their old habitations annually, and form new ones : the fur is ſoft and much eſteemed : the whole animal, during ſummer, has a moſt exquiſite ſmell of muſk, which it loſes in winter : perhaps the ſcent is derived from the calamus aromaticus, a favourite food of this animal. Leſcarbot ſays they are very good to eat.

CASTOR, in aſtronomy, a moiety of the conſtellation GEMINI ; called alſo APOLLO. Its latitude northwards, for the year 1700, according to Hevelius, was 10° 4′ 23″ ; and its longitude, of Cancer, 16° 4′ 14″. It is alſo called Raſalgenze, Apollo, Aphellan, Avellar, and Anelar.

CASTOR and Pollux, in Pagan mythology. Jupiter having an amour with Leda, the wife of Tyndarus king of Sparta, in the form of a ſwan, ſhe brought forth two eggs, each containing twins. From that impregnated by Jupiter proceeded Pollux and Helena, who were both immortal ; from the other Caſtor and Clytemneſtra, who being begot by Tyndarus were both mortal. They were all, however, called by the common name of *Tyndaridæ*. Theſe two brothers entered into an inviolable friendſhip : they went with the other noble youths of Greece in the expedition to Colchis, and, on ſeveral occaſions, ſignalized themſelves by their courage ; but Caſtor being at length killed, Pollux obtained leave to ſhare his own immortality with him ; ſo that they are ſaid to live and die alternately every day : for, being tranſlated into the ſkies, they form the conſtellation of gemini, one of which ſtars riſes as the other ſets.

A martial dance, called the *Pyrrhic* or *Caſtorian* dance, was invented in honour of thoſe deities whom the Cephelenſes placed among the Dii Magni, and offered to them white lambs. The Romans alſo paid them particular honours on account of the aſſiſtance they are ſaid to have given them in an engagement againſt the Latins ; in which, appearing mounted on white horſes, they turned the ſcale of victory in their favour, for which a temple was erected to them in the forum.

CASTOR and *Pollux*, a fiery meteor, which at ſea appears ſometimes ſticking to a part of the ſhip, in form of one, two, or even three or four fire-balls : when one is ſeen alone, it is more properly called *Helena* ; two are denominated Caſtor and Pollux, and ſometimes Tyndaridæ. Caſtor and Pollux are called by the Spaniards, San Elmo ; by the French, St Elme, St Nicholas, St Clare, St Helene ; by the Italians, Hermo ; by the Dutch, Vree Vuuren.

Caſtor and Pollux are commonly judged to portend a ceſſation of the ſtorm, and a future calm ; being rarely ſeen till the tempeſt is nigh ſpent. Helena alone portends ill, and witneſſes the ſevereſt part of the ſtorm yet behind. When the meteor ſticks to the maſts, yards, &c. they conclude, from the air's not having motion enough to diſſipate this flame, that a profound calm is at hand ; if it flutter about, it indicates a ſtorm.

CASTOREUM, in the Materia Medica, CASTOR ; the inguinal glands of the beaver. The ancients had a notion that it was lodged in the teſticles ; and that the animals, when hard preſſed, would bite them off, and leave them to its purſuers, as if conſcious of what they wanted to deſtroy him for. The beſt ſort of caſtor is what comes from Ruſſia. So much is Ruſſian caſtor ſuperior to the American, that two guineas per pound is paid in Britain for the former, and only 8s 6d. for the latter. The Ruſſian caſtor is in large hard round cods, which appear, when cut, full of a brittle, red, liver-coloured ſubſtance, interſperſed with membranes and fibres exquiſitely interwoven. An inferior ſort is brought from Dantzic, and is generally fat and moiſt. The American caſtor, which is the worſt of all, is in longiſh thin cods. Ruſſia caſtor has a ſtrong diſagreeable ſmell ; and an acrid, bitteriſh, and nauſeous taſte. Water extracts the nauſeous part, with little of the finer bitter ; rectified ſpirit extracts this laſt without much of the nauſeous ; proof-ſpirit both : water elevates the whole of its flavour in diſtillation ; rectified ſpirit brings over nothing. Caſtor is looked upon as one of the capital nervine and antihyſteric medicines : ſome celebrated practitioners, nevertheleſs, have doubted its virtues ; and Newman and Stahl declare it inſignificant. Experience, however, has ſhown that the virtues of caſtor are conſiderable, tho' leſs than they have been generally ſuppoſed.

CASTRATION, in ſurgery, the operation of gelding, *i. e.* of cutting off the teſticles, and putting a male animal out of a capacity of generation.

Caſtration is much in uſe in Aſia, eſpecially among the Turks, who practiſe it on their ſlaves, to prevent any commerce with their women. The Turks often make a general amputation.

Caſtration alſo obtains in Italy, where it is uſed with a view to preſerve the voice for ſinging. See EUNUCH.

The Perſians, and other eaſtern nations, have divers methods of making eunuchs, different from thoſe which obtain in Europe : we ſay, of making eunuchs, for it is not always done among them by cutting, or even colliſion. Cicuta and other poiſonous herbs do the ſame office, as is ſhewn by Paulus Ægineta. Thoſe eunuchiſed in this manner are called *thlibiæ*. Beſides which there is another ſort named *thlaſiæ*, in whom the genitals are left entire, and only the veins which ſhould feed them are cut ; by which means the parts do indeed remain, but ſo lax and weak, as to be of no uſe.

Caſtration was for ſome time the puniſhment of adultery. By the laws of the Viſigoths, ſodomites underwent the ſame puniſhment.

By the civil law, it is made penal in phyſicians and ſurgeons to caſtrate, even with conſent of the party, who is himſelf included in the ſame penalty, and his effects forfeited. The offence of Mayhem by caſtration is, according to all old writers, felony ; though committed upon the higheſt provocation. See a record to this purpoſe of Henry III. tranſcribed by Sir Edward Coke, 3 Inſt. 62. or Blackſtone's Com. vol. iv. p. 206.

Caſtration is ſometimes found neceſſary on medicinal conſiderations, as in mortifications, and ſome other diſeaſes of the teſticles, eſpecially the *ſarcocele* and *varicocele*. Some have alſo uſed it in maniac caſes.

Castration is alſo in ſome ſort practiſed on women. Athenæus mentions, that king Andramytes was the firſt who caſtrated women. Heſychius and Suidas ſay Gyges did the ſame thing. Galen obſerves, that women cannot be caſtrated without danger of life, and Dalechampius, on the forementioned paſſage of Athenæus, holds, that it is only to be underſtood of ſimple padlocking.

Castration, in reſpect of brutes, is called Gelding and Spaying.

Castration alſo denotes the art of retrenching, or cutting away any part of a thing from its whole.—Caſtrating a book, among bookſellers, is the taking out ſome leaf, ſheet, or the like, which renders it imperfect and unfit for ſale. The term is alſo applied to the taking away particular paſſages, on account of their obſcenity, too great freedom with reſpect to goverment, &c.

Castration, among botaniſts, a term derived from the fancied analogy betwixt plants and animals. The caſtration of plants conſiſts in cutting off the *antheræ*, or tops of the ſtamina, before they have attained maturity and diſperſed the pollen or fine duſt contained within their ſubſtance. This operation has been frequently practiſed by the moderns, with a view to eſtabliſh or confute the doctrine of the ſexes of plants; the antheræ or tops being conſidered by the ſexualiſts as the male organs of generation. The experiment of caſtration ſucceeds principally on plants which, like the melon, have their male flowers detached from the female. In ſuch as have both male and female flowers contained within the ſame covers, this operation cannot be eaſily performed without endangering the neighbouring organs. The reſult of experiments on this ſubject by Linnæus, Alſton, and other eminent botaniſts, may be ſeen under the article Botany, ſect. iii.

CASTREL, a kind of hawk reſembling the lanner in ſhape, but the hobby in ſize. The caſtrel is alſo called keſtrel, and is a ſlow and cowardly kind; her game is the grous, though ſhe will kill a partridge.

CASTRES, a city of Languedoc in France, about 35 miles eaſt of Thoulouſe. E. Long. 2. and N. Lat. 43. 40. It is a biſhop's ſee.

CASTRO, the capital of the iſland of Chiloe, on the coaſt of Chili in South America. W. Long. 82. S. Lat. 43.

Castro is alſo the capital of a duchy of the ſame name in the Pope's territories in Italy, ſituated on the confines of Tuſcany. E. Long. 12. 35. N. Lat. 42. 30.

Castro, (Pietro de) a celebrated painter, who flouriſhed about the middle of the 17th century. The ſubjects which this great artiſt choſe to paint, were what are diſtinguiſhed by the name of ſtill life, vaſes, ſhells, muſical inſtruments, gems, veſſels of gold, ſilver, and cryſtal, books, and rich bracelets; and in thoſe ſubjects his choice and diſpoſition were elegant, and his execution admirable.

CASTRUCCIO, (Caſtracani) a celebrated Italian general, was born (nobody knows of whom) at Lucca in Florence in 1284, and left in a vineyard covered with leaves, where he was found by Dianora a widow lady, the ſiſter of Antonio, a canon of St Michael in Lucca, who was deſcended from the illuſtrious family of the Caſtracani. The lady having no children, they reſolved to bring him up, and educated him as carefully as if he had been their own. They intended him for a prieſt; but he was ſcarcely 14 years old when he began to devote himſelf to military ſports, and thoſe violent exerciſes which ſuited his great ſtrength of body. The factions named the *Guelfs* and *Gibelines* then ſhared all Italy between them; divided the popes and the emperors; and engaged in their different intereſts not only the members of the ſame town, but even thoſe of the ſame family. Franciſco, a conſiderable perſon on the ſide of the Gibelines, obſerving Caſtruccio's uncommon ſpirit and great qualities, prevailed with Antonio to let him turn ſoldier; on which Caſtruccio ſoon became acquainted with every thing belonging to that profeſſion, and was made a lieutenant of a company of foot by Franciſco Guinigi. In his firſt campaign he gave ſuch proofs of his courage and conduct as ſpread his fame all over Lombardy; and Guinigi, dying ſoon after, committed to him the care of his ſon and the management of his eſtate. Still diſtinguiſhing himſelf by his exploits, he filled his commander in chief with ſuch jealouſy and envy, that he was impriſoned by ſtratagem in order to be put to death. But the people of Lucca ſoon releaſed him, and afterwards choſe him for their ſovereign prince.

The Gibelines conſidered him as the chief of their party; and thoſe who had been baniſhed from their country fled to him for protection, and unanimouſly promiſed that if he could reſtore them to their eſtates, they would ſerve him ſo effectually that the ſovereignty of their country ſhould be his reward. Flattered by theſe promiſes, he entered into a league with the prince of Milan. He kept his army conſtantly on foot, employing it as beſt ſuited his own deſigns. For ſervices he had done the pope, he was made ſenator of Rome with more than ordinary ceremony; but while there, received news which obliged him to haſten back to Lucca. The Florentines entered into a war with him, but Caſtruccio fought his way through them; and the ſupreme authority of Tuſcany was ready to fall into his hands, when a period was put to his life. In May 1328, he gained a complete victory over his enemies, who amounted to 30,000 foot and 10,000 horſe; in which 22,000 of them were ſlain, with the loſs of not quite 16,000 of his own men: but as he was returning from the field of battle, tired with the action, and covered with ſweat, he halted a little, in order to thank and careſs his ſoldiers as they paſſed; when, the north wind blowing upon him, he was immediately ſeized with an ague, which he at firſt neglected, but it carried him off in a few days, in the 44th year of his age.

Machiavel, who has written the life of Caſtruccio, ſays, that he was not only an extraordinary man in his own age, but would have been ſo in any other. He was of a noble aſpect, and of the moſt winning addreſs. He had all the qualities that make a man great; was grateful to his friends, juſt to his ſubjects, terrible to his enemies. No man was more forward to encounter dangers; no man more careful to eſcape them. He had an uncommon preſence of mind, and often made repartees with great ſmartneſs. Some of them are recorded, which diſcover a ſingular turn of humour;

and, for a ſpecimen, we ſhall mention three or four of them.—Paſſing one day through a ſtreet where there was a houſe of bad fame, he ſurpriſed a young man, who was juſt coming out, and who, upon ſeeing him, was all over bluſhes and confuſion: “Friend, you ſhould not be aſhamed when you come out, but when you go in.”—One aſking a favour of him with a thouſand impertinent and ſuperfluous words: “Hark you, friend; when you would have any thing with me for the future, ſend another man to aſk it.”—Another great talker having tired him with a tedious diſcourſe, excuſed himſelf at laſt, by ſaying, he was afraid he had been troubleſome. “No indeed, (replied he), for I did not mind one word you ſaid.”—He was forced to put a citizen of Lucca to death, who had formerly been a great inſtrument of his advancement; and being reproached by ſomebody for having dealt ſo ſeverely with an old friend, replied, “No, you are miſtaken, it was with a new foe.”—One of his courtiers, deſirous to regale him, made a ball and invited him to it. Caſtruccio came, entertained himſelf among the ladies, danced, and did other things which did not ſeem to comport with the dignity of his rank. One of his friends intimating that ſuch freedoms might diminiſh the reverence that ought to be paid him: “I thank you for your caution; but he who is reckoned wiſe all the day, will never be reckoned a fool at night.”

CASTRUM DOLORIS, in middle-aged writers, denotes a catafalco, or a lofty tomb of ſtate, erected in honour of ſome perſon of eminence, uſually in the church where his body is interred; and decorated with arms, emblems, lights, and the like.

Eccleſiaſtical writers ſpeak of a ceremony of conſecrating a *caſtrum doloris*; the edifice was to be made to repreſent the body of the deceaſed, and the prieſt and deacon were to take their poſts, and ſay the prayers after the ſame manner as if the corpſe were actually preſent.

CASTS. See Casting.

CASU CONSIMILI, in law a writ of entry granted where a tenant, by courteſy or for life, aliens either in fee, in tail, or for the term of another's life. It is brought by him in reverſion againſt the perſon to whom ſuch tenant does ſo alien to the prejudice of the reverſioner in the tenant's life-time.

Casu-Proviſo, in law, a writ of entry founded on the ſtatute of Glouceſter, where a tenant in dower aliens the lands ſhe ſo holds in fee, or for life; and lies for the party in reverſion againſt the alience.

CASUAL, ſomething that happens fortuitouſly, without any deſign, or any meaſures taken to bring it to paſs.

Casual-Revenues, are thoſe which ariſe from forfeitures, confiſcations, deaths, attainders, *&c.*

Casual-Theology, a denomination given to what is more frequently called Casuistry.

CASUALTY, in general ſenſe, denotes an accident, or a thing happening by chance, not deſign. It is particularly uſed for an accident producing unnatural death.

Casualty, in Scots law. *Caſualties of a ſuperior*, are thoſe duties and emoluments which a ſuperior has right to demand out of his vaſſal's eſtate, over and beſides the conſtant yearly duties eſtabliſhed by the *reddendo* of his charter upon certain caſual events.

Casualty, in Metallurgy. See Casualty.

CASUIST, a perſon who propoſes to reſolve caſes of conſcience. Eſcobar has made a collection of the opinions of all the caſuiſts before him. M. Le Feore, preceptor of Louis XIII. called the books of the caſuiſts the art of quibbling with God; which does not ſeem far from truth, by reaſon of the multitude of diſtinctions and ſubtleties they abound withal. Mayer has publiſhed a bibliotheca of caſuiſts, containing an account of all the writers on caſes of conſcience, ranged under three heads; the firſt comprehending the Lutheran, the ſecond the Calviniſt, and the third the Romiſh caſuiſts.

CASUISTRY, the doctrine and ſcience of conſcience and its caſes, with the rules and principles of reſolving the ſame; drawn partly from natural reaſon or equity; partly from authority of ſcripture, the canon law, councils, fathers, *&c.* To caſuiſtry belongs the deciſion of all difficulties ariſing about what a man may lawfully do or not do; what is ſin or not ſin; what things a man is obliged to do in order to diſcharge his duty, and what he may let alone without breach of it.

CASUS AMISSIONIS, in Scots law, in actions proving the tenor of obligations inextinguiſhable by the debtors retiring or cancelling them, it is neceſſary for the purſuer, before he is allowed a proof of the tenor, to condeſcend upon ſuch a *caſus amiſſionis*, or accident by which the writing was deſtroyed, as ſhows it was loſt while in the writer's poſſeſſion.

CAT, in zoology. See Felis.

Cat, in ſea-affairs, a ſhip employed in the coal-trade, formed from the Norwegian model. It is diſtinguiſhed by a narrow ſtern, projecting quarters, a deep *waiſte*, and by having ornamental figures on the prow. Theſe veſſels are generally built remarkably ſtrong, and carry from four to ſix hundred tons, or, in the language of their own mariners, from 20 to 30 *keels* of coals.

Cat, is alſo a ſort of ſtrong tackle, or combination of pullies, to hook and draw the anchor perpendicularly up to the *cat-head*. See *Cat-Heads*.

Cat's Eye, or *Sun-ſtone*, of the Turks, a kind of gem found chiefly in Siberia. Cat's-eye is by the Latins called *occulus cati*, and ſometimes *onycopalus*, as having white zones or rings like the onyx; and its colours variable like opal, from which laſt it differs chiefly by its ſuperior hardneſs. It is very hard, and ſemitranſparent and has different points, from whence the light is reflected with a kind of yellowiſh radiation ſomewhat ſimilar to the eyes of cats, from whence it had its name. The beſt of them are are very ſcarce, and jewellers cut them round to the greateſt advantage. One of theſe ſtones, an inch in diameter, was in the poſſeſſion of the duke of Tuſcany.

Cat-Fiſh, in ichthyology. See Squalus.

Cat-Gut, a denomination given to ſmall ſtrings for fiddles, and other inſtruments, made of the inteſtines of ſheep or lambs, dried and twiſted together, either ſingly, or ſeveral together. Theſe are ſometimes coloured red, ſometimes blue, but are commonly left whitiſh or browniſh, the natural colour of the gut.

They are alſo uſed by watch-makers, cutlers, turners, and other artificers. Great quantities are imported into England, and other northern countries, from Lyons and Italy.

Cat-Harpings, a purchaſe of ropes employed to brace in the ſhrowds of the lower maſts behind their yards, for the double purpoſe of making the ſhrowds more tight, and of affording room to draw in the yards more obliquely, to *trim* the ſails for a ſide-wind, when they are ſaid to be cloſe hauled.

Cat-Heads, two ſtrong ſhort beams of timber, which project almoſt horizontally over the ſhip's bows on each ſide of the bow-ſprit; being like two radii which extend from a centre taken in the direction of the bow-ſprit. That part of the cat-head which reſts upon the forecaſtle, is ſecurely bolted to the beams: the other part projects like a crane as above deſcribed, and carries in its extremity two or three ſmall wheels or *ſheaves* of braſs or ſtrong wood, about which a rope called the *cat-fall* paſſes, and communicates with the cat-block, which alſo contains three ſheaves. The machine formed by this combination of pullies is called the *Cat*, which ſerves to pull the anchor up to the cat-head, without tearing the ſhip's ſides with its flukes. The cat-head alſo ſerves to ſuſpend the anchor clear of the bow, when it is neceſſary to let it go: it is ſupported by a ſort of knee, which is generally ornamented with ſculpture. See Plate CXXVIII.

The cat-block is filled with a large and ſtrong hood, which catches the ring of the anchor when it is to be drawn up.

Cat-Mint. See Mentha.

Cat-Salt, a name given by the ſalt-workers to a very beautifully granulated kind of common ſalt. It is formed out of the bittern, or leach-brine, which runs from the ſalt when taken out of the pan. When they draw out the common ſalt from the boiling pans, they put it into long wooden troughs, with holes bored at the bottom for the brine to drain out; under theſe troughs are placed veſſels to receive this brine, and acroſs them ſmall ſticks to which the cat-ſalt affixes itſelf in very large and beautiful cryſtals. This ſalt contains ſome portion of the bitter purging ſalt, is very ſharp and pungent, and is white when powdered, though pellucid in the maſs. It is uſed by ſome for the table, but the greateſt part of what is made of it is uſed by the makers of hard-ſoap.

Cat-Silver. See Mica.

CATACAUSTIC curves, in the higher geometry, that ſpecies of cauſtic curves which are formed by reflection. See Fluxions.

CATACHRESIS, in rhetoric, a trope which borrows the name of one thing to expreſs another. Thus Milton, deſcribing Raphael's deſcent from the empyreal heaven to paradiſe, ſays,

> "Down thither prone in flight,
> "He ſpeeds, and through the vaſt etherial ſky
> "Sails between worlds and worlds."

CATACOMB, a grotto, or ſubterraneous place for the burial of the dead.

Some derive the word *catacomb* from the place where ſhips are laid up, which the modern Latins and Greeks call *cumbæ*. Others ſay, that *cata* was uſed for *ad*, and *catacumbas* for *adtumbas*: accordingly, Dadin ſays, they anciently wrote *catatumbas*. Others fetch the word from the Greek κατα, and κυμβος, a hollow, cavity, or the like.

Anciently the word *catacomb* was only underſtood of the tombs of St Peter and St Paul; and M. Chaſtelain obſerves, that, among the more knowing of the people of Rome, the word *catacomb* is never applied to the ſubterraneous burying-places hereafter mentioned, but only to a chapel in St Sebaſtian, one of the ſeven ſtational churches; where the ancient Roman kalendars ſay the body of St Peter was depoſited, under the conſulate of Tuſcus and Baſſus, in 258.

Catacombs of Italy; a vaſt aſſemblage of ſubterraneous ſepulchres about Rome, chiefly at about three miles from that city in the Via Appia; ſuppoſed to be the ſepulchres of the martyrs; and which are viſited accordingly out of devotion, and relics thence taken and diſperſed throughout the catholic countries, after having been firſt baptiſed by the pope under the name of ſome ſaint. Theſe *catacombs* are ſaid by many to be caves or cells wherein the primitive Chriſtians hid and aſſembled themſelves together, and where they interred ſuch among them as were martyred. Each *catacomb* is three feet broad, and eight or ten high; running in form of an alley or gallery, and communicating with others: in many places they extend within a league of Rome. There is no maſonry or vaulting therein; but each ſupports itſelf: the two ſides, which we may look on as the *parietes* or walls, were the places where the dead were depoſited; which were laid lengthwiſe, three or four rows over one another, in the ſame *catacomb*, parallel to the alley. They were commonly cloſed with large thick tyles, and ſometimes pieces of marble, cemented in a manner inimitable by the moderns. Sometimes, though very rarely, the name of the deceaſed is found on the tyle: frequently a palm is ſeen, painted or engraven, or the cipher Xp, which is commonly read *pro Chriſto*. The opinion held by many Proteſtant authors is, that the *catacombs* are heathen ſepulchres, and the ſame with the puticuli mentioned by Feſtus Pompeius; maintaining, that whereas it was the practiſe of the ancient Romans to burn their dead, the cuſtom was, to avoid expence, to throw the bodies of their ſlaves to rot in holes of the ground; and that the Roman Chriſtians, obſerving, at length, the great veneration paid to relics, reſolved to have a ſtock of their own; entering therefore the *catacombs*, they added what ciphers and inſcriptions they pleaſed; and then ſhut them up again, to be opened on a favourable occaſion. Thoſe in the ſecret, add they, dying or removing, the contrivance was forgot, till chance opened them at laſt. But this opinion has even leſs of probability than the former. Mr Monro, in the *Philoſophical Tranſactions*, ſuppoſes the *catacombs* to have been originally the common ſepulchres of the firſt Romans, and dug in conſequence of theſe two opinions, *viz.* That ſhades hate the light; and that they love to hover about the places where the bodies are laid.

Though the catacombs of Rome have made the greateſt noiſe of any in the world, there are ſuch belonging to many other cities. Thoſe of Naples, according to biſhop Burnet, are much more noble and ſpacious than the catacombs of Rome. Catacombs have alſo been diſcovered at Syracuſe, and Catanea in Sicily, and in the iſland of Malta. The Roman catacombs take particular names from the churches in their neighbourhood, and ſeem to divide the circumference of the city without the walls between them, extending their galleries every where under, and a vaſt way from it; ſo that all the ground under Rome, and for many miles about it, ſome ſay 20, is hollow. The largeſt, and thoſe commonly ſhown to ſtrangers, are the catacombs of San Sebaſtiano, thoſe of Saint Agneſe, and the others in the fields a little off Saint Agneſe. Women are only allowed to go into the catacombs in the church-yard of the Vatican on Whitſun-Monday, under pain of excommunication. There are men kept conſtantly at work in the *catacombs*. As ſoon as theſe labourers diſcover a grave with any of the ſuppoſed marks of a ſaint upon it, intimation is given to the cardinal Comerlingo, who immediately ſends men of reputation to the place, where finding the palm, the monogram, the coloured glaſs, *&c.* the remains of the body are taken up with great reſpect, and tranſlated to Rome. After the labourers have examined a gallery, they ſtop up the entry that leads to it; ſo that moſt of them remain thus cloſed up; only a few being left open to keep up the trade of ſhowing them to ſtrangers. This they ſay is done to prevent people from loſing themſelves in theſe ſubterraneous labyrinths, which indeed has often happened; but more probably to deprive the public of the means of knowing whither and how far the catacombs are carried.

The method of preſerving the dead in catacombs, ſeems to have been common to a number of the ancient nations. The catacombs of Egypt are ſtill extant about nine leagues from the city of Grand Cairo, and two miles from the city of Zaccara. They extend from thence to the pyramids of Pharaoh, which are about eight miles diſtant. They lie in a field covered with a fine running ſand, of a yellowiſh colour. The country is dry and hilly; the entrance of the tomb is choaked up with ſand; there are many open, but more that are ſtill concealed.

The bodies found in catacombs, eſpecially thoſe of Egypt, are called *mummies;* and as their fleſh was formerly reckoned an efficacious medicine, they were much ſought after. In this work the labourers were often obliged to clear away the ſand for weeks together, without finding what they wanted. Upon coming to a little ſquare opening of about 18 feet in depth, they deſcend into it by holes for the feet, placed at proper intervals; and there they are ſure of finding a mummy. Theſe caves, or *wells,* as they call them there, are hollowed out of a white free-ſtone, which is found in all this country a few feet below the covering of ſand. When one gets to the bottom of theſe, which are ſometimes 40 feet below the ſurface, there are ſeveral ſquare openings on each ſide into paſſages of 10 or 15 feet wide; and theſe lead to chambers of 15 or 20 feet ſquare. Theſe are all hewn out in the rock; and in each of the catacombs are to be found ſeveral of theſe apartments communicating with one another. They extend a great way under ground, ſo as to be under the city of Memphis, and in a manner to undermine its invirons. In ſome of the chambers the walls are adorned with figures and hieroglyphics; in others the mummies are found in tombs, round the apartment hollowed out in the rock.

The Egyptians ſeem to have excelled in the art of embalming and preſerving their dead bodies; as the mummies found in the Egyptian catacombs are in a better ſtate than the bodies found either in the Italian catacombs, or thoſe of any other part of the world. See EMBALMING and MUMMY.

Laying up the bodies in caves, is certainly the original way of diſpoſing of the dead; and appears to have been propagated by the Phœnicians throughout the countries to which they ſent colonies: the interring as we now do in the open air or in temples was firſt introduced by the Chriſtians. When an ancient hero died or was killed in a foreign expedition, as his body was liable to corruption, and for that reaſon unfit to be tranſported entire, they fell on the expedient of burning, in order to bring home the aſhes, to oblige the *manes* to follow; that ſo his country might not be deſtitute of the benefit of his tutelage. It was thus burning ſeems to have had its original; and by degrees it became common to all who could bear the expences of it, and took place of the ancient burying: thus *catacombs* became diſuſed among the Romans, after they had borrowed the manner of burning from the Greeks, and then none but ſlaves were laid in the ground. See BURIAL, *&c.*

CATALAUNI, called alſo *Durocatalauni,* a town of Gallia Belgica: *Catalauni,* the people. A name rather of the lower age than of claſſical antiquity. Now *Chalons ſur Marne,* in Campaign. E. Long. 4. 35. N. Lat. 48. 55.

CATADROMUS, (from κατα and δρεμω, *I run),* in antiquity, a ſtretched ſloping rope in the theatres, down which the *funambuli* walked to ſhow their ſkill.

Some have taken the word to ſignify the hippodrome or decurſorium wherein the Roman knights uſed to exercife themſelves in running and fighting on horſeback. But the moſt natural meaning is that of a rope faſtened at one end to the top of the theatre, and at the other to the bottom, to walk or run down, which was the higheſt glory of the ancient *ſchœnobates* or *funambuli.* Elephants were alſo taught to run down the *catadromus.* Suetonius ſpeaks of the exploit of a Roman knight, who paſſed down the *catadromus* mounted on an elephant's back.

CATAGOGION, a heathen feſtival at Epheſus, celebrated on the 22d of January, in which the devotees run about the ſtreets, dreſſed in divers antic and unſeemly manners, with huge cudgels in their hands, and carrying with them the images of their gods; in which guiſe they raviſhed the women they met with, abuſed and often killed the men, and committed many other diſorders, to which the religion of the day gave a ſanction.

CATAGRAPHA, in antiquity, denote oblique figures or views of mens faces; anſwering to what the moderns call *profiles.*

Catagrapha are ſaid to be the invention of Simon Cleonæus, who firſt taught painters to vary the looks of their figures, and ſometimes direct them upwards, ſometimes downwards, and ſometimes ſidewards or backwards.

CATALEPSIS, or CATALEPSY, in medicine, a kind of apoplexy or a drowſy diſeaſe wherein the patient is taken ſpeechleſs, ſenſeleſs, and fixed in the ſame poſture wherein the diſeaſe firſt ſeized him; his eyes open, without ſeeing or underſtanding. See MEDICINE-*Index*.

CATALOGUE, a liſt or enumeration of the names of ſeveral books, men, or other things, diſpoſed according to a certain order.

Catalogues of books are digeſted in different manners, ſome according to the order of the times when the books were printed, as that of Mattaire; others according to their form and ſize, as the common bookſellers-catalogues; others according to the alphabetical order of the authors names, as Hyde's catalogue of the Bodleian library: others according to the alphabetical order of matters or ſubjects, which are called *real* or *claſſical catalogues*, as thoſe of Lipenius and Draudius; laſtly, others are digeſted in a mixed method, partaking of ſeveral of the former, as de Seine's catalogue of cardinal Sluſius's library, which is firſt divided according to the ſubjects or ſciences, and afterwards the books in each are recited alphabetically.

The moſt applauded of all catalogues is that of Thuanus's library, in which are united the advantages of all the reſt. It was firſt drawn up by the two Puteani in the alphabetical order, then digeſted according to the ſciences and ſubjects, by Iſhm. Bullialdus, and publiſhed by F. Queſnel at Paris in 1679; and reprinted, though incorrectly, at Hamburg, in 1704. The books are here ranged with juſtneſs under their ſeveral ſciences and ſubjects, regard being ſtill had to the nation, ſect, age, &c. of every writer. Add, that only the beſt and choiceſt books in every ſubject are found here, and the moſt valuable editions. Yet the catalogue of M. le Telliers archbiſhop of Rheim's library, made by M. Clement, is not inferior to any publiſhed in our age, either on account of the number and choice of the books, or the method of its diſpoſition. One advantage peculiar to this catalogue is, the multitude of anonymous and pſeudonymous authors detected in it, ſcarce to be met with elſewhere. Some even prefer it to Thuanus's catalogue, as containing a greater variety of claſſes and books on particular ſubjects.

The conditions required in a catalogue are, that it indicate at the ſame time the order of the authors and of the matters, the form of the book, the number of volumes, the chronological order of the editions, the language it is written in, and its place in the library; ſo as that all theſe circumſtances may appear at once in the ſhorteſt, cleareſt, and exacteſt manner poſſible. In this view, all the catalogues yet made will be found to be defective.

An anonymous French writer has laid down a new plan of a catalogue, which ſhall unite all the advantages, and avoid all the inconveniences of the reſt.

The Jeſuits of Antwerp have given us a catalogue of the popes; which makes what they call their *Propylæum*.

CATALOGUE of the Stars, is a liſt of the fixed ſtars, diſpoſed in their ſeveral conſtellations; with the longitudes, latitudes, &c. of each.

The firſt who undertook to reduce the fixed ſtars into a catalogue was Hipparchus Rhodius, about 120 years before Chriſt; in which he made uſe of the obſervations of Timocharis and Ariſtyllus for about 180 years before him. Ptolemy retained Hipparchus's catalogue, containing 1026 fixed ſtars; though he himſelf made abundance of obſervations, with a view to a new catalogue, A. D. 140. About the year of Chriſt 880, Albategni, a Syrian, brought down the ſame to his time. Anno 1437, Ulugh Begh, king of Parthia and India, made a new catalogue of 1022 fixed ſtars, ſince tranſlated out of Perſian into Latin by Dr Hyde. The third who made a catalogue from his own obſervations was Tycho Brahe, who determined the places of 777 ſtars for the year 1600, which Kepler from other obſervations of Tycho, afterwards increaſed to the number of 1000 in the Rudolphine Tables; adding thoſe of Ptolemy omitted by Tycho, and of other authors, ſo that his catalogue amounts to above 1160. At the ſame time, William Landgrave of Heſſe, with his mathematicians Chriſtopher Rothmannus and Juſtus Byrgius, determined the places of 400 fixed ſtars by his own obſervations, with their places rectified for the year 1593; which Hevelius prefers to thoſe of Tycho's. Ricciolus, in his *Aſtronomia Reformata*, determined the places of 101 ſtars for the year 1700, from his own obſervations: for the reſt he followed Tycho's catalogue; altering it where he thought fit. Anno 1667, Dr Halley, in the iſland of St Helena, obſerved 350 ſouthern ſtars not viſible in our horizon. The ſame labour was repeated by F. Noel in 1710, who publiſhed a new catalogue of the ſame ſtars conſtructed for the year 1687.

Bayer, in his *Uranometria*, publiſhed a catalogue of 1160 ſtars, compiled chiefly from Ptolemy and Tycho, in which every ſtar is marked with ſome letter of the Greek alphabet; the biggeſt ſtar in any conſtellation being denoted by the firſt letter, the next by the ſecond, &c. and if the number exceeds the Greek alphabet, the remaining ſtars are marked by letters of the Roman alphabet, which letters are preſerved by Flamſtead, and by Senex on his globes. The celebrated Hevelius compoſed a catalogue of 1888 ſtars 1553 of which were obſerved by himſelf; and their places were computed for the year 1660.

The laſt and greateſt is the Britannic catalogue, compiled from the obſervations of the accurate Mr Flamſtead: who, for a long ſeries of years devoted himſelf wholly thereto. As there was nothing wanting either in the obſerver or apparatus, we may look on this as a perfect work ſo far as it goes. It is to be regretted the impreſſion had not paſſed through his own hands: that now extant, was publiſhed by authority, but without the author's conſent: it contains 2734 ſtars. There was another publiſhed in 1725, purſuant to his teſtament; containing no leſs than 3000 ſtars, with their places rectified for the year 1689: to which is added Mr Sharp's catalogue of the ſouthern ſtars not viſible in our hemiſphere, adapted to the year 1726.

CATALONIA, a province of Spain, bounded on the north by the Pyrenean mountains, which divide it from France; by the kingdom of Arragon and Valencia on the weſt; and by the Mediterranean ſea on the ſouth and eaſt. It is 155 miles in length, and 100 in breadth. It is watered by a great number of rivers; the principal of which are the Lobregat, the Ter, and the Segra. The air is temperate and healthy; but the land is mountainous, except in a few places. It produces, however, corn, wine, oil, pulſe, flax, and hemp, ſufficient for the inhabitants. The mountains are covered with large foreſts of tall trees, ſuch as the oak, the ever-green oak, the beech, the pine, the fir, the cheſnut, and many others: with cork-trees, ſhrubs, and medicinal plants. There are ſeveral quarries of marble of all colours, cryſtal, alabaſter, amethyſts, and lapis lazuli. Gold duſt has been found among the ſands of one or two of the rivers; and there are mines of tin, iron, lead, alum, vitriol, and ſalt. They likewiſe fiſh for coral on the eaſtern coaſt. The inhabitants are hardy, courageous, active, vigorous, and good ſoldiers, but apt to be diſcontented. The miquelets are a ſort of ſoldiers which guard the paſſes over the mountains, and ought to protect travellers; but if they are not paid to their minds, they ſeldom fail to pay themſelves. The river Lobregat divides Catalonia into two parts, the eaſt and weſt, according to their ſituation. This province comprehends 17 vigueries or territories; two of which are in Rouſillon, and belong to the French. The reſt are ſubject to the Spaniards. The principal towns are Barcelona the capital, Tarragona, Tortoſa, Lerida, Solſonia, Cordona Vich, Girona, Sen d'Urgel, Pui Cerda, and Cervera. Catalonia was the laſt province in Spain which ſubmitted to Philip in the ſucceſſion-war.

CATAMENIA, in medicine. See MENSES.

CATAMITE, a boy kept for ſodomitical practices.

CATANA, or CATINA, (anc. geog.) a town of Sicily, ſituated oppoſite to Ætna, to the ſouth-eaſt; one of the five Roman colonies: anciently built by the people of Naxus ſeven years after the building of Syracuſe, 728 years before Chriſt. It was the country of Charondas, the famous lawgiver. The town is called *Catanea*. See *CATANEA*.

CATANANCHE, CANDIA LIONS-FOOT: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is paleaceous; the calyx imbricated; the pappus furniſhed with awns by a caliculus of five ſtiff hairs. There are three ſpecies, of which the cerulea is the moſt remarkable. This ſends out many long, narrow, hairy leaves, which are jagged on their edges like thoſe of the buckſhorn plantain, but broader; the jags are deeper, and at greater diſtances: theſe lie flat on the ground, turning their points upwards. Between the leaves come out the flower ſtalks, which are in number proportionable to the ſize of the plants; for, from an old thriving root, there are frequently eight or ten, while young plants do not ſend out above two or three. Theſe ſtalks riſe near two feet high, dividing into many ſmall branches upward, garniſhed with leaves like thoſe below, but ſmaller, and without jags on their edges; each of theſe ſmaller branches are terminated by ſingle heads of flowers, of a fine blue colour. This is a perennial plant, and may be propagated by ſeeds or ſlips. The ſeeds may be ſown in the ſpring on a bed of common earth; and in the autumn following the plants may be removed to the places where they are to remain. The ſeeds ripen in Auguſt. This plant is a pretty ornament in gardens, and is eaſily kept within bounds.

CATANEA, or CATANIA, a city of Sicily, ſeated on a gulph of the ſame name, near the foot of Mount Ætna or Gibel. It was founded by the Chalcidians ſoon after the ſettlement of Syracuſe, and enjoyed great tranquillity till Hiero I. expelled the whole body of citizens; and after repleniſhing the town with a new ſtock of inhabitants, gave it the name of *Ætna*: immediately after his deceaſe, it regained its ancient name, and its citizens returned to their abodes. Catania fell into the hands of the Romans, among their earlieſt acquiſitions in Sicily, and became the reſidence of a prætor. To make it worthy of ſuch an honour, it was adorned with ſumptuous buildings of all kinds, and every convenience was procured to ſupply the natural and artificial wants of life. It was deſtroyed by Pompey's ſon, but reſtored with ſuperior magnificence by Auguſtus. The reign of Decius is famous in the hiſtory of this city for the martyrdom of its patroneſs St Agatha. On every emergency her interceſſion is implored. She is piouſly believed to have preſerved Catania from being overwhelmed by torrents of lava, or ſhaken to pieces by earthquakes; yet its ancient edifices are covered by repeated ſtreams of volcanic matter; and almoſt every houſe, even her own church, has been thrown to the ground. In the reign of William the Good, 20,000 Catanians, with their paſtor at their head, were deſtroyed before the ſacred veil could be properly placed to check the flames. In the laſt century the eruptions and earthquakes raged with redoubled violence, and Catania was twice demoliſhed. See ÆTNA.

The preſent prince of Biſcari has been at infinite pains, and ſpent a large ſum of money, in working down to the ancient town, which on account of the numerous torrents of lava that have flowed out of Mount Ætna for theſe laſt thouſand years, is now to be ſought for in dark caverns many feet below the preſent ſurface of the earth. Mr Swinburne informs us that he deſcended into the baths, ſepulchres, an amphitheatre, and a theatre, all very much injured by the various cataſtrophes that have befallen them. They were erected upon old beds of lava, and even built with ſquare pieces of the ſame ſubſtance, which in no inſtance appears to have been fuſed by the contact of new lavas: The ſciara or ſtones of cold lava, have conſtantly proved as ſtrong a barrier againſt the flowing torrent of fire as any other ſtone could have been, though ſome authors were of opinion that the hot matter would melt the old maſs and incorporate with it.

This city has been frequently defended from the burning ſtreams by the ſolid maſs of its own ramparts, and by the air compreſſed between them and the lava; as appears by the torrent having ſtopt within a ſmall diſtance of the walls, and taken another direction. But when the walls were broken or low, the lava collected itſelf till it roſe to a great height, and then poured over in a curve. A ſimilar inſtance is ſeen at the Terro del Greco near Naples, where the ſtream of liquid fire from Veſuvius divided itſelf into two branches, and left a church untouched in the middle. There is a well at the foot of the old walls of Catania, where the lava, after running along the parapet, and then falling forwards, has produced a very complete lofty arch over the ſpring.

The church here is a noble fabric. It is accounted the largeſt in Sicily, though neither a porch nor cupola has been erected, from a doubt of the ſolidity of the foundations, which are no other than the bed of lava that ran out of Ætna in 1669, and is ſuppoſed to be full of cavities. The organ is much eſteemed by connoiſſeurs in muſical inſtruments.

Catania, according to Mr Swinburne's account, is reviving with great ſplendor. "It has already (he ſays) much more the features of a metropolis and royal reſidence than Palermo; the principal ſtreets are wide, ſtraight, and well paved with lava. An obeliſk of red granite, placed on the back of an antique elephant of touchſtone ſtands in the centre of the great ſquare, which is formed by the town-hall, ſeminary, and cathedral. The cathedral erected by the abbot Angerius in the year 1094, was endowed by earl Roger with the territories of Catania and Ætna, for the ſmall acknowledgement of a glaſs of wine and a loaf of bread offered once a-year. It has ſuffered ſo much by earthquakes, that little of the original ſtructure remains, and the modern parts have hardly any thing except their materials to recommend them. The other religious edifices of the city are profuſely ornamented, but in a bad taſte. The ſpirit of building ſeems to have ſeized upon this people, and the prince of Biſcari's example adds freſh vigour. It were natural to ſuppoſe men would be backward in erecting new habitations, eſpecially with any degree of luxury, on ground ſo often ſhaken to its centre, and ſo often buried under the aſhes of a volcano; but ſuch is their attachment to their native ſoil, and their contempt of dangers they are habituated to, that they rebuild their houſes on the warm cinders of Veſuvius, the quaking plains of Calabria, and the black mountains of Sciarra at Catania; it is however ſurpriſing to ſee ſuch embelliſhments laviſhed in ſo dangerous a ſituation. There is a great deal of activity in the diſpoſition of this people: they know by tradition that their anceſtors carried on a flouriſhing commerce; and that, before the fiery river filled it up, they had a ſpacious convenient harbour, where they now have ſcarce a creek for a felucca: they therefore wiſh to reſtore thoſe advantages to Catania, and have often applied to government for aſſiſtance towards forming a mole and port, an undertaking their ſtrength alone is unequal to; but whether the refuſal originates in the deficiencies of the public treaſury or the jealouſy of other cities, all their projects have ended in fruitleſs applications. The number of inhabitants dwelling in Catania amounts to 30,000; the Catanians make it double: A conſiderable portion of this number appertains to the univerſity, the only one in the iſland, and the nurſery of all the lawyers." E. Long. 15. 19. N. Lat. 37. 30.

CATANZARO, a city in the kingdom of Naples, the capital of Calabria Ulterior, with a biſhop's ſee. It is the uſual reſidence of the governor of the province, and is ſeated on a mountain, in E. Long. 18. 20. N. Lat. 38. 58.

CATAPHONICS, the ſcience which conſiders the properties of reflected ſounds. See ACOUSTICS.

CATAPHORA, in medicine, the ſame as COMA.

CATAPHRACTA, (from κατα, and φρασσω, *I fortify* or *arm*), in the ancient military art, a piece of heavy defenſive armour, formed of cloth or leather, fortified with iron ſcales or links, wherewith ſometimes only the breaſt, ſometimes the whole body, and ſometimes the horſe too, was covered. It was in uſe among the Sarmatians, Perſians, and other Barbarians. The Romans alſo adopted it early for their foot; and, according to Vegetius, kept to it till the time of Gratian, when the military diſcipline growing remiſs, and field exerciſes and labour diſcontinued, the Roman foot thought the cataphracta as well as the helmet too great a load to bear, and therefore threw both by, chooſing rather to march againſt the enemy barebreaſted; by which, in the war with the Goths, multitudes were deſtroyed.

CATAPHRACTÆ Naves, ſhips armed and covered in fight, ſo that they could not be eaſily damaged by the enemy. They were covered over with boards or planks, on which the ſoldiers were placed to defend them; the rowers ſitting underneath, thus ſcreened from the enemy's weapons.

CATAPHRACTUS, denotes a thing defended or covered on all ſides with armour.

CATAPHRACTUS, or *Cataphractarius*, more particularly denotes a horſeman, or even horſe, armed with a cataphracta. The *cataphracta equites* were a ſort of cuiraſſiers, not only fortified with armour themſelves, but having their horſes guarded with ſolid plates of braſs or other metals, uſually lined with ſkins and wrought into plumes or other forms. Their uſe was to bear down all before them, to break in upon the enemies ranks, and ſpread terror and havock wherever they came, as being themſelves invulnerable and ſecure from danger. But their diſadvantage was their unwieldineſs, by which, if once unhorſed or on the ground, they were unable to riſe, and thus fell a prey to the enemy.

CATAPHRYGIANS, a ſect in the ſecond century, ſo called as being of the country of Phrygia. They were orthodox in every thing, ſetting aſide this, that they took Montanus for a prophet, and Priſcilla and Maximilla for true propheteſſes, to be conſulted in every thing relating to religion; as ſuppoſing the Holy Spirit had abandoned the church. See MONTANIST.

CATAPLASMA, a poultice; from καταϖλασσω, *illino*, to ſpread like a plaſter. Cataplaſms take their name ſometimes from the part to which they are applied, or effects they produce; ſo are called *anacollema*, *frontale*, *epicarpium*, *epiſpaſticum*, *veſicatorium*; and when muſtard is an ingredient, they are called *ſinapiſms*.

Theſe kind of applications are ſofter and more eaſy than plaſters or ointments. They are formed of ſome vegetable ſubſtances, and applied of ſuch a conſiſtence as neither to adhere nor run: they are alſo more uſeful when the intention is effected by the perpetuity of the heat or cold which they contain, for they retain them longer than any other kind of compoſition.

When deſigned to *relax*, or to promote ſuppuration, they ſhould be applied warm. Their warmth, moiſture, and the obſtruction they give to perſpiration, is the method of their anſwering that end. The proper heat, when applied warm, is no more than to promote a kindly pleaſant ſenſation; for great heat prevents the deſign for which they are uſed. They ſhould be renewed as often as they cool. For relaxing and ſuppurating, none excel the white-bread poultice, made with the crumb of an old loaf, a ſufficient quantity of milk to boil the bread in until it is ſoft, and a little oil; which laſt ingredient, beſides preventing the poultice from drying and ſticking to the ſkin, alſo retains the heat longer than the bread and milk alone would do. To preſerve the heat longer, the poultice, when applied, may be covered with a ſtrong ox's bladder.

When deſigned to *repel*, they ſhould be applied cold, and ought to be renewed as oft as they become warm. A proper compoſition for this end is a mixture of oatmeal and vinegar.

CATAPULTA, in antiquity, a military engine contrived for the throwing of arrows, darts, and ſtones upon the enemy.—Some of theſe engines were of ſuch force that they would throw ſtones of an hundred weight. Joſephus takes notice of the ſurpriſing effects of theſe engines, and ſays, that the ſtones thrown out of them beat down the battlements, knocked off the angles of the towers, and would level a whole file of men from one end to the other, was the phalanx ever ſo deep. This was called the

Battering Catapulta, and is repreſented on Plate CXXVII. This catapulta is ſuppoſed to carry a ſtone, *&c.* of an hundred weight, and therefore a deſcription of it will be ſufficient to explain the doctrine of all the reſt; for ſuch as threw ſtones of 500 and upwards were conſtructed on the ſame principles.

The baſe is compoſed of two large beams 2, 3. The length of thoſe beams is fifteen diameters of the bore of the capitals 9. At the two extremities of each beam, two double mortiſes are cut to receive the eight tenons of two croſs beams, each of them four of the diameters in length. In the centre of each of the beams of the baſe, and near two-thirds of their length, a hole, perfectly round, and 16 inches in diameter, ſhould be bored: theſe holes muſt be exactly oppoſite to each other, and ſhould increaſe gradually to the inſide of the beams, ſo that each of them, being 16 inches on the outſide towards the capitals 9, ſhould be 17½ at the opening on the inſide, and the edges carefully rounded off. The capitals 9 are, in a manner, the ſoul of the machine, and ſerve to twiſt and ſtrain the cordage, which forms its principle or power of motion.

The capitals are either of caſt braſs or iron; each conſiſting of a wheel with teeth, C 10, of 2½ inches thick. The hollow or bore of theſe wheels ſhould be 11¼ inches in diameter, perfectly round, and the edges ſmoothed down. As the friction would be too great, if the capitals rubbed againſt the beams, by the extreme ſtraining of the cordage, which draws them towards theſe beams, that inconvenience is remedied by the means of eight friction-wheels, or cylinders of braſs, about the 13th of an inch in diameter, and an inch and one-ſixth in length, placed circularly, and turning upon axes, as repreſented at D 13, B 12. One of theſe friction-wheels at large with its ſcrew, by which it is faſtened into the beam, is repreſented at A.

Upon this number of cylindrical wheels the capitals 9 muſt be placed in the beams, 2, 3, ſo that the cylinders do not extend to the teeth of the wheels, which muſt receive a ſtrong pinion 14. By the means of this pinion the wheel of the capital is made to turn for ſtraining the cordage with the key 15. The capital wheel has a ſtrong catch 16, and another of the ſame kind may be added to prevent any thing from giving way through the extreme and violent force of the ſtrained cordage.

The capital-piece of the machine is a nut or croſs-pin of iron, 17, ſeen at C, and hammered cold into its form. It divides the bore of the capitals exactly in two equal parts, and fixed in groves about an inch deep. This piece, or nut, ought to be about two inches and one-third thick at the top 18, as repreſented in the ſection at B; and rounded off and poliſhed as much as poſſible, that the cords folded over it may not be hurt or cut by the roughneſs or edges of the iron. Its height ought to be eight inches, decreaſing gradually in thickneſs to the bottom, where it ought to be only one inch. It muſt be very exactly inſerted in the capitals.

After placing the two capitals in the holes of the two beams in a right line with each other, and fixing the two croſs diametrical nuts or pieces over which the cordage is to wind, one end of the cord is reeved through a hole in one of the capitals in the baſe, and made faſt to a nail within-ſide of the beam. The other ſide of the cord is then carried through the hole in the oppoſite beam and capital, and ſo wound over the croſs pieces of iron in the centre of the two capitals, till they are full, the cordage forming a large ſkain. The tenſion or ſtraining of the cordage ought to be exactly equal, that is, the ſeveral foldings of the cord over the capital-pieces ſhould be equally ſtrained, and ſo near each other as not to leave the leaſt ſpace between them. As ſoon as the firſt folding or ſkain of cord has filled up one whole ſpace or breadth of the capital pieces, another muſt be carried over it; and ſo on, always equally ſtraining the end till no more will paſs through the capitals, and the ſkain of cordage entirely fills them, obſerving to rub it from time to time with ſoap.

At three or four inches behind the cordage, thus wound over the capital pieces, two very ſtrong upright beams 21 are raiſed: theſe are poſts of oak 14 inches thick, croſſed over at top by another of the ſame ſolidity. The height of the upright beams is 7½ diameters; each ſupported behind with very ſtrong props 25, fixed at bottom in the extremities of the baſe 2, 3. The croſs beam 24 is ſupported in the ſame manner by a prop in the centre.

The tree, arm, or ſtylus 22, ſhould be of ſound aſh. Its length is from 15 to 16 diameters of the bore of the capitals. The end at the bottom, or that fixed in the middle of the ſkain, is 10 inches thick, and 14 broad. To ſtrengthen the arm or tree, it ſhould be wrapped round with a cloth dipped in ſtrong glue like the tree of a ſaddle, and bound very hard with waxed thread of the ſixth of an inch in diameter from the large end at bottom, almoſt to the top, as repreſented in the figure.

At the top of the arm, juſt under the iron-hand or receiver 27, a ſtrong card is faſtened, with two loops twiſted one within another, for the greater ſtrength. Into theſe two loops the hook of a braſs pulley 28 is put. The cord 29 is then reeved through the pulley, and faſtened to the roll 30. The cock or trigger 31, which

which ſerves as a ſtay, is then brought to it, and made faſt by its hook to the extremity of the hand 27, in which the body to be diſcharged is placed. The pulley at the neck of the arm is then unhooked; and when the trigger is to let it off, a ſtroke muſt be given upon it with an iron-bar or crow of about an inch in diameter; on which the arm flies up with a force almoſt equal to that of a modern mortar. The cuſhion or ſtomacher 23, placed exactly in the middle of the croſs-beam 24, ſhould be covered with tanned ox-hide, and ſtuffed with hair, the arm ſtriking againſt it with inconceivable force. It is to be obſerved, that the tree or arm 22 deſcribes an angle of 90 degrees, beginning at the cock, and ending at the ſtomacher or cuſhion.

Catapulta for Arrows, Spears, or Darts. Some of the ſpears, &c. thrown by theſe engines are ſaid to have been 18 feet long, and to have been thrown with ſuch velocity as to take fire in their courſe.

Fig. 2. ABCD is the frame that holds the darts or arrows, which may be of different numbers, and placed in different directions. E F is a large and ſtrong iron ſpring, which is bent by a rope that goes over three pullies I, K, L; and is drawn by one or ſeveral men; this rope may be faſtened to a pin at M. The rope, therefore, being ſet at liberty, the ſpring muſt ſtrike the darts with great violence, and ſend them, with ſurprizing velocity to a great diſtance. This inſtrument differs in ſome particulars from the deſcription we have of that of the ancients; principally in the throwing of ſeveral darts at the ſame time, one only being thrown by theirs.

CATARACT, in hydrography, a precipice in the channel of a river, cauſed by rocks or other obſtacles, ſtopping the courſe of the ſtream from whence the water falls with a greater noiſe and impetuoſity. The word comes from καταρρασσω, "I tumble down with violence;" compounded of κατα, "down," and ρασσω, *dejicio*, "I throw down."—ſuch are the cataracts of the Nile, the Danube, Rhine, &c. In that of Niagara, the perpendicular fall of the water is 137 feet: and in that of Piſtil Rhaiadr, in North Wales, the fall of water is near 240 feet from the mountain to the lower pool.

Strabo calls that a cataract which we call a *caſcade;* and what we call a *cataract,* the ancients uſually called a *catadupa.* Herminius has an expreſs diſſertation, "De admirandis mundi Cataractis ſupra et ſubterraneis;" where he uſes the word in a new ſenſe; ſignifying by cataract, any violent motion of the elements.

CATARACT, in medicine and ſurgery, a diſorder of the humours of the eye, by which the pupilla, that ought to appear tranſparent and black, looks opaque, blue, grey, brown, &c. by which viſion is variouſly impeded, or totally deſtroyed. See SURGERY.

CATARO, a town of Dalmatia, and capital of the territory of the ſame name, with a ſtrong caſtle, and a biſhop's ſee. It is ſubject to Venice, and ſeated on a gulph of the ſame name. E. Long. 19. 19. N. Lat. 42. 25.

CATARACTES, in ornithology, the trivial name of a ſpecies of LAXUS.

CATARRH, in medicine a diſtillation or defluxion, from the head upon the mouth and aſpera arteria, and through them upon the lungs. See (the *Index* ſubjoined to) MEDICINE.

CATASTASIS, in poetry, the third part of the ancient drama; being that wherein the intrigue, or action, ſet forth in the epitaſis, is ſupported, carried on, and heightened, till it be ripe for the unravelling in the cataſtrophe. Scaliger defines it, the full growth of the fable, while things are at a ſtand in that confuſion to which the poet has brought them.

CATASTROPHE, in dramatic poetry, the fourth and laſt part in the ancient drama; or that immediately ſucceeding the cataſtaſis; or, according to others, the third only; the whole drama being divided into protaſis, epitaſis, and cataſtrophe, or in the terms of Ariſtotle, prologue, epilogue, and exode.

The cataſtrophe clears up every thing, and is nothing elſe but the diſcovery or winding up of the plot. It has its peculiar place: for it ought entirely to be contained, not only in the laſt act, but in the very concluſion of it; and when the plot is finiſhed, the play ſhould be ſo alſo. The cataſtrophe ought to turn upon a ſingle point, or ſtart up on a ſudden.

The great art in the cataſtrophe is, that the clearing up of all difficulties may appear wonderful, and yet eaſy, ſimple, and natural.

It is a very prepoſterous artifice of ſome writers to ſhow the cataſtrophe in the very title of the play. Mr Dryden thinks that a cataſtrophe reſulting from a mere change in the ſentiments and reſolutions of a perſon, without any other machinery, may be ſo managed as to be exceedingly beautiful.

It is a diſpute among the critics, whether the cataſtrophe ſhould always fall out favourably on the ſide of virtue or not. The reaſons on the negative ſide ſeem the ſtrongeſt. Ariſtotle prefers a ſhocking cataſtrophe to a happy one—The cataſtrophe is either ſimple or complex. The firſt is that in which there is no change in the ſtate of the principal perſons, nor any diſcovery or unravelling, the plot being only a mere paſſage out of agitation into quiet repoſe. In the ſecond, the principal perſons undergo a change of fortune, in the manner already defined.

CATCH, in the muſical ſenſe of the word, a fugue in the uniſon, wherein, to humour ſome conceit in the words, the melody is broken, and the ſenſe interrupted in one part, and caught again or ſupported by another; as in the catch in Shakeſpeare's play of the Twelfth-night, where there is a catch ſung by three perſons, in which the humour is, that each who ſings, calls, and is called *knave* in turn: Or, as defined by Mr Jackſon, "a catch is a piece for three or more voices, one of which leads, and the other follow in the ſame notes. It muſt be ſo contrived, that reſts (which are made for that purpoſe) in the muſic of one line be filled up with a word or two from another line; theſe form a croſs purpoſe, or catch, from whence the name."

Catch-Fly, in botany. See LYCHNIS.

Catch-Pole, (quaſi one that *catches* by the *pole),* a term uſed, by way of reproach, for the bailiff's follower or aſſiſtant.

Catch-Word, among printers, that placed at the bottom of each page, being always the firſt word of the following page.

CATECHESIS, in a general ſenſe, denotes an inſtruction given any perſon in the firſt rudiments of an art or ſcience; but more particularly of the Chriſtian religion. In the ancient church, catecheſis was an inſtruction given *viva voce*, either to children, or adult heathens, preparatory to their receiving of baptiſm. In this ſenſe, *catecheſis* ſtands contradiſtinguiſhed from *myſtagogica*, which were a higher part of inſtruction given to thoſe already initiated, and containing the myſteries of faith. Thoſe who give ſuch inſtructions are called *catechiſts*; and thoſe who receive them, *catechumens*.

CATECHETIC, or Catechetical, ſomething that relates to oral inſtruction in the rudiments of Chriſtianity.—Catechetic ſchools were buildings appointed for the office of the catechiſt, adjoining to the church, and called *catechumena*: ſuch was that in which Origen and many other famous men read catechetical lectures at Alexandria. See Catechumen.

CATECHISM, in its primary ſenſe, an inſtruction, or inſtitution, in the principles of the Chriſtian religion, delivered *viva voce*, and ſo as to require frequent repetitions, from the diſciple or hearer, of what has been ſaid. The word is formed from κατηχεω, a compound of κατα and εχος, q. d. *circumſono*, alluding to the noiſe or din made in this ſort of exerciſe, or to the zeal and earneſtneſs wherewith things are to be inculcated over and over on the learners.—Anciently the candidates for baptiſm were only to be inſtructed in the ſecrets of their religion by tradition *viva voce*, without writing; as had alſo been the caſe among the Egyptian prieſts, and the Britiſh and Gauliſh druids, who only communicated the myſteries of their theology by word of mouth.

Catechism is more frequently uſed in modern times for an elementary book, wherein the principal articles of religion are ſummarily delivered in the way of queſtion and anſwer.

CATECHIST, κατεχιςης, *catecheta*, he that catechiſes, *i. e.* he that inſtructs novices in the principles of religion.

Catechist more particularly denotes a perſon appointed by the church to inſtruct thoſe intended for baptiſm, by word of mouth, in the fundamental articles of the Chriſtian faith—The catechiſt of churches were miniſters uſually diſtinct from the biſhops and preſbyters, and had their auditories or *catechumena* apart. Their buſineſs was to inſtruct the catechumens, and prepare them for the reception of baptiſm. But the catechiſts did not conſtitute any diſtinct order of the clergy, but were choſen out of any other order. The biſhop himſelf ſometimes performed the office; at other times preſbyters, or even readers or deacons, were the catechiſts. Origen ſeems to have had no higher degree in the church than reader, when he was made catechiſt at Alexandria, being only 18 years of age, and conſequently incapable of the deaconſhip.

CATECHU, in the materia medica, the name of a troche conſiſting of Japan earth and gum arabic, each two ounces, and of ſugar of roſes ſixteen ounces, beat together with a little water. It is recommended as a mild reſtringent, &c.

CATECHUMEN, a candidate for baptiſm, or one who prepares himſelf for the receiving thereof.

The catechumens, in church-hiſtory, were the loweſt order of Chriſtians in the primitive church. They had ſome title to the common name of Chriſtian, being a degree above pagans and heretics, though not conſummated by baptiſm. They were admitted to the ſtate of catechumens by the impoſition of hands, and the ſign of the croſs. The children of believing parents were admitted catechumens, as ſoon as ever they were capable of inſtruction: but at what age thoſe of heathen parents might be admitted, is not ſo clear. As to the time of their continuance in this ſtate, there were no general rules fixed about it; but the practice varied according to the difference of times and places, and the readineſs and proficiency of the catechumens themſelves.

There were four orders or degrees of catechumens; the firſt were thoſe inſtructed privately without the church, and kept at a diſtance for ſome time from the privilege of entering the church, to make them the more eager and deſirous of it. The next degree were the *audientes*, ſo called from their being admitted to hear ſermons, and the ſcriptures read in the church, but were not allowed to partake of the prayers. The third ſort of catechumens were the *genu-flectentes*, ſo called becauſe they received impoſition of hands kneeling. The fourth order was the *competentes & electi*, denoting the immediate candidates for baptiſm, or ſuch as were appointed to be baptiſed the next approaching feſtival; before which, ſtrict examination was made into their proficiency under the ſeveral ſtages of catechetical exerciſes.

After examination, they were exerciſed for twenty days together, and were obliged to faſting and confeſſion: ſome days before baptiſm they went veiled; and it was cuſtomary to touch their ears, ſaying, *Ephatha*, i. e. Be opened; as alſo to anoint their eyes with clay; both ceremonies being in imitation of our Saviour's practice, and intended to ſhadow out to the catechumens their condition both before and after their admiſſion into the Chriſtian church.

CATEGORICAL, in a general ſenſe, is applied to thoſe things ranged under a Category.

Categorical alſo imports a thing to be abſolute, and not relative: in which ſenſe it ſtands oppoſed to *hypothetical*. We ſay, a *categorical* propoſition, a *categorical* ſyllogiſm, *&c.*

A *categorical* anſwer denotes an expreſs and pertinent anſwer made to any queſtion or objection propoſed.

CATEGORY, in logic, a ſeries or order of all the predicates or attributes contained under any genus.

The ſchool-philoſophers diſtribute all the objects of our thoughts and ideas into certain *genera* or claſſes, not ſo much, ſay they, to learn what they do not know, as to communicate a diſtinct notion of what they do know; and theſe claſſes the Greeks called *categories*, and the Latins *predicaments*.

Ariſtotle made ten categories, viz. quantity, quality, relation, action, paſſion, time, place, ſituation, and habit, which are uſually expreſſed by the following technical diſtich:

Arbor, ſex, ſervos, adore refrigerat, uſtos,
Rure cras ſtabo, nec tunicatus ero.

CATEK. See Bengal, n° 15.

CATENARIA, in the higher geometry, the name of a curve-line formed by a rope hanging freely from two

two points of ſuſpenſion, whether the points be horizontal or not. See FLUXIONS.

CATERPILLAR, in zoology, the name of all winged inſects when in their reptile or worm-ſtate. See ERUCA.

Method of Deſtroying CATERPILLARS *on Trees.*—Take a chaffing diſh with lighted charcoal, and placing it under the branches that are loaded with caterpillars, throw ſome pinches of brimſtone upon the coals. The vapour of the ſulphur, which is mortal to theſe inſects, will not only deſtroy all that are on the tree, but prevent it from being infeſted with them afterwards. A pound of ſulphur will clear as many trees as grow on ſeveral acres. This method has been ſucceſsfully tried in France. In the *Journal Oeconomique*, the following is ſaid to be infallible againſt the catterpillars feeding on cabbage, and perhaps may be equally ſerviceable againſt thoſe that infeſt other vegetables. Sow with hemp all the borders of the ground where you mean to plant your cabbage; and, although the neighbourhood is infected with caterpillars, the ſpace incloſed by the hemp will be perfectly free, not one of the vermin will approach it.

CATERPILLAR-*Eaters*, a name given by ſome authors to a ſpecies of worms bred in the body of the caterpillar, and which eat its fleſh; theſe are owing to a certain kind of fly that lodges her eggs in the body of this animal, and they, after their proper changes, become flies like their parents.

Mr Reaumur has given us, in his hiſtory of inſects, ſome very curious particulars in regard to theſe little worms. Every one of them, he obſerves, ſpins itſelf a very beautiful caſe of a cylindric figure, made of a very ſtrong ſort of ſilk; theſe are the caſes in which this animal ſpends its ſtate of chryſalis; and they have a mark by which they may be known from all other animal productions of this kind, which is, that they have always a broad ſtripe or band ſurrounding their middle, which is black when the reſt of the caſe is white, and white when that is black. Mr Reaumur has had the pains and patience to find out the reaſon of this ſingularity, which is this: the whole ſhell is ſpun of a ſilk produced out of the creature's body; this at firſt runs all white, and towards the end of the ſpinning turns black. The outſide of the caſe muſt neceſſarily be formed firſt, as the creature works from within; conſequently this is truly white all over, but it is tranſparent, and ſhows the laſt ſpun or black ſilk through it. It might be ſuppoſed that the whole inſide of the ſhell ſhould be black; but this is not the caſe: the whole is faſhioned before this black ſilk comes; and this is employed by the creature, not to line the whole, but to fortify certain parts only; and therefore is all applied either to the middle, or to the two ends omitting the middle; and ſo gives either a black band in the middle, or a blackneſs at both ends, leaving the white in the middle to appear. It is not unfrequent to find a ſort of ſmall caſes, lying about garden walks, which move of themſelves; when theſe are opened, they are found to contain a ſmall living worm. This is one of the ſpecies of theſe caterpillar-eaters; which as ſoon as it comes out of the body of that animal, ſpins itſelf a caſe for its transformation long before that happens, and lives in it without food till that change comes on; and it becomes a fly like that to which it owed its birth.

CATERVA, in ancient military writers, a term uſed in ſpeaking of the Gauliſh or Celtiberian armies, denoting a body of 6000 armed men. The word *caterva*, or *catervarius*, is alſo frequently uſed by ancient writers to denote a party or corps of ſoldiers in diſorder or diſarray: by which it ſtands diſtinguiſhed from cohort or turma, which were in good order.

CATESBÆA, the LILY-THORN: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The corolla is monopetalous, funnel-ſhaped, very long above the receptacle of the fruit; the ſtamina are within its throat; the fruit a polyſpermous berry. There is only one ſpecies, viz. the ſpinoſa, which was diſcovered in the iſland of Providence by Mr Cateſby, who gathered the ſeeds, and brought them to England. It riſes to the height of ten or twelve feet, and is covered with a pale ruſſet bark; the branches come out alternately, and are garniſhed with ſmall leaves reſembling thoſe of the box-tree, coming out in cluſters all round the branches at certain diſtances; the flowers hang downward, and come out from the ſide of the branches: they are tubulous and near ſix inches long, very narrow at their baſe, but widening upwards towards the top, where it is divided into four parts which ſpread open, and are reflexed backward. They are of a dull yellow colour. This plant is propagated by ſeeds which muſt be procured from the country where it grows. The ſeeds muſt be ſown on a hot-bed, and are to be treated in the ſame manner as other tender exotics.

CATHÆRETICS, in pharmacy, medicines of a cauſtic nature, ſerving to eat off proud fleſh.

CATHARINE, *Knights of St* CATHARINE *of Mount Sinai*, an ancient military order, erected for the aſſiſtance and protection of pilgrims going to pay their devotion to the body of St Catharine, a virgin of Alexandria, diſtinguiſhed for her learning, and ſaid to have ſuffered martyrdom under Maximin. The body of the martyr having been diſcovered on mount Sinai, cauſed a great concourſe of pilgrims; and travelling being very dangerous, by reaſon of the Arabs, an order of knighthood was erected in 1063, on the model of that of the holy ſepulchre, and under the patronage of St Catharine: the knights of which obliged themſelves by oath to guard the body of the ſaint, keep the roads ſecure, obſerve the rules of St Baſil, and obey their grand maſter. Their habit was white, and on it were repreſented the inſtruments of martyrdom whereby the ſaint had ſuffered; viz. a half-wheel armed with ſpikes, and traverſed with a ſword ſtained with blood.

CATHARINE, *Fraternity of St Catharine at Sienna*, a ſort of religious ſociety inſtituted in that city, in honour of St Catharine, a ſaint famous for her revelations, and for her marriage with Jeſus Chriſt, whoſe wedding ring is ſtill preſerved as a valuable relic. This fraternity yearly endows a certain number of deſtitute virgins, and has the privilege of redeeming annually two criminals condemned for murder, and the ſame number of debtors, by paying their debts.

CATHARTICS, in medicine, remedies which promote evacuation by ſtool. See MATERIA MEDICA.

CATHECU, in botany. See ARECA.

CATHEDRA, in a general ſenſe, a chair.—The word is more particularly uſed for a profeſſor's chair, and a preacher's pulpit.

CATHEDRA is alſo uſed for the biſhop's ſee, or throne, in a church.

CATHEDRAL, a church wherein is a biſhop's ſee or ſeat: See CHURCH, and BISHOP. The word comes from the Greek καθεδρα, "chair," of καθεζομαι, *ſedeo*, "I ſit." The denomination *cathedral* ſeems to have taken its riſe from the manner of ſitting in the ancient churches, or aſſemblies of primitive chriſtians: in theſe, the council, i. e. the elders and prieſts, was called *Preſbyterium*; at their head was the biſhop, who held the place of chairman, *Cathedralis*, or *Cathedraticus*; and the preſbyters, who ſat on either ſide, were alſo called by the ancient fathers, *Aſſeſſores Epiſcoporum*. The epiſcopal authority did not reſide in the biſhop alone; but in all the preſbyters, whereof the biſhop was preſident. A *cathedral*, therefore, originally, was different from what it is now; the Chriſtians, till the time of Conſtantine, having no liberty to build any temple: by their churches they only meant their aſſemblies; and by *cathedrals*, nothing more than conſiſtories.

CATHERINE PARR. See PARR.

CATHERINE I. *Empreſs of Ruſſia*, a moſt extraordinary perſonage, whoſe hiſtory deſerves to be given in detail. She was the natural daughter of a country girl; and was born at Ringen, a ſmall village upon the lake Virtcherve, near Dorpt in Livonia. The year of her birth is uncertain; but, according to her own account, ſhe came into the world on the 5th of April, 1687. Her original name was Martha, which ſhe changed for Catherine when ſhe embraced the Greek religion. Count Roſen, a lieutenant-colonel in the Swediſh ſervice, who owned the village of Ringen, ſupported, according to the cuſtom of the country, both the mother and the child: and was, for that reaſon, ſuppoſed by many perſons to have been her father. She loſt her mother when ſhe was but three years old; and, as count Roſen died about the ſame time, ſhe was left in ſo deſtitute a ſituation, that the pariſh-clerk of the village received her into his houſe. Soon afterwards Gluck, Lutheran miniſter of Marienburgh, happening, in a journey through thoſe parts, to ſee the foundling, took her under his protection, brought her up in his family, and employed her in attending his children. In 1701, and about the 14th year of her age, ſhe eſpouſed a dragoon of the Swediſh garriſon of Marienburgh. Many different accounts are given of this tranſaction: one author of great credit affirms that the bride and bridegroom remained together eight days after their marriage; another, of no leſs authority, aſſerts, on the contrary, that on the morning of their nuptials her huſband being ſent with a detachment for Riga, the marriage was never conſummated. Thus much is certain, that the dragoon was abſent when Marienburgh ſurrendered to the Ruſſians; and Catherine, who was reſerved for a higher fortune, never ſaw him more.

General Bauer, upon the taking of Marienburgh, ſaw Catherine among the priſoners; and, being ſmitten with her youth and beauty, took her to his houſe, where ſhe ſuperintended his domeſtic affairs, and was ſuppoſed to be his miſtreſs. Soon afterwards ſhe was removed into the family of prince Menzikof, who was no leſs ſtruck with the attractions of the fair captive. With him ſhe lived until 1704; when, in the 17th year of her age, ſhe became the miſtreſs of Peter the Great, and won ſo much upon his affections, that he eſpouſed her on the 29th of May 1711. The ceremony was ſecretly performed at Jawerof in Poland, in the preſence of General Bruce; and on the 20th of February, 1712, it was publicly ſolemnized with great pomp at Peterſburgh.

Catherine, by the moſt unwearied aſſiduity and unremitted attention, by the ſoftneſs and complacency of her diſpoſition, but above all by an extraordinary livelineſs and gaiety of temper, acquired a wonderful aſcendency over the mind of Peter. The latter was ſubject to occaſional horrors, which at times rendered him gloomy and ſuſpicious, and raiſed his paſſions to ſuch an height as to produce a temporary madneſs. In theſe dreadful moments Catherine was the only perſon who durſt venture to approach him; and ſuch was the kind of faſcination ſhe had acquired over his ſenſes, that her preſence had an inſtantaneous effect, and the firſt ſound of her voice compoſed his mind and calmed his agonies. From theſe circumſtances ſhe ſeemed neceſſary, not only to his comfort, but even to his very exiſtence, ſhe became his inſeparable companion on his journeys into foreign countries, and even in all his military expeditions.

The peace of Pruth, by which the Ruſſian army was reſcued from certain deſtruction, has been wholly attributed to Catherine, though ſhe was little more than an inſtrument in procuring the conſent of Peter. The latter, in his campaign of 1711 againſt the Turks, having imprudently led his troops into a diſadvantageous ſituation, took the deſperate reſolution of cutting his way through the Turkiſh army in the night. With this reſolution he retired to his tent in an agony of deſpair, and gave poſitive orders that no one ſhould be admitted under pain of death. In this important juncture the principal officers and the vice-chancellor Shaffirof, aſſembled in the preſence of Catherine, and drew up certain preliminaries in order to obtain a truce from the grand vizir. In conſequence of this determination, plenipotentiaries were immediately diſpatched without the knowledge of Peter, to the grand vizir, and a peace obtained upon more reaſonable conditions than could have been expected. With theſe conditions Catherine, notwithſtanding the orders iſſued by Peter, entered his tent, and prevailed upon him to ſign them. Catherine, by her conduct on this occaſion, acquired great popularity; and the emperor particularly ſpecifies her behaviour at Pruth as one of the reaſons which induced him to crown her publicly at Moſcow with his own hand. This ceremony was performed in 1724; and although deſigned by Peter only as a proof his affection, was the principal cauſe of her ſubſequent elevation.

Her influence continued undiminiſhed until a ſhort time before the death of the emperor, when ſome circumſtances happened which occaſioned ſuch a coolneſs between them as would probably have ended in a total rupture, if his death had not fortunately intervened. The original

original cauſe of this miſunderſtanding aroſe from the following diſcovery of a ſecret connection between Catherine and her firſt chamberlain, whoſe name was Mons. The emperor, who was ſuſpicious of this connection, quitted Peterſburgh under pretence of removing to a villa for a few days, but privately returned to his winter palace in the capital. From thence he occaſionally ſent one of his confidential pages with a complimentary meſſage to the empreſs, as if he had been in the country, and with ſecret orders to obſerve her motions. From the page's information the emperor on the third night, ſurpriſed Catherine in an arbour of the garden with her favourite Mons; while his ſiſter Madame Balke, who was firſt lady of the bed-chamber to the empreſs, was in company with a page, upon the watch without the arbour.

Peter, whoſe violent temper was inflamed by this diſcovery, ſtruck Catherine with his cane, as well as the page, who endeavoured to prevent him from entering the arbour, and then retired without uttering a ſingle word either to Mons or his ſiſter. A few days after this tranſaction theſe perſons were taken into cuſtody, and Mons was carried to the winter palace, where no one had admiſſion to him but Peter, who himſelf brought him his proviſions. A report was at the ſame time circulated, that they were impriſoned for having received bribes, and making their influence over the empreſs ſubſervient to their own mercenary views. Mons being examined by Peter, in the preſence of major-general Uſchakof, and threatened with the torture, confeſſed the corruption which was laid to his charge. He was beheaded; his ſiſter received five ſtrokes of the knout, and was baniſhed into Siberia; two of her ſons, who were chamberlains, were alſo degraded, and ſent as common ſoldiers among the Ruſſian troops in Perſia. On the day ſubſequent to the execution of the ſentence, Peter conveyed Catherine in an open carriage under the gallows, to which was nailed the head of Mons. The empreſs, without changing colour at this dreadful ſight, exclaimed "What a pity it is that there is ſo much corruption among courtiers!"

This event happened in the latter end of the year 1724; and as it was ſoon followed by Peter's death, and Catherine upon her acceſſion recalled Madame Balke, it has been ſuſpected that ſhe ſhortened the days of her huſband by poiſon. But notwithſtanding the critical ſituation for Catherine in which he died, and her ſubſequent elevation, this charge is totally deſtitute of the leaſt ſhadow of proof: for the circumſtances of Peter's diſorder were too well known, and the peculiar ſymptoms of his laſt illneſs ſufficiently account for his death, without the neceſſity of recurring to poiſon.

While Peter was yet lying in the agonies of death, ſeveral oppoſite parties were caballing to diſpoſe of the crown. At a conſiderable meeting of many among the principal nobility, it was ſecretly determined, on the moment of his diſſolution, to arreſt Catherine, and to place Peter Alexievitch upon the throne. Baſſevitz, apprized of this reſolution, repaired in perſon to the empreſs, although it was already night. "My grief and conſternation," replied Catherine, "render me incapable of acting myſelf: do you and prince Menzikof conſult together, and I will embrace the meaſures which you ſhall approve in my name." Baſſevitz, finding Menzikof aſleep, awakened and informed him of the preſſing danger which threatened the empreſs and her party. As no time remained for long deliberation, the prince inſtantly ſeized the treaſure, ſecured the fortreſs, gained the officers of the guards by bribes and promiſes, alſo a few of the nobility, and the principal clergy. Theſe partizans being convened in the palace, Catherine made her appearance: ſhe claimed the throne in right of her coronation at Moſcow; ſhe expoſed the ill effects of a minority; and promiſed, that, "ſo far from depriving the great-duke of the crown, ſhe would receive it only as a ſacred depoſit, to be reſtored to him when ſhe ſhould be united, in another world, to an adored huſband, whom ſhe was now upon the point of loſing."

The pathetic manner with which ſhe uttered this addreſs, and the tears which accompanied it, added to the previous diſtribution of large ſums of money and jewels, produced the deſired effect: at the cloſe of this meeting the remainder of the night was employed in making the neceſſary preparations to inſure her acceſſion in caſe of the emperor's death.

Peter at length expired in the morning of the 28th of January 1725. This event being made known, the ſenate, the generals, the principal nobility and clergy, haſtened to the palace to proclaim the new ſovereign. The adherents of the great duke ſeemed ſecure of ſucceſs, and the friends of Catherine were avoided as perſons doomed to deſtruction. At this juncture Baſſevitz whiſpered one of the oppoſite party, "The empreſs is miſtreſs of the treaſure and the fortreſs; ſhe has gained over the guards and the ſynod, and many of the chief nobility; even here ſhe has more followers than you imagine; adviſe therefore your friends to make no oppoſition as they value their heads." This information being rapidly circulated, Baſſevitz gave the appointed ſignal, and the two regiments of guards, who had been gained by a largeſs to declare for Catherine, and had already ſurrounded the palace, beat to arms. "Who has dared (exclaimed prince Repnin, the commander in chief) to order out the troops without my knowledge?" "I, (returned general Butterlin), without pretending to diſpute your authority, in obedience to the commands of my moſt gracious miſtreſs." This ſhort reply was followed by a dead ſilence. In this moment of ſuſpence an anxiety Menzikof entered, preceding Catherine, ſupported by the duke of Holſtein. She attempted to ſpeak, but was prevented by ſighs and tears from giving utterance to her words: at length, recovering herſelf, "I come (ſhe ſaid), notwithſtanding the grief which now overwhelms me, to aſſure you, that, ſubmiſſive to the will of my departed huſband, whoſe memory will be ever dear to me, I am ready to devote my days to the painful occupations of government until Providence ſhall ſummon me to follow him." Then, after a ſhort pauſe, ſhe artfully added, "If the great-duke will profit by my inſtructions, perhaps I ſhall have the conſolation, during my wretched widowhood, of forming for you an emperor worthy of the blood and the name of him whom you have now irretrievably loſt." "As this criſis (replied Menzikof) is a moment of ſuch importance to the good of the empire, and requires the moſt mature deliberations, your majeſty will permit us to confer, without reſtraint, that this whole affair may be tranſacted without reproach, as well in the opinion of the preſent age as in that of poſterity." "Acting as I do (anſwered Catherine), more for the public good than for my own advantage, I am not afraid to ſubmit all my concerns to the judgment of ſuch an enlightened aſſembly: you have not only my permiſſion to confer with freedom; but I lay my commands upon you all to deliberate maturely on this important ſubject, and I promiſe to adopt whatever may be the reſult of your deciſions." At the concluſion of theſe words the aſſembly retired into another apartment, and the doors were locked.

It was previouſly ſettled by Menzikof and his party that Catherine ſhould be empreſs; and the guards, who ſurrounded the palace with drums beating and colours flying, effectually vanquiſhed all oppoſition. The only circumſtance, therefore, which remained, was to give a juſt colour to her title, by perſuading the aſſembly that Peter intended to have named her his ſucceſſor. For this purpoſe Menzikof demanded of that emperor's ſecretary, whether his late maſter had left any written declaration of his intentions? The ſecretary replied, "That a little before his laſt journey to Moſcow he had deſtroyed a will; and that he had frequently expreſſed his deſign of making another, but had always been prevented by the reflection, that if he thought his people, whom he had raiſed from a ſtate of barbariſm to an high degree of power and glory, could be ungrateful, he would not expoſe his final inclinations to the inſult of a refuſal; and that if they recollected what they owed to his labours, they would regulate their conduct by his intentions, which he had diſcloſed with more ſolemnity than could be manifeſted by any writings." An altercation now began in the aſſembly; and ſome of the nobles having the courage to oppoſe the acceſſion of Catherine, Theophanes archbiſhop of Pleſcof called to their recollection the oath which they had all taken in 1722 to acknowledge the ſucceſſor appointed by Peter; and added, that the ſentiments of that emperor delivered by the ſecretary were in effect an appointment of Catherine. The oppoſite party, however, denied theſe ſentiments to be ſo clear as the ſecretary choſe to inſinuate; and inſiſted, that as their late monarch had failed to nominate his heir, the election of the new ſovereign ſhould revert to the ſtate. Upon this the archbiſhop farther teſtified, that the evening before the coronation of the empreſs at Moſcow, Peter had declared in the houſe of an Engliſh merchant, that he ſhould place the crown upon her head with no other view than to leave her miſtreſs of the empire after his deceaſe. This atteſtation being confirmed by many perſons preſent, Menzikof cried out, "What need have we of any teſtament! A refuſal to conform to the inclination of our great ſovereign, thus authenticated, would be both unjuſt and criminal. Long live the empreſs Catherine!" Theſe words being inſtantaneouſly repeated by the greateſt part of thoſe who were preſent, Menzikof, ſaluting Catherine by the title of empreſs, paid his firſt obeiſance by kiſſing her hand; and his example was followed by the whole aſſembly. She next preſented herſelf at the window to the guards, and to the people, who ſhouted acclamations of "Long live Catherine!" while Menzikof ſcattered amongſt them handfuls of money. Thus (ſays a contemporary) the empreſs was raiſed to the throne by the guards, in the ſame manner as the Roman emperors by the prætorian cohorts, without either the appointment of the people or of the legions.

The reign of Catherine may be conſidered as the reign of Menzikof, that empreſs having neither inclination or abilities to direct the helm of government; and ſhe placed the moſt implicit confidence in a man who had been the original author of her good fortune, and the ſole inſtrument of her elevation to the throne.

During her ſhort reign her life was very irregular; ſhe was extremely averſe to buſineſs; would frequently, when the weather was fine, paſs whole nights in the open air; and was particularly intemperate in the uſe of tokay-wine. Theſe irregularities, joined to a cancer and a dropſy, haſtened her end, and ſhe expired on the 17th of May 1727, a little more than two years after her acceſſion to the throne, and in about the 40th year of her age.

As the deaths of ſovereigns in deſpotic countries are ſeldom imputed to natural cauſes, that of Catherine has alſo been attributed to poiſon; as if the diſorders which preyed upon her frame were not ſufficient to bring her to her grave. Some aſſert, that ſhe was poiſoned in a glaſs of ſpirituous liquor; others, by a pear given her by general Diever. Suſpicions alſo fell upon prince Menzikof, who, a ſhort time before her deceaſe, had a trifling miſunderſtanding with her, and who was accuſed of haſtening her death that he might reign with ſtill more abſolute power during the minority of Peter II. But theſe reports deſerve not the leaſt credit, and were merely dictated by the ſpirit of party or by popular rumour.

Catherine was in her perſon under the middle-ſize, and in her youth delicate and well-formed, but inclined to corpulency as ſhe advanced in years. She had a fair complexion, dark eyes, and light hair, which ſhe was always accuſtomed to dye with a black colour. She could neither read nor write: her daughter Elizabeth uſually ſigned her name for her, and particularly to her laſt will and teſtament; and count Oſterman generally put her ſignature to the public decrees and diſpatches. Her abilities have been greatly exaggerated by her panegyriſts. Gordon, who had frequently ſeen her, ſeems, of all writers, to have repreſented her character with the greateſt juſtneſs, when he ſays, "She was a very pretty well-look'd woman, of good ſenſe, but not of that ſublimity of wit, or rather that quickneſs of imagination, which ſome peoble have believed. The great reaſon why the czar was ſo fond of her, was her exceeding good temper; ſhe never was ſeen peeviſh, or out of humour; obliging and civil to all, and never forgetful of her former condition; withal, mighty grateful." Catherine maintained the pomp of majeſty with an air of eaſe and grandeur united; and Peter uſed frequently to expreſs his admiration at the propriety with which ſhe ſupported her high ſtation, without forgetting that ſhe was not born to that dignity.

The following anecdotes will prove that ſhe bore her elevation meekly; and, as Gordon aſſerts, was never forgetful of her former condition. When Wurmb, who had been tutor to Gluck's children at the

the time that Catherine was a domeſtic in that clergyman's family, preſented himſelf before her after her marriage with Peter had been publicly ſolemnized, ſhe recollected and addreſſed him with great complacency, "What, thou good man, art thou ſtill alive! I will provide for thee." And ſhe accordingly ſettled upon him a penſion. She was no leſs attentive to the family of her benefactor Gluck, who died a priſoner at Moſcow: ſhe penſioned his widow; made his ſon a page; portioned the two eldeſt daughters; and advanced the youngeſt to be one of her maids of honour. If we may believe Weber, ſhe frequently enquired after her firſt huſband; and, when ſhe lived with prince Menzikof, uſed ſecretly to ſend him ſmall ſums of money, until, in 1705, he was killed in a ſkirmiſh with the enemy.

But the moſt noble part of her character was her peculiar humanity and compaſſion for the unfortunate. Motraye has paid an handſome tribute to this excellence. "She had, in ſome ſort, the government of all his (Peter's) paſſions; and even ſaved the lives of a great many more perſons than Le Fort was able to do: ſhe inſpired him with that humanity, which, in the opinion of his ſubjects, nature ſeemed to have denied him. A word from her mouth in favour of a wretch, juſt going to be ſacrificed to his anger, would diſarm him; but if he was fully reſolved to ſatisfy that paſſion, he would give orders for the execution when ſhe was abſent, for fear ſhe ſhould plead for the victim." In a word, to uſe the expreſſion of the celebrated Munich, "*Elle etoit proprement la mediatrice entre le monarque et ſes ſujets.*"

Catharine, (Order of St) in modern hiſtory, belongs to ladies of the firſt quality in the Ruſſian court. It was inſtituted in 1714 by Catherine wife of Peter the Great, in memory of his ſignal eſcape from the Turks in 1711. The emblems of this order are a red croſs, ſupported by a figure of St Catherine, and faſtened to a ſcarlet ſtring edged with ſilver, on which are inſcribed the name of St Catherine, and the motto, *Pro fide et patria.*

CATHERLOUGH, a town of Ireland, in the county of Catherlough, and province of Leinſter: ſeated on the river Barrow, 16 miles N. E. of Kilkenny. W. Long. 7. 1. N. Lat. 52. 45.

Catherlough, a county of Ireland, about 28 miles in length, and eight in breadth; bounded on the eaſt by Wicklow and Wexford, on the weſt by Queen's county, on the north by Kildare, and on the ſouth and ſouth-weſt by Wexford. It contains 5600 houſes, 42 pariſhes, five baronies or boroughs, and ſends ſix members to parliament, *viz.* two for the county, two for Catherlough, and two for old Leighlen.

CATHETER, in ſurgery, a fiſtulous inſtrument, uſually made of ſilver, to be introduced into the bladder, in order to ſearch for the ſtone, or diſcharge the urine when ſuppreſſed. See Surgery.

CATHETUS, in geometry, a line or radius falling perpendicularly on another line or ſurface; thus the catheti of a right-angled triangle, are the two ſides that include the right angle.

Cathetus of Incidence, in catoptrics, a right line drawn from a point of the object, perpendicular to the reflecting line.

Cathetus of Reflexion, or *of the Eye*, a right line drawn from the eye perpendicular to the reflecting plane.

Cathetus of Obliquation, a right line drawn perpendicular to the ſpeculum, in the point of incidence or reflexion.

Cathetus, in architecture, a perpendicular line, ſuppoſed to paſs through the middle of a cylindrical body, as a balluſter, column, &c.

CATHNESS. See Caithness.

CATHOLIC, in a general ſenſe, denotes any thing that is univerſal or general.

Catholic Church. The riſe of hereſies induced the primitive Chriſtian church to aſſume to itſelf the appellation of *catholic*, being a characteriſtic to diſtinguiſh itſelf from all ſects, who, though they had party names, ſometimes ſheltered themſelves under the name of Chriſtians.

The Romiſh church diſtinguiſhes itſelf now by the name of *catholic*, in oppoſition to all thoſe who have ſeparated from her communion, and whom ſhe conſiders as heretics and ſchiſmatics, and herſelf only as the true and Chriſtian church. In the ſtrict ſenſe of the word, there is no catholic church in being, that is, no univerſal Chriſtian communion.

Catholic King, is a title which has been long hereditary to the king of Spain. Mariana pretends, that Reccarede firſt received this title after he had deſtroyed Arianiſm in his kingdom, and that it is found in the council of Toledo for the year 589. Vaſce aſcribes the origin of it to Alphonſus in 738. Some allege that it has been uſed only ſince the time of Ferdinand and Iſabella. Colombiere ſays, it was given them on occaſion of the expulſion of the Moors. The Bollandiſts pretend it had been borne by their predeceſſors the Viſigoth kings of Spain; and that Alexander VI. only renewed it to Ferdinand and Iſabella. Others ſay, that Philip de Valois firſt bore the title; which was given him after his death by the eccleſiaſtics, on account of his favouring their intereſts.

In ſome epiſtles of the ancient popes, the title *catholic* is given to the kings of France and of Jeruſalem, as well as to ſeveral patriarchs and primates.

CATHOLICON, in pharmacy, a kind of ſoft purgative electuary, ſo called, as being ſuppoſed an univerſal purger of all humours.

CATILINE, (Lucius) a Roman of a noble family, who having ſpent his whole fortune in debauchery, formed the deſign of oppreſſing his country, deſtroying the ſenate, ſeizing the public treaſury, ſetting Rome on fire, and uſurping a ſovereign power over his fellow-citizens. In order to ſucceed in this deſign, he drew ſome young noblemen into his plot; whom he prevailed upon, it is ſaid, to drink human blood as a pledge of their union. His conſpiracy, however, was diſcovered by the vigilance of Cicero, who was then conſul. Upon which retiring from Rome, he put himſelf at the head of an army, with ſeveral of the conſpirators, and fought with incredible valour againſt Petreius, lieutenant to Anthony, who was colleague with Cicero in the conſulſhip; but was defeated and killed in battle. See *(Hiſtory of)* Rome.—Salluſt has given an excellent hiſtory of this conſpiracy.

CATO, (Marcus Portius) the Cenſor, one of the greateſt men among the ancients, was born at Tuſculum in the year of Rome 519, about the 232d before Chriſt.

Cato.

Chriſt. He began to bear arms at 17; and, on all occaſions, ſhowed extraordinary courage. He was a man of great ſobriety, and reckoned no bodily exerciſe unworthy of him. He had but one horſe for himſelf and his baggage, and he looked after and dreſſed it himſelf. At his return from his campaigns, he betook himſelf to plough his ground; not that he was without ſlaves to do it, but it was his inclination. He dreſſed alſo like his ſlaves, ſat down at the ſame table with them, and partook of the ſame fare. He did not in the mean while neglect to cultivate his mind, eſpecially in regard to the art of ſpeaking; and he employed his talents, which were very great, in generouſly pleading cauſes in the neighbouring cities without fee or reward. Valerius Flaccus, who had a country-ſeat near Cato, conceiving an eſteem for him, perſuaded him to come to Rome; where Cato, by his own merit, and the influence of ſo powerful a patron, was ſoon taken notice of, and promoted. He was firſt of all elected tribune of the ſoldiers for the province of Sicily. He was next made queſtor in Africa under Scipio. Having in this laſt office reproved him for his profuſeneſs to his ſoldiers, the general anſwered, that "he did not want ſo exact a queſtor, but would make war at what expence he pleaſed; nor was he to give an account to the Roman people of the money he ſpent, but of his enterpriſes, and the execution of them." Cato, provoked at this anſwer, left Sicily, and returned to Rome.

Afterwards Cato was made prætor, when he fulfilled the duties of his office with the ſtricteſt juſtice. He conquered Sardinia, governed with admirable moderation, and was created conſul. Being tribune in the war of Syria, he gave diſtinguiſhed proofs of his valour againſt Antiochus the Great; and at his return ſtood candidate for the office of cenſor. But the nobles, who not only envied him as a *new* man, but dreaded his ſeverity, ſet up againſt him ſeven powerful competitors. Valerius Flaccus, who had introduced him into public life, and had been his colleague in the conſulſhip, was a ninth candidate, and theſe two united their intereſts. On this occaſion Cato, far from employing ſoft words to the people, or giving hopes of gentleneſs or complaiſance in the execution of his office, loudly declared from the roſtra, with a threatening look and voice, "That the times required firm and vigorous magiſtrates to put a ſtop to that growing luxury which menaced the public with ruin; cenſors who would cut up the evil by the roots, and reſtore the rigour of ancient diſcipline." It is to the honour of the people of Rome, that, notwithſtanding theſe terrible intimations, they preferred him to all his competitors, who courted them by promiſes of a mild and eaſy adminiſtration: the comitia alſo appointed his friend Valerius to be his colleague, without whom he had declared that he could not hope to compaſs the reformations he had in view. Cato's merit, upon the whole, was ſuperior to that of any of the great men who ſtood againſt him. He was temperate, brave, and indefatigable; frugal of the public money, and not to be corrupted. There is ſcarce any talent requiſite for public or private life which he had not received from nature, or acquired by induſtry. He was a great ſoldier, an able ſtateſman, an eloquent orator, a learned hiſtorian, and very knowing in rural affairs. Yet, with all theſe accompliſhments, he had very great faults. His ambition being poiſoned with envy, diſturbed both his own peace and that of the whole city as long as he lived. Though he would not take bribes, he was unmerciful and unconſcionable in amaſſing wealth by all ſuch means as the law did not puniſh.

Cato.

The firſt act of Cato in his new office, was naming his colleague to be prince of the ſenate; after which the cenſors ſtruck out of the liſt of the ſenators the names of ſeven perſons; among whom was Lucius the brother of T. Flaminius. Lucius, when conſul, and commanding in Gaul, had with his own hand murdered a Boian of diſtinction, a deſerter to the Romans; and he had committed this murder purely to gratify the curioſity of his pathic, a young Carthaginian, who longing to ſee ſomebody die a violent death, had reproached the general for bringing him away from Rome juſt when there was going to be a fight of gladiators. Titus Flaminius, full of indignation at the diſhonour done to his brother, brought the affair before the people; and inſiſted upon Cato's giving the reaſon of his proceeding. The cenſor related the ſtory; and when Lucius denied the fact, put him to his oath. The accuſed, refuſing to ſwear, was deemed guilty; and Cato's cenſure was approved. But no part of the cenſor's conduct ſeemed ſo cruel to the nobles and their wives as the taxes he laid upon luxury in all its branches; dreſs, houſehold furniture, womens toilets, chariots, ſlaves, and equipage. Theſe articles were all taxed at three *per cent.* of the real value. The people, however, in general, were pleaſed with his regulations; inſomuch that they ordered a ſtatue to be erected to his honour in the temple of *Health*, with an inſcription that mentioned nothing of his victories or triumph, but imported only that by his wiſe ordinances in his cenſorſhip he had reformed the manners of the republic. Plutarch relates, that before this, upon ſome of Cato's friends expreſſing their ſurpriſe, that while many perſons without merit or reputation had ſtatues, he had none; he anſwered, "I had much rather it ſhould be aſked why the people have not erected a ſtatue to Cato, than why they have." Cato was the occaſion of the third Punic war. Being diſpatched to Africa to terminate a difference between the Carthaginians and the king of Numidia, on his return to Rome he reported, that Carthage was grown exceſſively rich and populous, and he warmly exhorted the ſenate to deſtroy a city and republic, during the exiſtence of which, Rome could never be ſafe. Having brought from Africa ſome very large figs, he ſhowed them to the conſcript fathers in one of the lappets of his gown. "The country (ſays he) where this fine fruit grows, is but three days voyage from Rome." We are told, that from this time he never ſpoke in the ſenate upon any ſubject, without concluding with theſe words, "I am alſo of opinion, that Carthage ought to be deſtroyed." He judged, that, for a people debauched by proſperity, nothing was more to be feared than a rival ſtate, always powerful, and now from its misfortunes grown wiſe and circumſpect. He held it neceſſary to remove all dangers that could be apprehended from *without*, when the republic had *within* ſo many diſtempers threatening her deſtruction.

From the cenſor dignified and ſevere, the reader will not perhaps be diſpleaſed to turn his view upon Cato ſociable and relaxed. For we ſhould have a falſe notion of him, if we imagined that nothing but a ſad auſterity prevailed in his ſpeech and behaviour. On the contrary, he was extremely free; and often with his friends at table intermixed the converſation with lively diſcourſes and witty ſayings. Of theſe Plutarch has collected a pretty large number; we ſhall relate but one, and make uſe of Balzac's paraphraſe, and the preface with which he introduces it. "The very cenſors, though ſadneſs ſeemed to be one of the functions of their office, did not altogether lay aſide raillery. They were not always bent upon ſeverity; and the firſt Cato, that troubleſome and intolerable honeſt man, ceaſed ſometimes to be troubleſome and intolerable. He had ſome glimpſes of mirth, and ſome intervals of good humour. He dropped now and then ſome words that were not unpleaſant, and you may judge of the reſt by this. He had married a very handſome wife; and hiſtory tells us that ſhe was extremely afraid of the thunder, and loved her huſband well. Theſe two paſſions prompted her to the ſame thing; ſhe always pitched upon her huſband as a ſanctuary againſt thunder, and threw herſelf into his arms at the firſt noiſe ſhe fancied ſhe heard in the ſky. Cato, who was well pleaſed with the ſtorm, and very willing to be careſſed, could not conceal his joy. He revealed that domeſtic ſecret to his friends; and told them one day, ſpeaking of his wife, "that ſhe had found out a way to make him love bad weather; and that he never was ſo happy as when Jupiter was angry." It is worth obſerving, that this was during his cenſorſhip; when he degraded the ſenator Manlius, who would probably have been conſul the year after, only for giving a kiſs to his wife in the day-time, and in the preſence of his daughter.

Oeuvres diverſes, p. 49.

Cato died in the year of Rome 604, aged 85. He wrote ſeveral works. 1. A Roman Hiſtory. 2. Concerning the art of war. 3. Of rhetoric. 4. A treatiſe of huſbandry. Of theſe, the laſt only is extant.

Cato, (Marcus Portius) commonly called Cato *Minor*, or Cato of *Utica*, was great grandſon of Cato *the Cenſor*. It is ſaid, that from his infancy he diſcovered by his ſpeech, by his countenance, and even his childiſh ſports and recreations, an inflexibility of mind; for he would force himſelf to go through with whatever he had undertaken, though the taſk was ill ſuited to his ſtrength. He was rough towards thoſe that flattered him, and quite intractable when threatened; was rarely ſeen to laugh, or even to ſmile; was not eaſily provoked to anger; but if once incenſed, hard to be pacified. Sylla having had a friendſhip for the father of Cato, ſent often for him and his brother, and talked familiarly with them. Cato, who was then about 14 years of age, ſeeing the heads of great men brought there, and obſerving the ſighs of thoſe that were preſent, aſked his preceptor, "Why does no body kill this man?" Becauſe, ſaid the other, he is more feared than he is hated. The boy replied, Why then did you not give me a ſword when you brought me hither, that I might have ſtabbed him, and freed my country from this ſlavery?

He learned the principles of the Stoic philoſophy, which ſo well ſuited his character, under Antipater of Tyre, and applied himſelf diligently to the ſtudy of it. Eloquence he likewiſe ſtudied, as a neceſſary means to defend the cauſe of juſtice, and he made a very conſiderable proficiency in that ſcience. To increaſe his bodily ſtrength, he inured himſelf to ſuffer the extremes of heat and cold; and uſed to make journeys on foot, and bare-headed in all ſeaſons. When he was ſick, patience and abſtinence were his only remedies: he ſhut himſelf up, and would ſee no body till he was well. Though remarkably ſober in the beginning of his life, making it a rule to drink but once after ſupper, and then retire, he inſenſibly contracted a habit of drinking more freely, and of ſitting at table till morning. His friends endeavoured to excuſe this, by ſaying that the affairs of the public engroſſed his attention all the day; and that, being ambitious of knowledge, he paſſed the night in the converſation of philoſophers. Cæſar wrote that Cato was once found dead drunk at the corner of a ſtreet, early in the morning, by a great number of people who were going to the levee of ſome great man; and that when, by uncovering his face, they perceived who it was, they bluſhed for ſhame: "You would have thought (added Cæſar), that Cato had found them drunk, not they him." Pliny obſerves, that by this reflection Cæſar praiſes his enemy at the ſame time that he blames him. And Seneca, his extravagant panegyriſt, ventures to aſſert, that it is eaſier to prove drunkenneſs to be a virtue, than Cato to be vicious. He affected ſingularity, and, in things indifferent, to act directly contrary to the taſte and faſhions of the age. Magnanimity and conſtancy are generally aſcribed to him; and Seneca would fain make that haughtineſs and contempt for others which, in Cato, accompanied thoſe virtues, a matter of praiſe. Cato, ſays Seneca, having received a blow in the face, neither took revenge nor was angry; he did not even *pardon the affront*, but *denied that he had received it*. His virtue raiſed him ſo high, that injury could not reach him. He is reputed to have been chaſte in his youth. His firſt love was Lepida; but when the marriage was upon the point of being concluded, Metellus Scipio, to whom ſhe had been promiſed, interfered, and the preference was given to him. This affront extremely exaſperated our Stoic. He was for going to law with Scipio; and when his friends had diverted him from that deſign, by ſhowing him the ridicule of it, he revenged himſelf by making verſes upon his rival. When this firſt flame ſubſided, he married Attilia the daughter of Serranus, had two children by her, and afterwards divorced her for her very indiſcreet conduct.

He ſerved as a volunteer under Gallius in the war of Spartacus; and when military rewards were offered him by the commander, he refuſed them, becauſe he thought he had no right to them. Some years after, he went a legionary tribune into Macedonia under the prætor Rubrius: in which ſtation he appeared, in his dreſs, and during a march, more like a private ſoldier than an officer: but the dignity of his manners, the elevation of his ſentiments, and the ſuperiority of his views, ſet him far above thoſe who bore the titles of generals and proconſuls. It is ſaid, that Cato's deſign in all his behaviour was to engage the ſoldiers to the love of virtue; whoſe affections he engaged thereby to himſelf, without his having that in his intention. "For the ſincere love of virtue, (adds Plutarch), implies an affection for the virtuous. Thoſe who praiſe the worthy without loving them, pay homage to their glory ; but are neither admirers nor imitators of their virtues." When the time of his ſervice expired, and he was leaving the army, the ſoldiers were all in tears ; ſo effectually had he gained their hearts by his condeſcending manners, and ſharing in their labours. After his return home, he was choſen to the queſtorſhip ; and had ſcarce entered on his charge, when he made a great reformation in the queſtor's office, and particularly with regard to the regiſters. Theſe regiſters, whoſe places were for life, and through whoſe hands paſſed inceſſantly all the public accounts, being to act under young magiſtrates unexperienced in buſineſs, aſſumed an air of importance ; and, inſtead of aſking orders from the queſtors, pretended to direct and govern as if they themſelves were the queſtors. Cato reduced them to their proper ſphere.

One thing by which Cato extremely pleaſed the people, was his making the aſſaſſins to whom Sylla had given conſiderable rewards out of the treaſury, for murdering the proſcribed, diſgorge their gains. Plutarch tells us, that Cato was ſo exact in diſcharging the duties of a ſenator, as to be always the firſt who came to the houſe, and the laſt who left it ; and that he never quitted Rome during thoſe days when the ſenate was to ſit. Nor did he fail to be preſent at every aſſembly of the people, that he might awe thoſe who, by an ill-judged facility, beſtowed the public money in largeſſes, and frequently, through mere favour, granted remiſſion of debts due to the ſtate. At firſt his auſterity and ſtiffneſs diſpleaſed his colleagues ; but afterwards they were glad to have his name to oppoſe to all the unjuſt ſolicitations, againſt which they would have found it difficult to defend themſelves. Cato very readily took upon him the taſk of refuſing.

Cato, to keep out a very bad man, put in for the tribunate. He ſided with Cicero againſt Catiline, and oppoſed Cæſar on that occaſion. His enemies ſent him to recover Cyprus, which Ptolemy had forfeited, thinking to hurt his reputation by ſo difficult an undertaking ; yet none could find fault with his conduct.

Cato laboured to bring about an agreement between Cæſar and Pompey ; but ſeeing it in vain, he ſided with the latter. When Pompey was ſlain, he fled to Utica ; and being purſued by Cæſar, adviſed his friends to be gone, and throw themſelves on Cæſar's clemency. His ſon, however, remained with him ; and Statilius, a young man, remarkable for his hatred to Cæſar.

The evening before the execution of the purpoſe he had formed with regard to himſelf, after bathing, he ſupped with his friends and the magiſtrates of the city. They ſat late at table, and the converſation was lively. The diſcourſe falling upon this maxim of the Stoics, that "the wiſe man alone is free, and that the vicious are ſlaves ;" Demetrius, who was a Peripatetic, undertook to confute it from the maxims of his ſchool. Cato, in anſwer, treated the matter very amply ; and with ſo much earneſtneſs and vehemence of voice, that he betrayed himſelf, and confirmed the ſuſpicions of his friends, that he deſigned to kill himſelf. When he had done ſpeaking, a melancholy ſilence enſued ; and Cato perceiving it, turned the diſcourſe to the preſent ſituation of affairs, expreſſing his concern for thoſe who had been obliged to put to ſea, as well as for thoſe who had determined to make their eſcape by land, and had a dry and ſandy deſart to paſs. After ſupper, the company being diſmiſſed, he walked for ſome time with a few friends, and gave his orders to the officers of the guard : and going into his chamber, he embraced his ſon and his friends with more than uſual tenderneſs, which farther confirmed the ſuſpicions of the reſolution he had taken. Then laying himſelf down on his bed, he took up Plato's Dialogue on the immortality of the Soul. Having read for ſome time, he looked up, and miſſing his ſword, which his ſon had removed while he was at ſupper, he called a ſlave, and aſked who had taken it away ; and receiving no pertinent anſwer, he reſumed his reading. Some time after, he aſked again for his ſword ; and, without ſhowing any impatience, ordered it to be brought to him : but, having read out the book, and finding nobody had brought him his ſword, he called for all his ſervants, fell into a rage, and ſtruck one of them on the mouth with ſo much violence, that he very much hurt his own hand, crying out in a paſſionate manner, "What ! do my own ſon and family conſpire to betray me, and deliver me up naked and unarmed to the enemy ?" Immediately his ſon and friends ruſhed into the room ; and began to lament, and to beſeech him to change his reſolution. Cato raiſing himſelf, and looking fiercely at them, "How long is it," ſaid he," ſince I have loſt my ſenſes, and my ſon is become my keeper ? Brave and generous ſon, why do you not bind your father's hands, that when Cæſar comes, he may find me unable to defend myſelf ? Do you imagine that without a ſword I cannot end my life ? Cannot I deſtroy myſelf by holding by breath for ſome moments, or by ſtriking my head againſt the wall ?" His ſon anſwered with his tears, and retired. Apollonides and Demetrius remained with him, and to them he addreſſed himſelf in the following words : "Is it to watch over me that ye ſit ſilent here ? Do you pretend to force a man of my years to live ? or can you bring any reaſon to prove, that it is not baſe and unworthy of Cato to beg his ſafety of an enemy ? or why do you not perſuade me to unlearn what I have been taught, that, rejecting all the opinions I have hitherto defended, I may now, by Cæſar's means, grow wiſer, and be yet more obliged to him than for life alone ? Not that I have determined any thing concerning myſelf ; but I would have it in my power to perform what I ſhall think fit to reſolve upon : and I ſhall not fail to aſk your counſel, when I have occaſion to act up to the principles which your philoſophy teaches. Go tell my ſon, that he ſhould not compel his father to what he cannot perſuade him." They withdrew, and the ſword was brought by a young ſlave. Cato drew it, and finding the point to be ſharp ; "Now, (ſaid he), I am my own maſter :" And, laying it down, he took up his book again, which, it is reported, he read twice over. After this he ſlept ſo ſoundly that he was heard to ſnore by theſe who were near him. About midnight he called two of his freedmen, Cleanthes his phyſician, and Butas whom he chiefly employed in the management of his affairs. The laſt he ſent to the port, to ſee whether all the

Romans were gone; to the phyſician he gave his hand to be dreſſed, which was ſwelled by the blow he had given his ſlave. This being an intimation that he intended to live, gave great joy to his family. Butas ſoon returned, and brought word that they were all gone except Craſſus, who had ſtaid upon ſome buſineſs, but was juſt ready to depart. He added, that the wind was high, and the ſea rough. Theſe words drew a ſigh from Cato. He ſent Butas again to the port, to know whether there might not be ſome one, who, in the hurry of embarkation, had forgot ſome neceſſary proviſions, and had been obliged to put back to Utica. It was now break of day, and Cato ſlept yet a little more, till Butas returned to tell him, that all was perfectly quiet. He then ordered him to ſhut his door; and he flung himſelf upon his bed, as if he meant to finiſh his night's reſt; but immediately he took his ſword, and ſtabbed himſelf a little below his cheſt; yet not being able to uſe his hand ſo well by reaſon of the ſwelling, the blow did not kill him. It threw him into a convulſion, in which he fell from his bed, and overturned a table near it. The noiſe gave the alarm; and his ſon, and the reſt of the family, entering the room, found him weltering in his blood, and his bowels half out of his body. The ſurgeon, upon examination, found that his bowels were not cut; and was preparing to replace them, and bind up the wound, when Cato, recovering his ſenſes, thruſt the ſurgeon from him, and tearing out his bowels immediately expired, in the 48th year of his age.

By this raſh act, independent of all moral or religious conſiderations, he carried his patriotiſm to the higheſt degree of political frenzy: for Cato, dead, could be of no uſe to his country; but had he preſerved his life, his counſel might have moderated Cæſar's ambition, and (as Monteſquieu obſerves) have given a different turn to public affairs.

CATOCHE, or CATOCHUS, a diſeaſe by which the patient is rendered in an inſtant as immoveable as a ſtatue, without either ſenſe or motion, and continues in the ſame poſture he was in at the moment of his being ſeized. See (the *Index* ſubjoined to) MEDICINE.

CATOPTRICS.

CATOPTRICS is that part of optics which explains the properties of reflected light, and particularly that which is reflected from mirrors.

As this and the other branches of OPTICS are fully treated under the collective word, we ſhall, in the preſent article, *1ſt*, Juſt give a ſummary of the principles of the branch, in a few plain aphoriſms, with ſome preliminary definitions; and, *2dly*, Inſert a ſet of entertaining experiments founded upon them.

SECT. I. *Definitions.*

1 Definitions

1. Every poliſhed body that reflects the rays of light is called a mirror, whether its ſurface be plane, ſpherical, conical, cylindric, or of any other form whatever.

Plate CXXVIII.

2. Of mirrors there are three principally uſed in optical experiments: The plane mirror G H I, (fig. 1.); The ſpherical convex mirror, G H I, (fig. 2.) and the ſpherical concave mirror GHI, (fig. 3.).

3. The point K, (fig. 2, 3.) round which the reflecting ſurface of a ſpherical mirror is deſcribed, is called its centre. The line KH, drawn from its centre perpendicular to its two ſurfaces, is the axis of the mirror; and the point H, to which that line is drawn, is its vertex.

4. The diſtance between the lines AG and BG, (fig. 1.) is called the angle of incidence, and the diſtance between BG and CG is the angle of reflection.

SECT. II. *Aphoriſms.*

2 I. In a plain mirror.

1. The image DF, (fig. 1.) will appear as far behind the mirror, as the object AC is before it.

2. The image will appear of the ſame ſize, and in the ſame poſition as the object.

3. Every ſuch mirror will reflect the image of an object of twice its own length and breadth.

4. If the object be an opaque body, and its rays fall on the mirror nearly in direct lines, there will be only one image viſible, which will be reflected by the inner ſurface of the glaſs. But,

5. If the object be a luminous body, and its rays fall very obliquely on the mirror, there will appear, to an eye placed in a proper poſition, ſeveral images; the firſt of which, reflected from the outer ſurface of the glaſs, will not be ſo bright as the ſecond, reflected from the inner ſurface. The following images, that are produced by the repeated reflections of the rays between the two ſurfaces of the glaſs, will be in proportion leſs vivid, to the eighth or tenth, which will be ſcarce viſible.

3 II. In a ſpherical convex mirror.

1. The image DF, (fig. 2.) will always appear behind it.

2. The image will be in the ſame poſition as the object. 3. It will be leſs than the object.

4. It will be curved, but not, as the mirror, ſpherical.

5. Parallel rays falling on this mirror will have the focus or image at half the diſtance of the centre K, from the mirror.

6. In converging rays, the diſtance of the object muſt be equal to half the diſtance of the centre, to make the image appear behind the mirror.

7. Diverging rays will have their image at leſs than half the diſtance of the centre. If the object be placed in the centre of the mirror, its image will appear at one-eighth of that diſtance behind it.

4 III. In a ſpherical concave mirror.

1. That point where the image appears of the ſame dimenſions as the object, is the centre of that mirror.

2. Parallel rays will have their focus at one-half the diſtance of the centre.

3. Converging rays will form an image before the mirror.

4. In diverging rays, if the object be at leſs than one half the diſtance of the centre, the image will be behind the mirror, erect, curved, and magnified, as

DEF, (fig. 3.) but if the diſtance of the object be greater, the image will be before the mirror, inverted and diminiſhed, as DEF, (fig. 4.)

5. The ſun's rays falling on a concave mirror, and being parallel, will be collected in a focus at half the diſtance of its centre, where their heat will be augmented in proportion of the ſurface of the mirror to that of the focal ſpot.

6. If a luminous body be placed in the focus of a concave mirror, its rays being reflected in parallel lines will ſtrongly enlighten a ſpace of the ſame dimenſion with the mirror, at a great diſtance. If the luminous object be placed nearer than the focus, its rays will diverge, and conſequently enlighten a larger ſpace. It is on this principle that reverberators are conſtructed.

IV. In all plane and ſpherical mirrors the angle of incidence is equal to the angle of reflection.

Sect. III. *Entertaining Experiments.*

5 I. Catroptical illuſions.

I. Of all our ſenſes the ſight is certainly ſubject to the greateſt illuſion. The various writers on optics have deſcribed a great number of inſtances in which it deceives us, and have conſtantly endeavoured to inveſtigate the cauſes, to explain their effects, and to reconcile appearance with reality. We every day diſcover new phenomena, and doubtleſs many more are reſerved for poſterity. It frequently happens, moreover, that a diſcovery which at firſt ſeemed of little conſequence, has led to matters of the higheſt importance.

Take a glaſs bottle A (fig. 14.) and fill it with water to the point B; leave the upper part BC empty, and cork it in the common manner. Place this bottle oppoſite a concave mirror, and beyond its focus, that it may appear reverſed, and before the mirror (ſee ſect. ii. aphor. 4. of a ſpher. concave mirror,) place yourſelf ſtill further diſtant from the bottle, and it will appear to you in the ſituation, *a*, *b*, *c*, (fig. 15.)

Now it is remarkable in this apparent bottle, that the water, which, according to all the laws of catoptrics, and all the experiments made on other objects, ſhould appear at *a b*, appears on the contrary at *b c*, and conſequently the part *a b* appears empty.

If the bottle be inverted and placed before the mirror (as in fig. 16.), its image will appear in its natural, erect poſition; and the water, which is in reality at BC, will appear at *a b*.

If while the bottle is inverted it be uncorked, and the water run gently out, it will appear, that while the part BC is emptying, that of *a b* in the image is filling; and what is likewiſe very remarkable, as ſoon as the bottle is empty the illuſion ceaſes, the image alſo appearing entirely empty. If the bottle likewiſe be quite full there is no illuſion.

If while the bottle is held inverted, and partly empty, ſome drops of water fall from the bottom A towards BC, it ſeems in the image as if there were formed at the bottom of the part *a b*, bubbles of air that roſe from *a* to *b*; which is the part that ſeems full of water. All theſe phenomena conſtantly appear.

The remarkable circumſtances in this experiment, are, firſt, not only to ſee an object where it is not, but alſo where its image is not; and ſecondly, that of two objects which are really in the ſame place, as the ſurface of the bottle and the water it contains, the one is ſeen at one place, and the other at another; and to ſee the bottle in the place of its image, and the water where neither it nor its image are.

6 II. Appearance of a boundleſs viſta. fig. 5.

II. Conſtruct a box A B, of about a foot long, eight inches wide, and ſix high; or what other dimenſion you ſhall think fit, provided it does not greatly vary from theſe proportions.

On the inſide of this box, and againſt each of its oppoſite ends A and B, place a mirror of the ſame ſize. Take off the quickſilver from the mirror that you place at B, for about an inch and an half, at the part C, where you are to make a hole in the box of the ſame ſize, by which you may eaſily view its inſide. Cover the top of the box with a frame, in which muſt be placed a tranſparent glaſs, covered with gauze, on the ſide next the inner part of the box. Let there be two grooves at the parts E and F to receive the two painted ſcenes hereafter mentioned. On two pieces of cut paſteboard let there be ſkilfully painted on both ſides (ſee fig. 6. and 7.) any ſubject you think proper; as woods, gardens, bowers, colonades, *&c.* and on two other paſtebords, the ſame ſubjects on one ſide only; obſerving that there ought to be on one of them ſome object relative to the ſubject placed at A, that the mirror placed at D may not reflect the hole at C on the oppoſite ſide.

Place the two boards painted on both ſides in the grooves E and F; and thoſe that are painted on one ſide only, againſt the oppoſite mirrors C and D; and then cover the box with its tranſparent top. This box ſhould be placed in a ſtrong light to have a good effect.

When the eye is placed at C, and views the objects on the inſide of the box, of which ſome, as we have ſaid, are painted on both ſides, they are ſucceſſively reflected from one mirror to the other; and if, for example, the painting conſiſts of trees, they will appear like a very long viſta, of which the eye cannot diſcern the end; for each of the mirrors repeating the objects, continually more faintly, contribute greatly to augment the illuſion.

7 III. Of a fortification of immenſe extent, fig. 8.

III. Take a ſquare box ABCD, of about ſix inches long, and twelve high; cover the inſide of it with four plane mirrors, which muſt be placed perpendicular to the bottom of the box CHFD.

Place certain objects in relief on the bottom of this box; ſuppoſe, for example, a piece of fortification, (as fig. 9.) with tents, ſoldiers, &c. or any other ſubject that you judge will produce an agreeable effect by its diſpoſition when repeatedly reflected by the mirrors.

On the top of this box place a frame of glaſs, in form of the bottom part of a pyramid, whoſe baſe AGEB is equal to the ſize of the box: its top ILN, muſt form a ſquare of ſix inches, and ſhould not be more than four or five inches higher than the box. Cover the four ſides of this frame with a gauze, that the inſide may not be viſible but at the top ILN, which ſhould be covered with a tranſparent glaſs.

When you look into this box through the glaſs ILN, the mirrors that are diametrically oppoſite each other, mutually reflecting the figures incloſed, the eye beholds a boundleſs extent, completely covered with theſe

theſe objects ; and if they are properly diſpoſed, the illuſion will occaſion no ſmall ſurprize, and afford great entertainment.

Note, The nearer the opening ILN is to the top of the box, the greater will be the apparent extent of the ſubject. The ſame will happen if the four mirrors placed on the ſides of the box be more elevated. The objects, by either of theſe diſpoſitions will appear to be repeated nine, twenty five, forty-nine times, *&c.* by taking always the ſquare of the odd numbers of the arithmetical progreſſion 3, 5, 7, 9, *&c.* as is very eaſy to conceive, if we remember that the ſubject encloſed in the box is always in the centre of a ſquare, compoſed of ſeveral others, equal to that which forms the bottom of the box.

Other pieces of the ſame kind (that is viewed from above) may be contrived, in which mirrors may be placed perpendicular on a triangular, pentagon, or hexagon, (that is, a three, five, or ſix-ſided) plane. All theſe different diſpoſitions, properly directed, as well with regard to the choice as poſition of the objects, will conſtantly produce very remarkable and pleaſing illuſions.

If inſtead of placing the mirrors perpendicular, they were to incline equally, ſo as to form part of a reverſed pyramid, the ſubject placed in the box would then have the appearance of a very extenſive globular or many-ſided figure.

8
IV. Surpriſing multiplication of objects, fig. 10.

IV. On the hexagonal or ſix-ſided plane ABCDEF draw ſix-ſemi-diameters GA, GB, GC, GD, GE, GF; and on each of theſe place perpendicularly two plane mirrors, which muſt join exactly at the centre G, and which placed back to back muſt be as thin as poſſible. Decorate the exterior boundary of this piece (which is at the extremity of the angles of the hexagon) with ſix columns, that at the ſame time ſerve to ſupport the mirrors, by grooves formed on their inner ſides. (See the profile H). Add to theſe columns their entablatures, and cover the edifice in ſuch manner as you ſhall think proper.

In each one of theſe ſix triangular ſpaces, contained between the mirrors, place little figures of paſteboard, in relief, repreſenting ſuch objects as when ſeen in an hexagonal form will produce an agreeable effect. To theſe add ſmall figures of enamel ; and take particular care to conceal, by ſome object that has relation to the ſubject, the place where the mirrors join, which, as we have ſaid before, all meet in the common centre G.

When you look into any one of the ſix openings of this palace, the objects there contained being repeated ſix times, will ſeem entirely to fill up the whole of the building. This illuſion will appear very remarkable ; eſpecially if the objects made choice of are properly adapted to the effect that is to be produced by the mirrors.

Note, if you place between two of theſe mirrors part of a fortification, as a curtain and two demi-baſtions, you will ſee an entire citadel, with its ſix baſtions. Or if you place part of a ball-room, ornamented with chandeliers and figures in enamel, all thoſe objects being here multiplied, will afford a very pleaſing proſpect.

9
V. Opaque bodies ſeemingly rendered tranſparent, fig. 11.

V. Within the caſe ABCD, place four mirrors, O, P, Q, R, ſo diſpoſed that they may each of them make an angle of forty-five degrees, that is, that they may be half way inclined from the perpendicular, as in the figure. In each of the two extremities AB, make a circular overture, in one of which fix the tube GL, in the other the tube MF, and obſerve that in each of theſe is to be inſerted another tube, as H and I (A).

Furniſh the firſt of theſe tubes with an object-glaſs at G, and a concave eye-glaſs at F. You are to obſerve that in regulating the focus of theſe glaſſes, with regard to the length of the tube, you are to ſuppoſe it equal to the line G, or viſual pointed ray, which entering at the overture G, is reflected by the four mirrors, and goes out at the other overture F, where the ocular glaſs is placed. Put any glaſs you will into the two ends of the moveable tubes H and I; and laſtly place the machine on a ſtand E, moveable at the point S, that it may be elevated or depreſſed at pleaſure.

When the eye is placed at F, and you look through the tube, the rays of light that proceed from the object T, paſſing through the glaſs G, are ſucceſſively reflected by the mirrors, O, P, Q, and R, to the eye at F, and there paint the object T, in its proper ſituation, and theſe rays appear to proceed directly from that object.

The two moveable tubes H and I, at the extremities of each of which a glaſs is placed, ſerve only the more to diſguiſe the illuſion, for they have no communication with the interior part of the machine. This inſtrument being moveable on the ſtand E, may be directed to any object; and if furniſhed with proper glaſſes will anſwer the purpoſe of a common perſpective.

The two moveable tubes H and I being brought together, the machine, is directed toward any object, and deſiring a perſon to look in at the end F, you aſk him if he ſee diſtinctly that object. You then ſeparate the two moveable tubes, and leaving a ſpace between them ſufficient to place your hand, or any other ſolid body, you tell him that the machine has the power of making objects viſible through the moſt obaque body; and as a proof you deſire him then to look at the ſame object, when, to his great ſurprize, he will ſee it as diſtinct as when there was no ſolid body placed between the tubes.

Note, This experiment is the more extraordinary, as it is very difficult to conceive how the effect is produced. The two arms of the caſe appearing to be made to ſupport the perſpective glaſs; and to whatever object it is directed, the effect is ſtill the ſame.

VI.

(A) Theſe four tubes muſt terminate in the ſubſtance of the caſe, and not enter the inſide, that they may not hinder the effect of the mirrors. The fourfold reflection of the rays of light from the mirrors, darkens in ſome degree the brightneſs of the object ; ſome light is alſo loſt by the magnifying power of the perſpective: If, therefore, inſtead of the object-glaſs at G, and concave eye-glaſs at F, plain glaſſes were ſubſtituted; the magnifying power of the perſpective will be taken away, and the object will appear brighter.

10 VI. VII The magician's Mirrors, fig. 12.

VI. In the partition AB, make two overtures, CD, and EF, of a foot high, and ten inches wide, and about a foot diſtant from each other. Let them be at the common height of a man's head; and in each of them place a tranſparent glaſs, ſurrounded with a frame like a common mirror.

Behind this partition place two mirrors H and I, inclined to it in an angle of forty-five degrees: that is half-way between a line drawn perpendicular to the ground and its ſurface; let them be both 18 inches ſquare: let all the ſpace between them be incloſed by boards or paſteboard painted black, and well cloſed, that no light may enter: let there be alſo two curtains to cover them, which may be drawn aſide at pleaſure.

When a perſon looks into one of theſe ſuppoſed mirrors, inſtead of ſeeing his own face, he will perceive the object that is in front of the other: ſo that if the two perſons preſent themſelves at the ſame time before theſe mirrors, inſtead of each one ſeeing himſelf, they will reciprocally ſee each other.

Note, There ſhould be a ſconce with a candle placed on each ſide of the two glaſſes in the wainſcot, to enlighten the faces of the perſons who look in them, otherwiſe this experiment will have no remarkable effect.

This experiment may be conſiderably improved by placing the two glaſſes in the partition in adjoining rooms, and a number of perſons being previouſly placed in one room, when a ſtranger enters the other, you may tell him his face is dirty; and deſire him to look in the glaſs, which he will naturally do; and on ſeeing a ſtrange face he will draw back: but returning to it, and ſeeing another, another, and another, like the phantom kings of Macbeth, what his ſurprize will be is more eaſy to conceive then expreſs. After this a real mirror may be privately let down on the back of the glaſs; and if he can be prevailed to look in it once more, he will then, to his further aſtoniſhment, ſee his own face; and may be told, perhaps perſuaded, that all he thought he ſaw before was mere imagination.

How many tricks, leſs artful than this, have paſſed in former times for ſorcery; and paſs at this time, in ſome countries, for apparitions?

Note, When a man looks in a mirror that is placed perpendicular to another, his face will appear entirely deformed. If the mirror be a little inclined, ſo as to make an angle of 80 degrees (that is, one-ninth part from the perpendicular), he will then ſee all the parts of his face, except the noſe and forehead. If it be inclined to 60 degrees (that is one-third part), he will appear with three noſes and ſix eyes: in ſhort, the apparent deformity will vary at each degree of inclination; and when the glaſs comes to 45 degrees (that is, half way down), the face will vaniſh. If, inſtead of placing the two mirrors in this ſituation, they are ſo diſpoſed that their junction may be vertical, their different inclinations will produce other effects; as the ſituation of the object relative to theſe mirrors is quite different. The effects of theſe mirrors, though remarkable enough, occaſions but little ſurpriſe, as there is no method of concealing the cauſe by which they are produced.

Fig. 13.

VII. Make a box of wood, of a cubical figure, ABCD, of about 15 inches every way. Let it be fixed on the pedeſtal P, at the uſual height of a man's head. In each ſide of this box let there be an opening of an oval form, of ten inches high, and ſeven wide.

In this box place two mirrors A, D, with their backs againſt each other; let them croſs the box in a diagonal line, and in a vertical poſition. Decorate the openings in the ſides of this box with four oval frames and tranſparent glaſſes, and cover each of them with a curtain, ſo contrived that they may all draw up together.

Place four perſons in front of the four ſides, and at equal diſtances from the box, and then draw up the curtains that they may ſee themſelves in the mirrors; when each of them, inſtead of his own figure, will ſee that of the perſon who is next him, and who, at the ſame time, will ſeem to him to be placed on the oppoſite ſide. Their confuſion will be the greater, as it will be very difficult for them to diſcover the mirrors concealed in the box. The reaſon of this phænomenon is evident; for though the rays of light may be turned aſide by a mirror, yet as we have before ſaid, they always appear to proceed in right lines.

12 VIII. The perſpective mirror, fig. 17.

VIII. Provide a box ABCD of about two feet long, 15 inches wide, and 12 inches high. At the end AC place a concave mirror, the focus of whoſe parallel rays is at 18 inches from the reflecting ſurface. At IL place a paſteboard blacked, in which a hole is cut ſufficiently large to ſee on the mirror H the object placed at BEFD.

Cover the top of the box, from A to I, cloſe, that the mirror H may be entirely darkened. The other part IB, muſt be covered with a glaſs, under which is placed a gauze.

Make an aperture at G, near the top of the ſide E B; beneath which, on the inſide, place in ſucceſſion paintings of different ſubjects, as viſtas, landſcapes, *&c.* ſo that they may be in front of the mirror H. Let the box be ſo placed that the object may be ſtrongly illuminated by the ſun, or by wax lights placed under the encloſed part of the box AI.

By this ſimple conſtruction the objects placed at GD will be thrown into their natural perſpective; and if the ſubjects be properly choſen, the appearance will be altogether as pleaſing as in optical machines of a much more complicated form.

Note, A glaſs mirror ſhould be always here uſed, as thoſe of metal do not repreſent the objects with equal vivacity, and are beſide ſubject to tarniſh. It is alſo neceſſary that the box be ſufficiently large, that you may not be obliged to uſe a mirror whoſe focus is too ſhort; for in that caſe, the right lines near the border of the picture will appear bent in the mirror, which will have a diſagreeable effect, and cannot be avoided.

15 IX. To ſet fire to a combuſtible body by the reflection of two concave mirrors, fig. 18.

IX. The rays of a luminous body placed in the focus of a concave mirror being reflected in parallel lines, if a ſecond mirror be placed diametrically oppoſite the firſt, it will, by recollecting thoſe rays in its focus, ſet fire to a combuſtible body.

Place two concave mirrors, A and B, at about 12 or 15 feet diſtance from each other, and let the axis of each of them be in the ſame line. In the focus C of one of them, place a live coal, and in the focus D of the other, ſome gun-powder. With a pair of double bellows, which make a continual blaſt, keep conſtantly blowing the coal, and notwithſtanding the diſtance between them, the powder will preſently take fire.

It is not neceſſary that theſe mirrors be of metal or braſs, thoſe made of wood or paſteboard, gilded, will produce the exploſion, which has ſometimes taken effect at the diſtance of 50 feet, when mirrors of eighteen inches, or two feet diameter, have been uſed.

This experiment ſucceeds with more difficulty at great diſtances; which may proceed from the moiſture in a large quantity of air. It would doubtleſs take effect more readily, if a tin tube, of an equal diameter with the mirrors, were to be placed between them.

14 The real apparition, fig. 19.

X. Behind the partition AB, place, in a poſition ſomething oblique, the concave mirror EF, which muſt be at leaſt ten inches in diameter, and its diſtance from the partition equal to three-fourths of the diſtance of its centre.

In the partition make an opening of ſeven or eight inches, either ſquare or circular: it muſt face the mirror, and be of the ſame height with it. Behind this partition place a ſtrong light, ſo diſpoſed that it may not be ſeen at the opening, and may illumine an object placed at C, without throwing any light on the mirror.

Beneath the aperture in the partition place the object C, that you intend ſhall appear on the outſide of the partition, in an inverted poſition; and which we will ſuppoſe to be a flower. Before the partition, and beneath the aperture, place a little flower-pot D, the top of which ſhould be even with the bottom of the aperture, that the eye, placed at G, may ſee the flower in the ſame poſition as if its ſtalk came out of the pot.

Take care to paint the ſpace between the back part of the partition and the mirror black, to prevent any reflections of light from being thrown on the mirror; in a word, ſo diſpoſe the whole that it may be as little enlightened as poſſible.

When a perſon is placed at the point G, he will perceive the flower that is behind the partition, at the top of the pot at D, but on putting out his hand to pluck it, he will find that he attempts to graſp a ſhadow.

If in the opening of the partition a large double convex lens of a ſhort focus be placed, or, which is not quite ſo well, a bottle of clear water, the image of the flower reflected thereon will appear much more vivid and diſtinct.

Obſervation. The phenomena that may be produced by means of concave mirrors are highly curious and aſtoniſhing. By their aid, ſpectres of various kinds may be exhibited. Suppoſe, for example, a perſon with a drawn ſword places himſelf before a large concave mirror, but farther from it than its focus; he will then ſee an inverted image of himſelf in the air, between him and the mirror, of a leſs ſize than himſelf. If he ſteadily preſent the ſword towards the centre of the mirror, an image of the ſword will come out therefrom towards the ſword in his hand, point to point, as it were to fence with him; and by his puſhing the ſword nearer the image will appear to come nearer him, and almoſt to touch his breaſt, having a ſtriking effect upon him. If the mirror be turned 45 degrees, or one-eighth round, the reflected image will go out perpendicular to the direction of the ſword preſented, and apparently come to another perſon placed in the direction of the motion of the image. If that perſon is unacquainted with the experiment, and does not ſee the original ſword, he will be much ſurpriſed and alarmed.—This experiment may be another way diverſified, by telling any perſon, that at ſuch an hour, and in ſuch a place, he ſhould ſee the apparition of an abſent or deceaſed friend (of whoſe portrait you are in poſſeſſion). In order to produce this phantom, inſtead of the hole in the partition AB in the laſt figure, there muſt be a door which opens into an apartment to which there is a conſiderable deſcent. Under that door you are to place the portrait, which muſt be inverted and ſtrongly illuminated, that it may be lively reflected by the mirror, which muſt be large and well poliſhed. Then having introduced the incredulous ſpectator at another door, and placed him in the proper point of view, you ſuddenly throw open the door at AB, when, to his great aſtoniſhment, he will immediately ſee the apparition of his friend.

It will be objected, perhaps, that this is not a perfect apparition, becauſe it is only viſible at one point of view, and by one perſon. But it ſhould be remembered, that it was an eſtabliſhed maxim in the laſt centuries, that a ſpectre might be viſible to one perſon and not to others. So Shakeſpeare makes both Hamlet and Macbeth ſee apparitions that were not viſible to others, preſent at the ſame time. It is not unlikely, moreover, that this maxim took its riſe from certain apparitions of this kind that were raiſed by the monks, to ſerve ſome purpoſes they called religious; as they alone were in poſſeſſion of what little learning there then was in the world.

Opticians ſometimes grind a glaſs mirror concave in one direction only, as it is ſaid longitudinally; it is in fact a concave portion of a cylinder, the breadth of which may be conſidered that of the mirror. A perſon looking at his face in this mirror, in the direction of its concavity, will ſee it curiouſly diſtorted in a very lengthened appearance; and by turning the cylindrical mirror a quarter round, his viſage will appear diſtorted another way, by an apparent increaſe in width only. Another curious and ſingular property attends this ſort of mirrors: If in a very near ſituation before it, you put your finger on the right hand ſide of your noſe, it will appear the ſame in the mirror; but if in a diſtant ſituation, ſomewhat beyond the centre of concavity, you again look at your face in the mirror, your finger will appear to be removed to the other or left-hand ſide of your noſe. This, though ſomething extraordinary, will in its cauſe appear very evident from a ſmall conſideration of the properties of ſpherical concave mirrors.

CATOPTROMANCY, Κατοπτρομαντεια, a kind of divination among the ancients; ſo called, becauſe, conſiſting in the application of a mirror. The word is formed from κατοπτρον, *ſpeculum* "mirror," and μαντεια, *divinatio*, "divination." Pauſanias ſays, it was in uſe among the Achaians; where thoſe who were ſick, and in danger of death, let down a mirror, or looking-glaſs faſtened by a thread, into a fountain before the temple of Ceres; then, looking in the glaſs, if they ſaw a ghaſtly disfigured face, they took it as a ſure ſign of death: on the contrary, if the fleſh appeared freſh and healthy, it was a token of recovery. Sometimes glaſſes were uſed without water, and the images of things future repreſented in them. See Gastromancy.

CATROU, (Francis) a famous Jeſuit, born at Paris in 1659. He was engaged for twelve years in the *Journal de Trevoux*, and applied himſelf at the ſame time to other works, which diſtinguiſhed him among the learned. He wrote a general Hiſtory of the Mogul empire, and a Roman hiſtory, in which he was aſſiſted by father Rouille, a brother jeſuit. Catrou died in 1737; and this laſt hiſtory was continued by Rouille, who died in 1740.

CATTERTHUN, a remarkable Caledonian poſt, a few miles north of the town of Brechin in the county of Angus in Scotland. Mr Pennant deſcribes it as of uncommon ſtrength. "It is (ſays he) of an oval form made of a ſtupenduous dike of looſe white ſtones, whoſe convexity, from the baſe within to that without, is 122 feet. On the outſide a hollow, made by the diſpoſition of the ſtones, ſurrounds the whole. Round the baſe is a deep ditch, and below that about 100 yards, are veſtiges of another, that went round the hill. The area within the ſtony mound is flat; the axis, or length of the oval, is 436 feet, the tranſverſe diameter 200. Near the eaſt ſide is the foundation of a rectangular building; and on moſt parts are the foundations of others ſmall and circular: all which had once their ſuperſtructures, the ſhelter of the poſſeſſors of the poſt: there is alſo a hollow, now almoſt filled with ſtones, the well of the place." There is another fortification, but of inferior ſtrength, in the neighbourhood. It is called the *Brown Catterthun*, from the colour of the ramparts which are compoſed only of earth. It is of a circular form, and conſiſts of various concentric dikes. On one ſide of this riſes a ſmall rill, which, running down the hill, has formed a deep gully. From the ſide of the fortreſs is another rampart, which extends parallel to the rill, and then reverts, forming an additional poſt or retreat. The meaning of the word *Catter-thun* is *Camp-town*; and Mr Pennant thinks theſe might probably be the poſts occupied by the Caledonians before their engagement at the foot of the Grampian Mountains with the celebrated Agricola. See (*Hiſtory of*) Scotland.

CATTI, a people of Germany, very widely ſpread, on the eaſt reaching to the river Sala, on the north to Weſtphalia; occupying, beſides Heſſe, the Wetterau, and part of the tract on the Rhine, and on the banks of the river Lohne. The Hercynian foreſt began and ended in their country.

CATTIVELLAUNI, anciently a people of Britain, ſeated in the country which is now divided into the counties of Hertford, Bedford, and Bucks. The name of this ancient Britiſh people is written in ſeveral different ways by Greek and Roman authors being ſometimes called Catti, Caſſii, Catticuclani, Cattidudani, Catticludani, &c. That they were of Belgic origin cannot be doubted, and it is not improbable, that they derive their name of Catti from the Belgic word Kattin, which ſignifies illuſtrious or noble, and that the addition of Vellauni, which means on the banks of rivers, might be given them after their arrival in Britain, as deſcriptive of the ſituation of their country. However this may be, the Cattivellauni formed one of the moſt brave and warlike of the ancient Britiſh nations when Cæſar invaded Britain, and long after. Caſſibelanus, their prince, was made commander in chief of the confederated Britons, not only on account of his own perſonal qualities, but alſo becauſe he was at the head of one of their braveſt and moſt powerful tribes. In the interval between the departure of Cæſar and the next invaſion under Claudius, the Cattivellauni had reduced ſeveral of the neighbouring ſtates under their obedience; and they again took the lead in the oppoſition to the Romans at their ſecond invaſion, under their brave but unfortunate prince Caractacus. The country of the Cattivellauni was much frequented and improved by the Romans, after it came under their obedience. Verulamium, their capital, which ſtood near where St Albans now ſtands, became a place of great conſideration, was honoured with the name and privileges of a municipium or free city, and had magiſtrates after the model of the city of Rome. This place was taken and almoſt deſtroyed by the inſurgents under Boadicea; but it was afterwards rebuilt, reſtored to its former ſplendor, and ſurrounded with a ſtrong wall, ſome veſtiges of which are ſtill remaining. Durocobrivæ and Magiavintum, in the ſecond iter of Antoninus, were probably Dunſtable and Fenny-Stratford, at which places there appear to have been Roman ſtations. The Salena of Ptolemy, a town in the country of the Cattivellauni, was perhaps ſituated at Saludy, in Bedfordſhire, where ſeveral Roman antiquities have been found. There were, beſides theſe, ſeveral other Roman forts, ſtations, and towns in this country, which it would be tedious to enumerate. The territories of the Cattivellauni made a part of the Roman province called Britannia Prima.

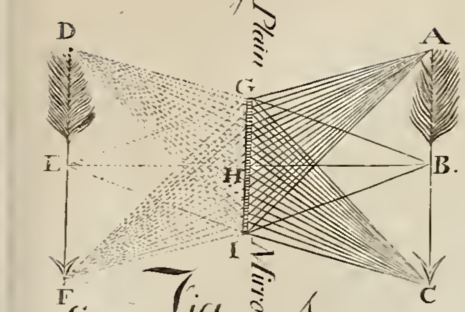
CATTLE, a collective word, which ſignifies the fourfooted animals, which ſerve either for tilling the ground, or for food to men. They are diſtinguiſhed into large, or black cattle; and into ſmall cattle: of the former are horſes, bulls, oxen, cows, and even calves and heifers; amongſt the latter are rams, ewes, ſheep, lambs, goats, kids, &c. Cattle are the chief ſtock of a farm: they who deal in cattle are ſtyled graziers.

CATULLUS, (Caius Valerius) a Latin poet, born at Verona, in the year of Rome 666. The harmony of his numbers acquired him the eſteem and friendſhip of Cicero, and other great men of his time. Many of his poems, however, abound with groſs obſcenities. He wrote ſatirical verſes againſt Cæſar, under the name of Marmoro. He ſpent his whole life in a ſtate of poverty; and died in the flower of his age, and the height of his reputation. Joſeph Scaliger, Paſſerat, Muret, and Iſaac Voſſius, have written learned notes on this poet.

CATOPTRICS.

Plate CXXVIII.

Fig. 1.



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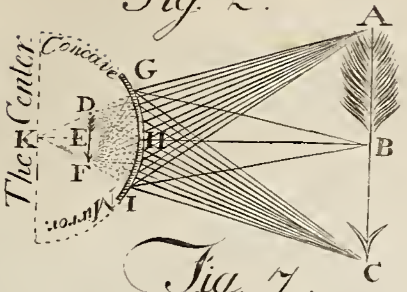

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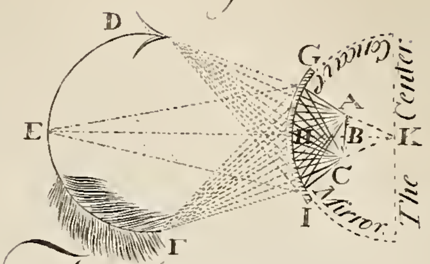

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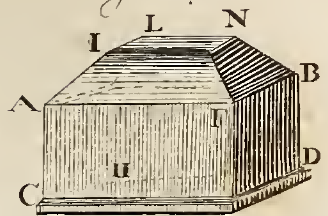

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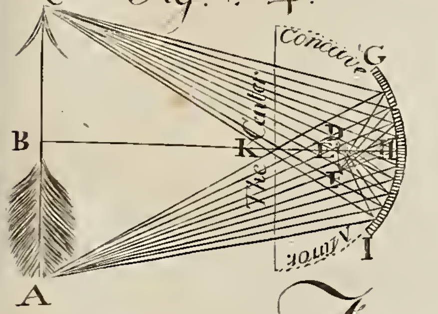

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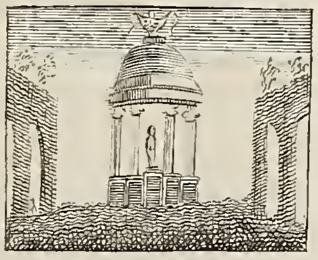

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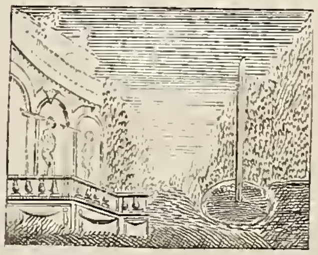

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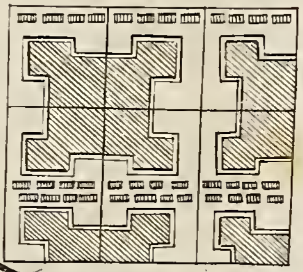

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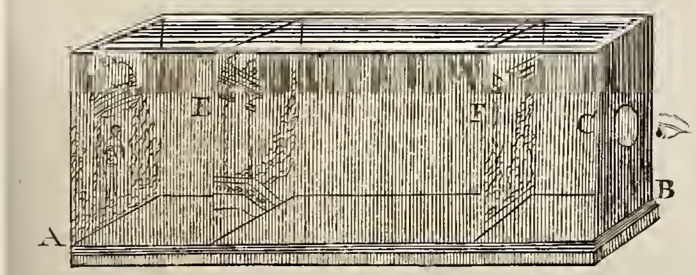

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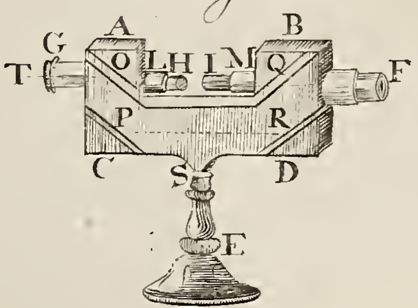

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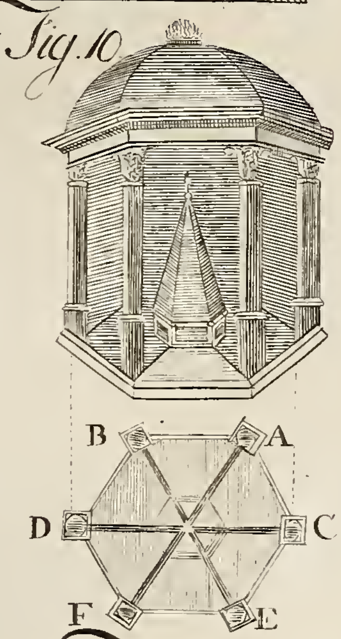

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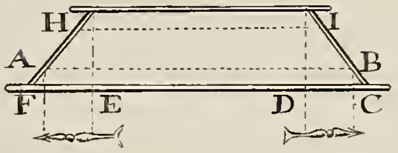

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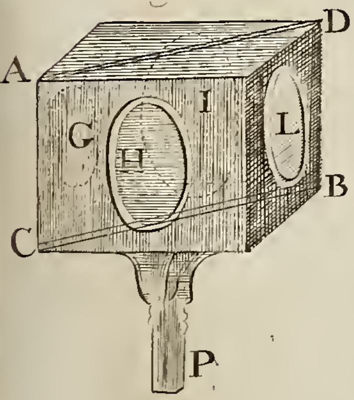


Fig. 14.

Fig. 15.

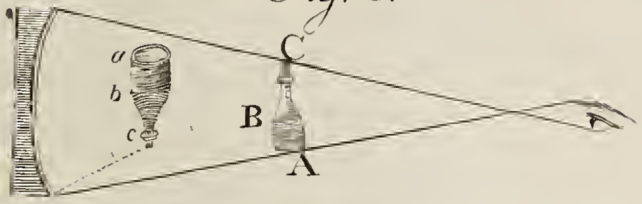


Fig. 17.

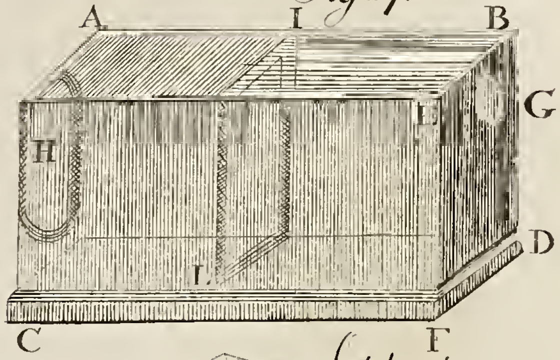
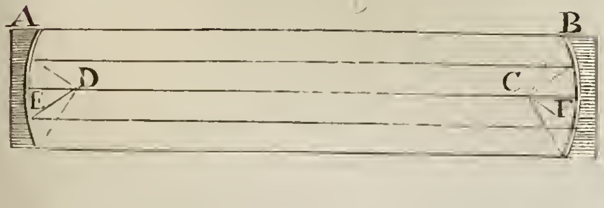


Fig. 16.

Fig. 18.



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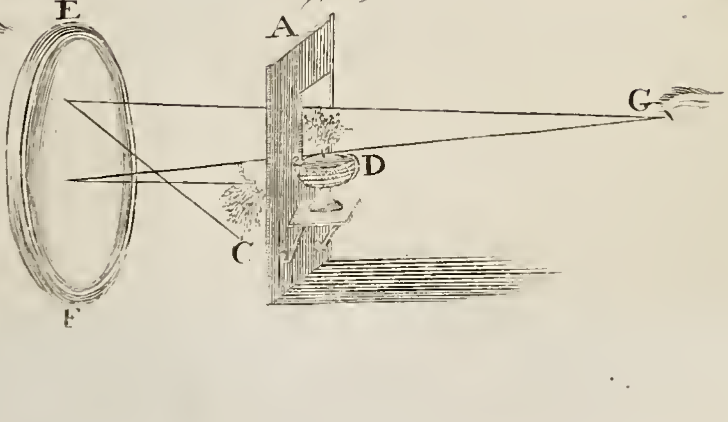
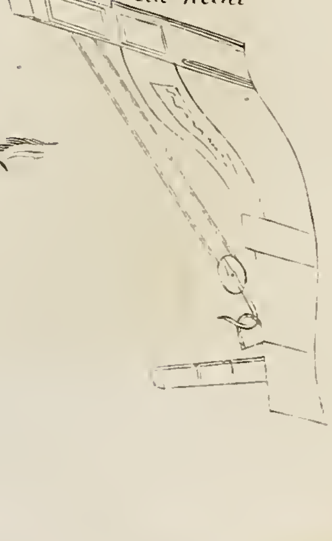


Cat-head



CATZ, (James) a great civilian, politician, and Dutch poet, was born at Browerſhaven, in Zealand, in the year 1577. After having made ſeveral voyages, he fixed at Middleburg; and acquired by his pleadings ſuch reputation, that the city of Dort choſe him for its penſionary; as did alſo, ſome time after, that of Middleburg. In 1634, he was nominated penſionary of Holland and Weſt Frieſland; and in 1648, he was elected keeper of the ſeal of the ſame ſtate, and ſtadtholder of the fiefs: but ſome time after, he reſigned theſe employments, to enjoy the repoſe which his advanced age demanded. As the poſt of grand penſionary had been fatal to almoſt all thoſe who had enjoyed it, from the beginning of the republic till that time, Catz delivered up his charge on his knees, before the whole aſſembly of the ſtates, weeping for joy, and thanking God for having preſerved him from the inconveniences that ſeemed attached to the duties of that office. But though he was reſolved to ſpend the reſt of his days in repoſe, the love of his country engaged him to comply with the deſires of the ſtate, who importuned him to go on an embaſſy to England, in the delicate conjuncture in which the republic found itſelf during the protectorate of Cromwell. At his return, he retired to his fine country ſeat at Sorgvliet, where he lived in tranquillity till the year 1660, in which he died. He wrote a great number of poems in Dutch; moſt of which are on moral ſubjects, and ſo eſteemed, that they have been often printed in all the different ſizes; and next to the Bible, there is no work ſo highly valued by the Dutch.

CATZENELLIBOGEN, a town of Germany, in the lower part of the upper circle of the Rhine, with a ſtrong caſtle. It is capital of a county of the ſame name. E. Long. 7. 38. N. Lat. 50. 20.

CAVA, in anatomy, the name of a vein, the largeſt in the body, terminating in the right ventricle of the heart. See ANATOMY, p. 751. col. 2.

CAVA, a conſiderable and populous town of Italy, in the kingdom of Naples, and in the Hither Principato, with a biſhop's ſee. It is ſituated at the foot of Mount Metelian, in E. Long. 15. 5. N. Lat. 40. 40.

CAVAILLAN, a town of France in Contal Venaiſſin; with a biſhop's ſee. It is ſituated on the river Durance, in a fertile and pleaſant country. E. Long. 4. 17. N. Lat. 43. 52.

CAVALCADE, a formal pompous march or proceſſion of horſemen, equipages, &c. by way of parade, or ceremony, as a grace to a triumph, public entry, or the like.

CAVALCADOUR, or CAVALCADEUR, anciently denoted a riding-maſter; but at preſent is diſuſed in that ſenſe, and only employed to denote a ſort of equerries or officers who have the direction of princes ſtables. The French ſay, *ecuyer cavalcadeur* of the king, the duke of Orleans, &c. Menage writes it *cavalcadour*, and derives it from the Spaniſh *cavalgador*, a horſeman.

CAVALCANTE, (Guido) a nobleman of Florence in the 13th century, who having followed the party of the Guelfes, experienced the changeableneſs of fortune. He ſhowed great ſtrength of mind in his misfortunes, and never neglected to improve his talents. He wrote a treatiſe in Italian concerning ſtyle, and ſome verſes which are eſteemed. His poem on the love of this world, has been commented on by ſeveral learned men.

CAVALIER, a horſeman, or perſon mounted on horſeback; eſpecially if he be armed withal, and have a military appearance.

Anciently, the word was reſtrained to a knight, or *miles*. The French ſtill uſe *Chevalier* in the ſame ſenſe.

CAVALIER, conſidered as a faction. See BRITAIN, n° 109.

CAVALIER, in fortification, an elevation of earth of different ſhapes, ſituated ordinarily in the gorge of a baſtion, bordered with a parapet, and cut into more or leſs embraſures, according to the capacity of the cavalier. Cavaliers are a double defence for the faces of the oppoſite baſtion: they defend the ditch, break the beſiegers galleries, command the traverſes in dry moats, ſcour the ſaliant angle of the counterſcarp, where the beſiegers have their counter-batteries, and enfilade the enemies trenches, or oblige them to multiply their parallels: they are likewiſe very ſerviceable in defending the breach and the retrenchments of the beſieged, and can very much incommode the entrenchments which the enemy make, being lodged in the baſtion.

CAVALIER, in the menage, one that underſtands horſes, and is practiſed in the art of riding them.

CAVALIERI, (Bonaventure) an eminent mathematician in the 17th century, a native of Milan, and a friar of the order of the Jeſuati of St Jerome, was profeſſor of mathematics at Bologna, where he publiſhed ſeveral mathematical books, particularly the *Method of Indiviſibles*. He was a ſcholar of Galileo. His *Directorium generale Uranometricum* contains great variety of moſt uſeful practices in trigonometry and aſtronomy. His trigonometrical tables in that work are excellent.

CAVALRY, a body of ſoldiers that charge on horſeback. The word comes from the French, *cavalerie*, and that from the corrupt Latin, *caballus*, a horſe.

The Roman cavalry conſiſted wholly of thoſe called *equites*, or knights, who were a diſtinct order in the diſtribution of citizens.—The Grecian cavalry were divided into *cataphracta* and *non cataphracta*, i. e. into heavy and light armed.—Of all the Greeks, the Theſſalians excelled moſt in cavalry. The Lacedemonians, inhabiting a mountainous country, were but meanly furniſhed with cavalry, till, carrying their arms into other countries, they found great occaſion for horſes to ſupport and cover their foot. The Athenian cavalry, for a conſiderable time, conſiſted only of 96 horſemen: after expelling the Perſians out of Greece, they increaſed the number to 300: and afterwards to 1200, which was the higheſt pitch of the Athenian cavalry. The Turkiſh cavalry conſiſts partly of Spahis, and partly of horſemen raiſed and maintained by the Zaims and Timariots.

The chief uſe of the cavalry is to make frequent excurſions to diſturb the enemy, intercept his convoys, and deſtroy the country: in battle to ſupport and cover the foot, and to break through and diſorder the enemy; alſo to ſecure the retreat of the foot. Formerly, the manner of the fighting of the cavalry was, after firing their piſtols or carabines, to wheel off, and to give opportunity for loading again. Guſtavus Adolphus is ſaid to have firſt taught the cavalry to charge through, to march ſtraight up to the enemy, with the ſword drawn in the bridlehand, and each man having fired his piece, at the proper diſtance, to betake himſelf to his ſword, and charge the enemy as was found moſt advantageous.

CAVAN, a town of Ireland, and capital of a county of the ſame name, in the province of Ulſter, ſituated in W. Long. 7. 32. N. Lat. 53. 40.

CAVAN, a county of Ireland, 47 miles in length, and 23 in breadth; is bounded on the eaſt by Monaghan, and on the ſouth by Longford, Weſt-Meath, and Eaſt-Meath. It has but two towns of any note, viz. Cavan and Kilmore. It ſends five members to parliament; two for the county, two for Cavan, and one for Kilmore. It contains upwards of 8000 houſes, 37 pariſhes, ſeven baronies, and two boroughs.

CAUCASUS, the name of a very high mountain of Aſia, being one of that great ridge which runs between the Black and Caſpian ſeas. Sir John Chardin deſcribes this as the higheſt mountain, and the moſt difficult to paſs, of any he had ſeen. It has frightful precipices, and in many places the roads are cut out of the ſolid rock. At the time he paſſed it, the mountain was entirely covered with ſnow; ſo that, in many places, his guides behoved to clear the way with ſhovels. The mountain is 36 leagues over, and the ſummit of it eight leagues in breadth. The top is perpetually covered with ſnow: and our traveller relates, that the two laſt days he ſeemed to be in the clouds, and was not able to ſee 20 paces before him. Excepting the very top, however, all the parts of Mount Caucaſus are extremely fruitful; abounding in honey, corn, fruits, hogs, and large cattle. The vines twine about the trees, and riſe ſo high, that the inhabitants cannot gather the fruit from the uppermoſt branches. There are many ſtreams of excellent water, and a vaſt number of villages. The inhabitants are for the moſt part Chriſtians of the Georgian Church. They have fine complexions, and the women are very beautiful.—In the winter they wear ſnow-ſhoes in the form of rackets, which prevent their ſinking in the ſnow, and enable them to run upon it with great ſwiftneſs.

CAUDEBEC, a rich, populous, and trading town in Normandy, and capital of the territory of Caux. It is ſeated at the foot of a mountain near the river Seine, in E. Long. 0. 46. N. Lat. 40. 30.

CAUDEX, by Malphigi and other botaniſts, is uſed to ſignify the ſtem or trunk of a tree: by Linnæus, the ſtock or body of the root, part of which aſcends, part deſcends. The aſcending part raiſes itſelf gradually above ground, ſerving frequently for a trunk, and correſponds in ſome meaſure to the *caudex* of former writers: the deſcending part ſtrikes gradually downward into the ground, and puts forth radicles or ſmall fibres, which are the principal and eſſential part of every root. The deſcending caudex therefore correſponds to the radix of other botaniſts. Agreeably to this idea, Linnæus conſiders trees and ſhrubs as roots above ground; an opinion which is confirmed by a well-known fact, that trees, when inverted, put forth leaves from the deſcending caudex, and radicles or roots from the aſcending. For the varieties in the deſcending caudex, ſee the article RADIX.

CAUDIUM, (anc. geog.) a town of Samnium, on the Via Appia, between Calatia and Beneventum: *Caudinus*, the epithet. The *Caudinae Furcae*, or *Furculae*, were memorable by the diſgrace of the Romans; being ſpears diſpoſed in the form of a gallows under which priſoners of war were made to paſs, and gave name to a defile or narrow paſs near *Caudium*, Livy; where the Samnites obliged the Roman army and the two conſuls to lay down their arms and paſs under the gallows, or yoke, as a token of ſubjection.

CAVE, any large ſubterraneous hollow. Theſe were undoubtedly the primitive habitations, before men began to build edifices above ground. The primitive method of burial was alſo to repoſite the bodies in caves, which ſeems to have been the origin of catacombs. They long continued the proper habitations of ſhepherds. Among the Romans, *caves (antra)* uſed to be conſecrated to nymphs, who were worſhipped in caves, as other gods were in temples. The Perſians alſo worſhipped their god Mithras in a natural cave, conſecrated for the purpoſe by Zoroaſter. The cave of the nymph Egeria is ſtill ſhown at Rome. Kircher, after Gaffarellus, enumerates divers ſpecies of caves; as divine, natural, &c.—Of natural caves ſome are poſſeſſed of a medicinal virtue, as the Grotto de Serpente; others are poiſonous or mephitical; ſome are replete with metalline exhalations, and others with waters. Divine caves were thoſe ſaid to affect the human mind and paſſions in various ways, and ever to inſpire with a knowledge of future events. Such were the ſacred caverns at Delphi which inſpired the Pythia; the Sibyl's cave at Cumæ, ſtill ſhown near the lake Avernus; the cave of Trophonius, &c.

CAVE, (Dr William), a learned Engliſh divine born in 1637, educated in St John's college Cambridge; and ſucceſſively miniſter of Haſely in Oxfordſhire, Allhallows the Great in London, and of Iſlington. He became chaplain to Charles II. and in 1684 was inſtalled a canon of Windſor. He compiled *The Lives of the Primitive Fathers in the three firſt centuries of the church*, which is eſteemed a very uſeful work; and *Hiſtoria Literaria*, &c. in which he gives an exact account of all who had written for or againſt Chriſtianity, from the time of Chriſt to the 14th century: which works produced a warm controverſy between Dr Cave and M. Le Clerc, who was then writing his *Bibliotheque Univerſelle* in Holland, and who charged the doctor with partiality. Dr Cave died in 1713.

CAVE, (Edward) printer, celebrated as the projector of the *Gentleman's MAGAZINE*,—the firſt publication of the ſpecies, and ſince

> The fruitful mother of a thouſand more,

who was born in 1691. His father being diſappointed of ſome ſmall family expectations, was reduced to follow the trade of a ſhoemaker at Rugby in Warwickſhire. The free ſchool of this place, in which his ſon had, by the rules of its foundation, a right to be inſtructed, was then in high reputation, under the Rev. Mr Holyock, to whoſe care moſt of the neighbouring families, even of the higheſt rank, entruſted their ſons. He had judgment to diſcover, and for ſome time generoſity to encourage the genius of young Cave; and was ſo well pleaſed with his quick progreſs in the ſchool, that he declared his reſolution to breed him for the univerſity, and recommend him as a ſervitor to ſome of his ſcholars of high rank. But proſperity which depends upon the caprice of others, is of ſhort duration. Cave's ſuperiority in literature exalted him to an invidious familiarity with boys who were far above him in rank and expectations; and, as in unequal aſſociations it always happens, whatever unlucky prank was played was imputed to Cave. When any miſchief, great or ſmall, was done, though perhaps others boaſted of the ſtratagem when it was ſucceſsful, yet upon detection or miſcarriage, the fault was ſure to fall upon poor Cave. The harſh treatment he experienced from this ſource, and which he bore for a while, made him at laſt leave the ſchool, and the hope of a literary education, to ſeek ſome other means of gaining a livelihood.

He was firſt placed with a collector of the exciſe: but the inſolence of his miſtreſs, who employed him in ſervile drudgery, quickly diſguſted him, and he went up to London in queſt of a more ſuitable employment. He was recommended to a timber-merchant at the Bankſide: and while he was there on liking, is ſaid to have given hopes of great mercantile abilities: but this place he ſoon left, and was bound apprentice to Mr Collins, a printer of ſome reputation, and deputy alderman. This was a trade for which men were formerly qualified by a literary education, and which was pleaſing to Cave, becauſe it furniſhed ſome employment for his ſcholaſtic attainments. Here, therefore, he reſolved to ſettle, though his maſter and miſtreſs lived in perpetual diſcord, and their houſe was therefore no comfortable habitation. From the inconveniences of theſe domeſtic tumults he was ſoon releaſed, having in only two years attained ſo much ſkill in his art, and gained ſo much the confidence of his maſter, that he was ſent without any ſuperintendant to conduct a printing-houſe at Norwich, and publiſh a weekly paper. In this undertaking he met with ſome oppoſition, which produced a public controverſy, and procured young Cave the reputation of a writer.

His maſter died before his apprenticeſhip was expired, and he was not able to bear the perverſeneſs of his miſtreſs. He therefore quitted her houſe upon a ſtipulated allowance, and married a young widow with whom he lived at Bow. When his apprenticeſhip was over, he worked as a journeyman at the printing-houſe of Mr Barber, a man much diſtinguiſhed and employed by the Tories, whoſe principles had at that time ſo much prevalence with Cave, that he was for ſome years a writer in Miſt's Journal. He afterwards obtained by his wife's intereſt a ſmall place in the poſt-office; but ſtill continued, at his intervals of attendance, to exerciſe his trade, or to employ himſelf with ſome typographical buſineſs. He corrected the *Gradus ad Parnaſſum*: and was liberally rewarded by the company of ſtationers. He wrote an Account of the Criminals, which had for ſome time a conſiderable ſale; and publiſhed many little pamphlets that accident brought into his hands, of which it would be very difficult to recover the memory. By the correſpondence which his place in the poſt-office facilitated, he procured a country news-paper, and ſold their intelligence to a journaliſt in London for a guinea a week. He was afterwards raiſed to the office of clerk of the franks, in which he acted with great ſpirit and firmneſs; and often ſtopped franks which were given by members of parliament to their friends, becauſe he thought ſuch extenſion of a peculiar right illegal. This raiſed many complaints; and the influence that was exerted againſt him procured his ejectment from office. He had now, however, collected a ſum ſufficient for the purchaſe of a ſmall printing-office, and began the Gentleman's Magazine; an undertaking to which he owed the affluence in which he paſſed the laſt 20 years of his life, and the large fortune which he left behind him. When he formed the project, he was far from expecting the ſucceſs which he found; and others had ſo little proſpect of its conſequence, that though he had for ſeveral years talked of his plan among printers and bookſellers, none of them thought it worth the trial. That they were not (ſays Dr Johnſon) reſtrained by their virtue from the execution of another man's deſign, was ſufficiently apparent as ſoon as that deſign began to be gainful; for in a few years a multitude of magazines aroſe, and periſhed: only the London Magazine, ſupported by a powerful aſſociation of bookſellers, and circulated with all the art and all the cunning of trade, exempted itſelf from the general fate of Cave's invaders, and obtained though not an equal yet a conſiderable ſale.

Cave now began to aſpire to popularity; and being a greater lover of poetry than any other art, he ſometimes offered ſubjects for poems, and propoſed prizes for the beſt performers. The firſt prize was 50l. for which, being newly acquainted with wealth, and thinking the influence of 50l. extremely great, he expected the firſt authors of the kingdom to appear as competitors; and offered the allotment of the prize to the univerſities. But when the time came, no name was ſeen among the writers that had been ever ſeen before; the univerſities and ſeveral private men rejected the province of aſſigning the prize. The determination was then left to Dr Cromwell Mortimer and Dr Birch; and by the latter the award was made, which may be ſeen in Gent. Mag. Vol. VI. p. 59.

Mr Cave continued to improve his Magazine, and had the ſatisfaction of ſeeing its ſucceſs proportionate to his diligence, till in 1751 his wife died of an aſthma. He ſeemed not at firſt much affected by her death, but in a few days loſt his ſleep and his appetite, which he never recovered. After having lingered about two years, with many viciſſitudes of amendment and relapſe, he fell by drinking acid liquors into a diarrhœa, and afterwards into a kind of lethargic inſenſibility; and died Jan. 10, 1754, having juſt concluded the 23d annual collection.

CAVEARE. See CAVIARE.

CAVEAT, in law, a kind of proceſs in the ſpiritual courts, to ſtop the proving of a will, the granting tithes of adminiſtration, &c. to the prejudice of another. It is alſo uſed to ſtop the inſtitution of a clerk to a benefice.

CAVEATING, in fencing, is the ſhifting the ſword from one ſide of that of your adverſary to the other.

CAVEDO, in commerce, a Portugueſe long meaſure, equal to $27\frac{354}{1000}$ Engliſh inches.

CAVENDISH, (Thomas) of Suffolk, the ſecond Engliſhman that ſailed round the globe, was deſcended from a noble family in Devonſhire. Having diſſipated his fortune, he reſolved to repair it at the expence of the Spaniards. He ſailed from Plymouth with two ſmall ſhips in July 1586; paſſed through the ſtraits of Magellan; took many rich prizes along the coaſts of Chili and Peru; and near California poſſeſſed himſelf of the St Ann, an Acapulco ſhip, with a cargo of immenſe value. He completed the circumnavigation of the globe, by returning home round the Cape of Good Hope, and reached Plymouth again in September 1588. On his arrival, it is ſaid, that his ſoldiers and ſailors were clothed in ſilk, his ſails were damaſk, and his topmaſt was covered with cloth of gold. His acquired riches did not laſt long: he reduced himſelf, in 1591, to the expedient of another voyage; which was far from being ſo ſucceſsful as the former; he went no farther than the ſtraits of Magellan, where the weather obliging him to return, he died of grief on the coaſt of Brazil.

CAVENDISH, (Sir William) deſcended of an ancient and honourable family, was born about the year 1505, the ſecond ſon of Thomas Cavendiſh, of Cavendiſh in Suffolk, clerk of the pipe in the reign of Henry VIII. Having had a liberal education, he was taken into the family of the great cardinal Woolſey, whom he ſerved in the capacity of gentleman-uſher of the chamber, when that ſuperb prelate maintained the dignity of a prince. In 1527, he attended his maſter on his ſplendid embaſſy to France, returned with him to England, and was one of the few who continued faithful to him in his diſgrace. Mr Cavendiſh was with him when he died, and delayed going to court till he had performed the laſt duty of a faithful ſervant by ſeeing his body decently interred. The king was ſo far from diſapproving of his conduct, that he immediately took him into his houſehold, made him treaſurer of his chamber, a privy-counſellor, and afterwards conferred on him the order of knighthood. He was alſo appointed one of the commiſſioners for taking the ſurrender of religious houſes. In 1540 he was nominated one of the auditors of the court of augmentations, and ſoon after obtained a grant of ſeveral conſiderable lordſhips in Hertfordſhire. In the reign of Edward VI. his eſtates were much increaſed by royal grants in ſeven different counties: and he appears to have continued in high favour at court during the reign of queen Mary. He died in the year 1557. He was the founder of Chatſworth, and anceſtor of the dukes of Devonſhire. He wrote “The life and death of cardinal Woolſey:” printed at London 1667; reprinted in 1706, under the title of “Memoirs of the great favourite cardinal Woolſey.”

CAVENDISH, (William) duke of Newcaſtle, grandſon of Sir William Cavendiſh, was born in 1592. In 1610, he was made knight of the bath; in 1620, raiſed to the dignity of a peer, by the title of baron Ogle, and Viſcount Mansfield; and in the third year of king Charles I. created earl of Newcaſtle upon Tyne, and baron Cavendiſh of Boleſover. He was after this made governor to the prince of Wales, afterwards Charles II. When the firſt troubles broke out in Scotland, and the king's treaſury was but indifferently provided, he contributed ten thouſand pounds; and alſo raiſed a troop of horſe, conſiſting of about two hundred knights and gentlemen, who ſerved at their own charge, were commanded by the earl, and honoured with the title of *the prince's troop*. He had after this the command of the northern counties; and was conſtituted general and commander in chief of all the forces that might be raiſed north of Trent, and of ſeveral counties ſouth of that river. He afterwards raiſed an army of eight thouſand horſe, foot, and dragoons; with which he took ſome towns, and gained ſeveral important victories. On this he was advanced to the dignity of marquis of Newcaſtle: but his majeſty's affairs being totally ruined by the raſhneſs of prince Rupert, he, with a few of the principal officers of the army, went abroad, and ſtaid for ſome time at Paris; where, notwithſtanding the vaſt eſtate he had when the civil war broke out, his circumſtances were now ſo bad, that himſelf and wife were reduced to the neceſſity of pawning their clothes for a dinner. He afterwards removed to Antwerp, that he might be nearer his own country; and there, though under great difficulties, reſided for ſeveral years: but, notwithſtanding his diſtreſſes, he was treated, during an exile of eighteen years, with extraordinary marks of diſtinction. On his return to England at the reſtoration, he was advanced to the dignity of earl of Ogle and duke of Newcaſtle. He ſpent his time in a country retirement, and was the patron of men of merit. His grace died in 1679, aged 84. He wrote a treatiſe on horſemanſhip, which is eſteemed: and ſome comedies, which are not.

Mr Granger obſerves, that he was maſter of many accompliſhments, and was much better qualified for a court than a camp: that he underſtood horſemanſhip, muſic, and poetry; but was a better horſeman than muſician, and a better muſician than poet.

CAVENDISH, (Margaret) ducheſs of Newcaſtle, famous for her voluminous productions, was born about the latter end of the reign of James I. and was the youngeſt ſiſter of Lord Lucas of Colcheſter. She married the duke of Newcaſtle abroad in 1645; and on their return after the reſtoration, ſpent the remainder of her life in writing plays, poems, with the life of her huſband, to the amount of about a dozen of folios. “What gives the beſt idea of her unbounded paſſion for ſcribbling (ſays Mr Walpole), was her ſeldom reviſing the copies of her works, leſt, as ſhe ſaid, it ſhould diſturb her following conceptions.” She died in 1673.

CAVENDISH, (William) the firſt duke of Devonſhire, and one of the moſt diſtinguiſhed patriots in the Britiſh annals, was born in 1640. In 1677, being then member for Derby, he vigorouſly oppoſed the venal meaſures of the court; and, the following year, was one of the committee appointed to draw up articles of impeachment againſt the lord treaſurer Danby. In 1679, being re-elected to ſerve for Derby in a new parliament, Charles II. thought fit to make him a privy counſellor; but he ſoon withdrew from the board, with his friend lord Ruſſel, when he found that popiſh intereſt prevailed. He carried up the articles of impeachment to the houſe of lords, againſt lord chief juſtice Scroggs, for his arbitrary and illegal proceedings.

ings in the court of king's bench; and when the king declared his reſolution not to ſign the bill for excluding the Duke of York (afterwards James II.), he moved the houſe of commons, that a bill might be brought in for the aſſociation of all his majeſty's proteſtant ſubjects. He alſo openly named the king's evil counſellors, and voted for an addreſs to remove them from his preſence and councils for ever. He nobly appeared at lord Ruſſel's trial, in defence of that great man, at a time when it was ſcarce more criminal to be an accomplice than a witneſs for him. The ſame fortitude, activity, and love of his country, animated this illuſtrious patriot to oppoſe the arbitrary proceedings of James II.; and when he ſaw there was no other method of ſaving the nation from impending ſlavery, he was the foremoſt in the aſſociation for inviting over the prince of Orange, and the firſt nobleman who appeared in arms to receive him at his landing. He was created Duke of Devonſhire in 1694, by William and Mary. His laſt public ſervice was in the union with Scotland, for concluding of which he was appointed a commiſſioner by queen Anne. He died in 1707, and ordered the following inſcription to be put on his monument.

Willielmus Dux Devon,
Bonorum Principum Fidelis Subditus,
Inimicus et Inviſus Tyrannis.
William Duke of Devonſhire,
Of good Princes the faithful Subject,
The Enemy and Averſion of Tyrants.

Beſides being thus eſtimable for public virtues, his grace was diſtinguiſhed by his literary accompliſhments. He had a poetical genius, which ſhowed itſelf particularly in two pieces, written with equal ſpirit, dignity, and delicacy: theſe are, an ode on the death of queen Mary; and an alluſion to the archbiſhop of Cambray's ſupplement to Homer. He had great knowledge in the languages, was a true judge in hiſtory, and a critic in poetry; he had a fine hand in muſic, an elegant taſte in painting, and in architecture had a ſkill equal to any perſon of the age in which he lived. His predeceſſor, Sir John Cavendiſh, was the perſon who killed the famous Watt Tyler in 1381.

CAVETTO, in architecture, a hollow member, or round concave moulding, containing a quadrant of a circle, and having a quite contrary effect to that of a quarter round: it is uſed as an ornament in cornices.

CAVEZON, in the manege, a ſort of noſe-band, either of iron, leather, or wood, ſometimes flat, and at other times hollow or twiſted, clapt upon the noſe of a horſe to wring it, and ſo forward the ſuppling and breaking of the horſe.

CAVIARE, a kind of food lately introduced into Britain. It is made of the hard roes of ſturgeon*, formed into ſmall cakes, about an inch thick and three or four inches broad. The method of making it is by taking out of the ſpawn all the nerves or ſtrings, then waſhing it in white-wine or vinegar, and ſpreading it on a table. It is then ſalted and preſſed in a fine bag; after which it is caſed up in a veſſel with a hole at the bottom, that if any moiſture is left it may run out. This kind of food is in great requeſt among the Moſcovites, on account of their three lents, which they keep with a ſuperſtitious exactneſs; wherefore the Italians ſettled at Moſcow drive a very great trade in this commodity throughout that empire, there being a prodigious quantity of ſturgeon taken at the mouth of the Wolga and other rivers which fall into the Caſpian ſea. A pretty large quantity of the commodity is alſo conſumed in Italy and France. They get the caviare from Archangel, but commonly buy it at ſecond hand of the Engliſh and Dutch.—According to Savary, the beſt caviare brought from Muſcovy is prepared from the belluga, a fiſh eight or ten feet long, caught in the Caſpian ſea, which is much preferable to that made of the ſpawn of ſturgeon. A kind of caviare, or rather ſauſage, is alſo made from the ſpawn of ſome other fiſhes; particularly a ſort of mullet caught in the Mediterranean. See MUGIL and BOTARGO.

Inſect CAVIARE. See AXAYACATL.

CAVIDOS. See CABIDOS.

CAVIL, (*cavillatio*) is defined by ſome a fallacious kind of reaſon, carrying ſome reſemblance of truth, which a perſon, knowing its falſehood, advances in diſpute for the ſake of victory. The art of framing ſophiſms or fallacies is called by Boethius *cavillatoria.*

CAUK, or CAWK. See TERRA PONDEROSA, and CHEMISTRY, *Index.*

CAUKING, or CAULKING, *of a ſhip*, is driving a quantity of oakum, or old ropes untwiſted and drawn aſunder, into the ſeams of the planks, or into the intervals where the planks are joined together in the ſhip's decks or ſides, in order to prevent the entrance of water. After the oakum is driven very hard into theſe ſeams, it is covered with hot and melted pitch or roſin, to keep the water from rotting it.

Among the ancients, the firſt who made uſe of pitch in caulking, were the inhabitants of Phœacia, afterwards called Corſica. Wax and roſin appear to have been commonly uſed previous to that period; and the Poles at this time uſe a ſort of unctuous clay for the ſame purpoſe, on their navigable rivers.

CAULKING-Irons, are iron chiſſels for that purpoſe. Some of theſe irons are broad, ſome round, and others grooved. After the ſeams are ſtopped with oakum, it is done over with a mixture of tallow, pitch, and tar, as low as the ſhip draws water.

CAUL, in anatomy, a membrane in the abdomen, covering the greateſt part of the guts; called, from its ſtructure, *Reticulum*, but moſt frequently *Omentum*. See ANATOMY, nº 90.

CAUL is likewiſe a little membrane, found on ſome children, encompaſſing the head when born.

Drelincourt takes the *caul* to be only a fragment of the membranes of the fœtus; which ordinarily break at the birth of the child. Lampridius tells us, that the midwives ſold this *caul* at a good price to the advocates and pleaders of his time; it being an opinion, that while they had this about them, they ſhould carry with them a force of perſuaſion which no judge could withſtand: the canons forbid the uſe of it; becauſe ſome witches and ſorcerers, it ſeems, had abuſed it.

CAULIFLOWERS, in gardening, a much eſteemed ſpecies of cabbage. See BRASSICA.

CAURIS, in natural hiſtory, a name given by ſome to the genus of ſhells called, by the generality of writers, *porcellana*, and *concha venerea*. It is from a falſe pronunciation of this word *cauris* that we call theſe ſhells *gowries*. See *PORCELAIN-Shell.*

CAURSINES, (*Courſini*) were Italians that came into England about the year 1235, terming themſelves

* See Acipenſer.

the Pope's merchants, but driving no other trade than letting out money ; and having great banks in England, they differed little from Jews, ſave (as hiſtory ſays) they were rather more mercileſs to their debtors. Some will have them called *Courſines*, quaſi *Cauſa Urſini*, beariſh and cruel in their cauſes ; others *Caorſini* or *Corſini*, as coming from the iſle of Corſica ; but Cowel ſays, they have their name from *Caorſium, Caorſi*, a town in Lombardy, where they firſt practiſed their arts of uſury and extortion ; from whence, ſpreading themſelves, they carried their infamous trade through moſt parts of Europe, and were a common plague to every nation where they came. The then biſhop of London excommunicated them ; and king Henry III. baniſhed them from his kingdom in the year 1240. But, being the pope's ſolicitors and money-changers, they were permitted to return in the year 1250 ; tho' in a very ſhort time they were again driven out of the kingdom on account of their intolerable exactions.

CAUSA MATRIMONII PRÆLOCUTI, in common law, a writ that lies where a woman gives land to a man in fee to the intent he ſhall marry her, and he refuſes to do it in a reaſonable time, being thereunto required by the woman ; and in ſuch caſe, for not performing the condition, the entry of the woman into the lands again has been adjudged lawful.

The huſband and wife may ſue this writ againſt another who ought to have married her.

CAUSALITY, among metaphyſicians, the action or power of a cauſe in producing its effect.

CAUSALTY, among miners, denotes the lighter, ſulphureous, earthy parts of ores, carried off in the operation of waſhing. This, in the mines, they throw in heaps upon banks, which in ſix or ſeven years they find it worth their while to work over again.

CAUSE, that from whence any thing proceeds, or by virtue of which any thing is done : it ſtands oppoſed to effect. We get the ideas of cauſe and effect from our obſervation of the viciſſitude of things, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings. That which produces, is the cauſe ; and that which is produced, the effect : thus, fluidity in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

Reid on the Active Powers of Man.

Ariſtotle, and the ſchoolmen after him, diſtinguiſhed four kinds of cauſes ; the efficient, the material, the formal, and the final. This, like many of Ariſtotle's diſtinctions, is only a diſtinction of the various meanings of an ambiguous word ; for the efficient, the matter, the form, and the end, have nothing common in their nature, by which they may be accounted ſpecies of the ſame *genus* ; but the Greek word, which we tranſlate *cauſe*, had theſe four different meanings in Ariſtotle's days, and we have added other meanings. We do not indeed call the matter or the form of a thing its cauſe ; but we have final cauſes, inſtrumental cauſes, occaſional cauſes, and many others. Thus the word *cauſe* has been ſo hackneyed, and made to have ſo many different meanings in the writings of philoſophers, and in the diſcourſe of the vulgar, that its original and proper meaning is loſt in the crowd.

With regard to the phenomena of nature, the important end of knowing their cauſes, beſides gratifying our curioſity, is, that we may know when to expect them, or how to bring them about. This is very often of real importance in life ; and this purpoſe is ſerved, by knowing what, by the courſe of nature, goes before them and is connected with them ; and this, therefore, we call the *cauſe* of ſuch a phenomenon.

If a magnet be brought near to a mariner's compaſs, the needle, which was before at reſt, immediately begins to move, and bends its courſe towards the magnet, or perhaps the contrary way. If an unlearned ſailor is aſked the cauſe of this motion of the needle, he is at no loſs for an anſwer. He tells you it is the magnet : and the proof is clear ; for, remove the magnet, and the effect ceaſes ; bring it near, and the effect is again produced. It is, therefore, evident to ſenſe, that the magnet is the cauſe of this effect.

A Carteſian philoſopher enters deeper into the cauſe of this phenomenon. He obſerves, that the magnet does not touch the needle, and therefore can give it no impulſe. He pities the ignorance of the ſailor. The effect is produced, ſays he, by magnetic effluvia, or ſubtile matter, which paſſes from the magnet to the needle, and forces it from its place. He can even ſhow you, in a figure, where theſe magnetic effluvia iſſue from the magnet, what round they take, and what way they return home again. And thus he thinks he comprehends perfectly how, and by what cauſe, the motion of the needle is produced.

A Newtonian philoſopher inquires what proof can be offered for the exiſtence of magnetic effluvia, and can find none. He therefore holds it as a fiction, a hypotheſis ; and he has learned that hypotheſes ought to have no place in the philoſophy of nature. He confeſſes his ignorance of the real cauſe of this motion, and thinks that his buſineſs as a philoſopher is only to find from experiment the laws by which it is regulated in all caſes.

Theſe three perſons differ much in their ſentiments with regard to the real cauſe of this phenomenon ; and the man who knows moſt is he who is ſenſible that he knows nothing of the matter Yet all the three ſpeak the ſame language, and acknowledge that the cauſe of this motion is the attractive or repulſive power of the magnet.

What has been ſaid of this, may be applied to every phenomenon that falls within the compaſs of natural philoſophy. We deceive ourſelves, if we conceive that we can point out the real efficient cauſe of any one of them.

The grandeſt diſcovery ever made in natural philoſophy, was that of the law of gravitation, which opens ſuch a view of our planetary ſyſtem, that it looks like ſomething divine. But the author of this diſcovery was perfectly aware that he diſcovered no real cauſe, but only the law or rule according to which the unknown cauſe operates.

Natural philoſophers, who think accurately, have a preciſe meaning to the terms they uſe in the ſcience ; and when they pretend to ſhow the cauſe of any phenomenon of nature, they mean by the cauſe, a law of nature of which that phenomenon is a neceſſary conſequence.

The whole object of natural philoſophy, as Newton expreſsly teaches, is reducible to theſe two heads : firſt, by juſt induction from experiment and obſervation, to diſcover the laws of nature; and then to apply thoſe laws to the ſolution of the phenomena of nature. This was all that this great philoſopher attempted, and all that he thought attainable. And this indeed he attained in a great meaſure, with regard to the motions of our planetary ſyſtem, and with regard to the rays of light.

But ſuppoſing that all the phenomena which fall within the reach of our ſenſes were accounted for from general laws of nature juſtly deduced from experience; that is, ſuppoſing natural philoſophy brought to its utmoſt perfection; it does not diſcover the efficient cauſe of any one phenomenon in nature.

The laws of nature are the rules according to which the effects are produced; but there muſt be a cauſe which operates according to theſe rules. The rules of navigation never navigated a ſhip. The rules of architecture never built a houſe.

Natural philoſophers, by great attention to the courſe of nature, have diſcovered many of her laws, and have very happily applied them to account for many phenomena: but they have never diſcovered the efficient cauſe of any one phenomenon; nor do thoſe who have diſtinct notions of the principles of the ſcience make any ſuch pretence.

Upon the theatre of nature we ſee innumerable effects, which require an agent endowed with active power; but the agent is behind the ſcene. Whether it be the Supreme Cauſe alone, or a ſubordinate cauſe or cauſes; and if ſubordinate cauſes be employed by the Almighty, what their nature, their number, and their different offices may be; are things hid, for wiſe reaſons, without doubt, from the human eye.

CAUSE, among civilians, the ſame with action. See ACTION.

CAUSE, among phyſicians. The cauſe of a diſeaſe is defined by Galen to be that during the preſence of which we are ill, and which being removed the diſorder immediatey ceaſes. The doctrine of the cauſes of diſeaſes is called ETIOLOGY.

Phyſicians divide cauſes into procatarctic, antecedent, and continent.

Procatarctic CAUSE αιτια προκαταρκτικη, called alſo *primitive* and *incipient cauſe*, either an occaſion which of its own nature does not beget a diſeaſe, but happening on a body inclined to diſeaſes, breeds a fever, gout, &c. (ſuch as are watching, faſting and the like); or an evident and manifeſt cauſe, which immediately produces the diſeaſe, as being ſufficient thereto, ſuch as is a ſword in reſpect of a wound.

Antecedent CAUSE, αιτια προηγουμενη, a latent diſpoſition of the body, from whence ſome diſeaſe may ariſe; ſuch as a plethora in reſpect of a fever, a cacochymia in reſpect of a ſcurvy.

Continent, Conjunct, or *Proximate* CAUSE, that principle in the body which immediately adheres to the diſeaſe, and which being preſent, the diſeaſe is alſo preſent; or, which being removed, the diſeaſe is taken away: ſuch is the ſtone in a nephritic patient.

CAUSEWAY, or CAUSEY, a maſſive conſtruction of ſtone, ſtakes, and faſcines; or an elevation of fat, viſcous earth, well beaten; ſerving either as a road in wet marſhy places or as a mole to retain the waters of a pond or prevent the river from overflowning the lower ground. See ROAD.—The word comes from the French *Chauſſee*, anciently wrote *Chaulſee*; and that from the Latin *Calceata*, or *Calcata*; according to Somner and Spelman, *a calcando*. Bergier rather takes the word to have had its riſe *à peditum calceis, quibus teruntur*. Some derive it from the Latin *calx*, or French *chaux*, as ſuppoſing it primarily to denote a way paved with chalk-ſtones.

CAUSEWAY, *calcetum*, or *calcea*, more uſually denotes a common hard raiſed way, maintained and repaired with ſtones and rubbiſh.

Devil's CAUSEWAY, a famous work of this kind, which ranges through the county of Northumberland in England, commonly ſuppoſed to be Roman, though Mr Horſley ſuſpects it to be of later times.

Giant's CAUSEWAY, is a denomination given to a huge pile of ſtony columns in the diſtrict of Coleraine in Ireland. See GIANT's *Cauſeway*.

CAUSSIN, (Nicholas) ſurnamed the Juſt, a French Jeſuit, was born at Troyes in Champagne, in the year 1580; and entered into the Jeſuits order when he was 26 years of age. He taught rhetoric in ſeveral of their colleges, and afterwards began to preach by which he gained very great reputation. He increaſed this reputation by publiſhing books, and in time was preferred to be confeſſor to the king. But he did not diſcharge this office to the ſatisfaction of Cardinal Richelieu, though he diſcharged it to the ſatisfaction of every honeſt man; and therefore, it is not to be wondered at that he came at length to be removed. He died in the Jeſuits convent at Paris in 1651. None of his works did him more honour than that which he entitled *La Cour Sainte*. It has been printed a great many times; and tranſlated into Latin, Italian, Spaniſh, Portugueſe, German, and Engliſh. He publiſhed ſeveral other books both in Latin and French.

CAUSTICITY, a quality belonging to ſeveral ſubſtances, by the acrimony of which the parts of living animals may be corroded and deſtroyed. Bodies which have this quality, when taken internally, are true poiſons. The cauſticity of ſome of theſe, as of arſenic, is ſo deadly, that even their external uſes is proſcribed by prudent phyſicians. Several others as nitrous acid, lapis infernalis or lunar cauſtic, common cauſtic, butter of antimony, are daily and ſucceſsfully uſed to conſume fungous fleſh, to open iſſues, &c. They ſucceed very well when properly employed and ſkilfully managed.

The cauſticity of bodies depends entirely on the ſtate of the ſaline, and chiefly of the acid, matters they contain. When theſe acids happen to be at the ſame time much concentrated, and ſlightly attached to the matters with which they are combined, they are then capable of acting, and are corroſive or cauſtic. Thus fixed and volatile alkalies, although they are themſelves cauſtic, become much more ſo by being treated with quicklime; becauſe this ſubſtance deprives them of much fat an inflammable matter, and all their fixed air, which binds and reſtrains the action of their ſaline principle. By this treatment, then the ſaline principle is more diſengaged, and rendered more capable of action. Alſo all combinations of metallic matters with acids form ſalts more or leſs corroſive, becauſe theſe acids are deprived of all their ſuperabundant water, and are beſides but imperfectly ſaturated with the metallic matters. Nevertheleſs, ſome other circumſtance is neceſſary to conſtitute the cauſticity of theſe ſaline metaline matters. For the ſame quantity of marine acid, which, when pure and diluted with a certain quantity of water, would be productive of no harm, ſhall, however, produce all the effects of a corroſive poiſon, when it is united with mercury in *corroſive ſublimate*, although the ſublime ſhall be diſſolved in ſo much water that its cauſticity cannot be attributed to the concentration of its acid. This effect is, by ſome chemiſts, attributed to the great weight of the metallic matters with which the acid is united: and this opinion is very probable, ſeeing its cauſticity is nothing but its diſſolving power, or its diſpoſition to combine with other bodies; and this diſpoſition is nothing elſe than attraction.

On this ſubject Dr Black obſerves, that the compounds produced by the union of the metals with acids are in general corroſive. Many of them applied to the ſkin deſtroy it almoſt as faſt as the mineral acids; and ſome of the moſt powerful potential cauteries are made in this way. Some are reckoned more acrid than the pure acids themſelves; and they have more powerful effects when taken internally, or at leaſt ſeem to have. Thus we can take 10 or 12 drops of a foſſil acid, diluted with water, without being diſturbed by it; but the ſame quantity of acid previouſly combined with ſilver, quickſilver, copper, or regulus of antimony, will throw the body into violent diſorders, or even prove a poiſon, if taken all at once.

This increaſed activity was, by the mechanical philoſophers, ſuppoſed to ariſe from the weight of the metallic particles. They imagined that the acid was compoſed of minute particles of the ſhape of needles or wedges; by which means they were capable of entering the pores of other bodies, ſeparating their atoms from each other, and thus diſſolving them. To theſe acid ſpiculæ the metallic particles gave more force; and the momentum of each particular needle or wedge was increaſed in proportion to its increaſe of gravity by the additional weight of the metallic particle. But this theory is entirely fanciful, and does not correſpond with facts. The activity of the compound is not in proportion to the weight of the metal: nor are the compounds always poſſeſſed of any great degree of acrimony: neither is it true that any of them have a greater power of deſtroying animal ſubſtances than the pure acids have.

There is a material difference between the powers called *ſtimuli* and *corroſives*. Let a perſon apply to any part of the ſkin a ſmall quantity of lunar cauſtic, and likewiſe a drop of ſtrong nitrous acid, and he will find that the acid acts with more violence than the cauſtic; and the diſorders that are occaſioned by the compounds of metals and acids do not proceed from a *cauſticity* in them, but from the metal affecting and proving a ſtimulus to the nerves: and that this is the caſe, appears from their affecting ſome particular nerves of the body. Thus the compounds of regulus of antimony and mercury with the vegetable acids, do not ſhow the ſmalleſt degree of acrimony; but, taken internally, they produce violent convulſive motions over the whole body, which are occaſioned by the metallic matter having a power of producing this effect; and the acid is only the means of bringing it into a diſſolved ſtate, and making it capable of acting on the nervous ſyſtem. In general, however, the compounds of metallic ſubſtances with acids may be conſidered as milder than the acids in a ſeparate ſtate; but the acid is not ſo much neutralized as in other compounds, for it is leſs powerfully attracted by the metal; ſo that alkaline ſalts, abſorbent earths, or even heat alone, will decompound them; and ſome of the inflammable ſubſtances, as ſpirit of wine, aromatic oils, &c. will attract the acid, and precipitate the metal in its metallic form; and the metals can be employed to precipitate one another in their metallic form; ſo that the coheſion of theſe compounds is much weaker than thoſe formed of the ſame acids with alkaline ſalts or earths.

CAUSTICS, in phyſics, an appellation given to medicines of ſo hot and fiery a nature, that, being applied, conſume, and as it were burn, the texture of the parts, like hot iron.

Cauſtics are generally divided into four ſorts; the common ſtrong cauſtic, the common milder cauſtic, the antimonial cauſtic, and the lunar cauſtic. See PHARMACY and CHEMISTRY.

Caustic Curve, in the higher geometry, a curve formed by the concourſe or coincidence of the rays of light reflected from ſome other curve.

CAUSUS, or BURNING FEVER, a ſpecies of continual fever, accompanied with a remarkable inflammation of the blood.

CAUTERIZATION, the act of burning or ſearing ſome morbid part, by the application of fire either actual or potential. In ſome places they cauterize with burning tow, in others with cotton or moxa, in others with live coals; ſome uſe Spaniſh wax, others pyramidal pieces of linen, others gold or ſilver: but Severinus recommends flame blown through a pipe; but what is uſually preferred among us is a hot iron.

Cauterizing irons are of various figures; ſome flat, others round, ſome curved, *&c.* of all which we find draughts in Albucaſis, Scultetus, and Ferrara, and others. Sometimes a cautery is applied through a capſula, to prevent any terror from the ſight of it. This method was invented by Placentinus, and is deſcribed by Scultetus. In the uſe of all cauteries, care is to be taken to defend the neighbouring parts, either by a lamina, defenſive plaſter, or lint moiſtened in oxyerate. Sometimes the hot iron is tranſmitted through a copper cannula, for the greater ſafety of the adjoining parts. The degrees and manners of cauterizing are varied according to the nature of the diſeaſe and the part affected.

CAUTERY, in ſurgery, a medicine for burning, eating, or corroding any ſolid part of the body.

Cauteries are diſtinguiſhed into two claſſes; actual and potential: by actual cauteries are underſtood red hot inſtruments, uſually of iron; and by potential cauteries are underſtood certain kinds of corroding medicines. See PHARMACY.

CAUTION, in the civil and Scots law, denotes much the ſame with what, in the law of Engand, is called BAIL.

CAUTIONER, in Scots law, that perſon, who becomes bound for another to the performance of any deed or obligation. As to the different kinds and effects of Cautionry, ſee LAW, Part III. N° clxxv. 19.

CAWK. See CAUK.

CAXA, a little coin made of lead mixed with ſome ſcoria of copper, ſtruck in China, but current chiefly at Bantam in the iſland of Java, and ſome of the neighbouring iſlands. See (the *Table* ſubjoined to) Money.

CAXAMALCA, the name of a town and diſtrict of Peru in South-America, where there was a moſt ſumptuous palace belonging to the Incas, and a magnificent temple dedicated to the ſun.

CAXTON, (William) a mercer of London, eminent by the works he publiſhed, and for being *reputed* the firſt who introduced and practiſed the art of printing in England: as to which, ſee (*the Hiſtory of*) Printing.

CAYENNE, a rich town and iſland in South-America, and capital of the French ſettlements there, is bounded on the north by the Dutch colonies of Surinam, and ſituated in W. Long. 53. 10. N. Lat. 5. 0.

This ſettlement was begun in 1635. A report had prevailed for ſome time before, that, in the interior parts of Guiana, there was a country known by the name of *del Dorado*, which contained immenſe riches in gold and precious ſtones; more than ever Cortez and Pizarro had found in Mexico and Peru; and this fable had fired the imagination of every nation in Europe. It is ſuppoſed that this was the country in queſt of which Sir Walter Raleigh went on his laſt voyage; and, as the French were not behind their neighbours in their endeavours to find out ſo deſirable a country, ſome attempts, for this purpoſe, were likewiſe made by that nation much about the ſame time; which at laſt coming to nothing, the adventurers took up their reſidence on the iſland of Cayenne. In 1643, ſome merchants of Rouen united their ſtock, with a deſign to ſupport the new colony; but, committing their affairs to one Poncet de Bretigny, a man of a ferocious diſpoſition, he declared war both againſt the coloniſts and ſavages, in conſequence of which he was ſoon maſſacred. This cataſtrophe entirely extinguiſhed the ardour of theſe aſſociates; and in 1651 a new company was eſtabliſhed. This promiſed to be much more conſiderable than the former; and they ſet out with ſuch a capital as enabled them to collect 700 or 800 coloniſts in the city of Paris itſelf. Theſe embarked on the Seine, in order to ſail down to Havre de Grace; but unfortunately the Abbe de Marivault, a man of great virtue, and the principal promoter of the undertaking, was drowned as he was ſtepping into his boat. Another gentleman, who was to have acted as general, was aſſaſſinated on his paſſage; and 12 of the principal adventurers, who had promiſed to put the colony into a flouriſhing ſituation, not only were the principal perpetrators of this fact, but uniformly behaved in the ſame attrocious manner. At laſt they hanged one of their own number; two died; three were baniſhed to a deſert iſland; and the reſt abandoned themſelves to every kind ofexceſs. The commandant of the citadel deſerted to the Dutch with part of his garriſon. The ſavages, rouſed by numberleſs provocations, fell upon the remainder; ſo that the few who were left thought themſelves happy in eſcaping to the Leeward Iſlands in a boat and two canoes, abandoning the fort, ammunition, arms, and merchandiſe, fifteen months after they had landed on the iſland.

In 1663, a new company was formed, whoſe capital amounted only to L.8750. By the aſſiſtance of the miniſtry they expelled the Dutch, who had taken poſſeſſion of the iſland, and ſettled themſelves much more comfortably than their predeceſſors. In 1667 the iſland was taken by the Engliſh, and in 1676 by the Dutch, but afterwards reſtored to the French; and ſince that time it never has been attacked. Soon after ſome pirates, laden with the ſpoils they had gathered in the South Seas, came and fixed their reſidence at Cayenne; reſolving to employ the treaſures they had acquired in the cultivation of the lands. In 1688, Ducaſſe, an able ſeaman, arrived with ſome ſhips from France, and propoſed to them the plundering of Surinam. This propoſal exciting their natural turn for plunder, the pirates betook themſelves to their old trade, and almoſt all the reſt followed their example. The expedition, however, proved unfortunate. Many of the aſſailants were killed, and all the reſt taken priſoners and ſent to the Caribbee Iſlands. This loſs the colony has never yet recovered.

The iſland of Cayenne is about 16 leagues in circumference, and is only parted from the continent by two rivers. By a particular formation, uncommon in iſlands, the land is higheſt near the water ſide, and low in the middle. Hence the land is ſo full of moraſſes, that all communication between the different parts of it is impoſſible, without taking a great circuit. There are ſome ſmall tracts of an excellent ſoil to be found here and there; but the generality is dry, ſandy, and ſoon exhauſted. The only town in the colony is defended by a covert way, a large ditch, a very good mud rampart and five baſtions. In the middle of the town is a pretty conſiderable eminence, of which a redoubt has been made that is called the *fort*. The entrance into the harbour is through a narrow channel; and ſhips can only get in at high water through the rocks and reefs that are ſcattered about this paſs.

The firſt produce of Cayenne was the arnotto; from the produce of which, the coloniſts proceeded to that of cotton, indigo, and laſtly ſugar. It was the firſt of all the French colonies that attempted to cultivate coffee. The coffee-tree was brought from Surinam in 1721, by ſome deſerters from Cayenne, who purchaſed their pardon by ſo doing. Ten or twelve years after they planted cocoa. In the year 1752, there were exported from Cayenne 260,541 pounds of arnotto, 80,363 pounds of ſugar, 17,919 pounds of cotton, 26,881 pounds of coffee, 91,916 pounds of cocoa, 618 trees for timber, and 104 planks.

CAYLUS, (Count de) Marquis de Sternay, Baron de Branſac, was born at Paris in 1692. He was the eldeſt of the two ſons of John count de Caylus, lieutenant-general of the armies of the king of France, and of the Marchioneſs de Villete. The count and counteſs his father and mother, were very careful of the education of their ſon. The former inſtructed him in the profeſſion of arms, and in bodily exerciſes: the latter watched over and foſtered the virtues of his mind; and this delicate taſk ſhe diſcharged with ſingular ſucceſs. The counteſs was the niece of Madam de Maintenon, and was remarkable both for the ſolidity of her underſtanding and the charms of her wit. She was the author of that agreeable book intitled, "The Recollections of Madam de Caylus," of which Voltaire lately publiſhed an elegant edition. The amiable qualities of the mother appeared in the ſon; but they appeared with a bold and military air. In his natural temper he was gay and ſprightly, had a taſte for pleaſure, a ſtrong paſſion for independence, and an invincible averſion to the ſervitude of a court. Such were the inſtructors of the count de Caylus. He was only twelve years of age when his father died at Bruſſels in 1704. After finiſhing his exerciſes, he entered into the corps of the *Mouſquetoires;* and in his firſt campaign in the year 1709, he diſtinguiſhed himſelf by his valour in ſuch a manner, that Louis XIV. commended him before all the court, and rewarded him with an enſigncy in the *Gendarmerie.* In 1711 he commanded a regiment of dragoons, which was called by his own name; and he ſignalized hinſelf at the head of it in Catalonia. In 1713, he was at the ſiege of Fribourg, where he was expoſed to imminent danger in the bloody attack of the covered way. The peace of Raſtade having left him in a ſtate of inactivity ill-ſuited to his natural temper, his vivacity ſoon carried him to travel into Italy; and his curioſity was greatly excited by the wonders of that country, where antiquity is ſtill fruitful, and produces ſo many objects to improve taſte and to excite admiration. The eyes of the count were not yet learned; but he was ſtruck with the ſight of ſo many beauties, and ſoon became acquainted with them. After a year's abſence, he returned to Paris with ſo ſtrong a paſſion for travelling, and for antiquities, as induced him to quit the army.

He had no ſooner quitted the ſervice of Louis, than he ſought for an opportunity to ſet out for the Levant. When he arrived at Smyrna, he viſited the ruins of Epheſus. From the Levant he was recalled in February 1717 by the tenderneſs of his mother. From that time he left not France, but to make two excurſions to London. The academy of painting and ſculpture adopted him an honorary member in the year 1731; and the count, who loved to realize titles, ſpared neither his labour, nor his credit, nor his fortune, to inſtruct, aſſiſt, and animate the artiſts. He wrote the lives of the moſt celebrated painters and engravers that have done honour to this illuſtrious academy; and, in order to extend the limits of the art, which ſeemed to him to move in too narrow a circle, he collected, in three different works, new ſubjects for the painter, which he had met with in the works of the ancients.

Such was his paſſion for antiquity, that he wiſhed to have had it in his power to bring the whole of it to life again. He ſaw with regret, that the works of the ancient painters, which have been diſcovered in our times, are effaced and deſtroyed almoſt as ſoon as they are drawn from the ſubterraneous manſions where they were buried. A fortunate accident furniſhed him with the means of ſhewing us the compoſition and the colouring of the pictures of ancient Rome. The coloured drawings which the famous Pietro Sante Bartoli had taken there from antique pictures, fell into his hands. He had them engraved; and, before he enriched the king of France's cabinet with them, he gave an edition of them at his own expence. It is perhaps the moſt extroardinary book of antiquities that ever will appear. The whole is painted with a purity and a preciſion that are inimitable: we ſee the livelineſs and the freſhneſs of the colouring that charmed the Cæſars. There were only 30 copies publiſhed; and there is no reaſon to expect that there will hereafter be any more.

Count de Caylus was engaged at the ſame time in an enterprize ſtill more favourable to Roman grandeur, and more intereſting to the French nation. Colbert had framed the deſign of engraving the Roman antiquities that are ſtill to be ſeen in the ſouthern provinces of France. By his orders Mignard the architect had made drawings of them, which count de Caylus had the good fortune to recover. He reſolved to finiſh the work begun by Colbert, and to dedicate it to that great miniſter; and ſo much had he this enterpriſe at heart, that he was employed in it during his laſt illneſs, and warmly recommended it to M. Mariette.

In 1742, Count Caylus was admitted honorary member of the academy of belles lettres; and then it was that he ſeemed to have found the place for which nature deſigned him. The ſtudy of literature now became his ruling paſſion; he conſecrated to it his time and his fortune; he even renounced his pleaſures to give himſelf wholly up to that of making ſome diſcovery in the field of antiquity. But amidſt the fruits of his reſearch and invention, nothing ſeemed more flattering to him than his diſcovery of encauſtic painting. A deſcription of Pliny's, but too conciſe a one to give him a clear view of the matter, ſuggeſted the idea of it. He availed himſelf of the friendſhip and ſkill of M. Magault, a phyſician in Paris, and an excellent chemiſt; and by repeated experiments found out the ſecret of incorporating wax with divers tints and colours, and of making it obedient to the pencil. Pliny has made mention of two kinds of encauſtic painting practiſed by the ancients; one of which was performed with wax, and the other upon ivory, with hot punches of iron. It was the former that Count Caylus had the merit of reviving; and M. Muntz afterwards made many experiments to carry it to perfection.

In the hands of Count Caylus, literature and the arts lent each other a mutual aid. But it would be endleſs to give an account of all his works. He publiſhed above 40 diſſertations in the Memoirs of the Academy of Belles Lettres. The artiſts he was particularly attentive to; and to prevent their falling into miſtakes from an ignorance of coſtume, which the ableſt of them have ſometimes done, he founded a prize of 500 livres, the object of which is to explain, by means of authors and monuments, the uſages of ancient nations. In order that he might enjoy with the whole world the treaſures he had collected, he cauſed them to be engraved, and gave a learned deſcription of them in a work which he embelliſhed with 800 copperplates.

The ſtrengh of his conſtitution ſeemed to give him hopes of a long life: but a humour ſettling in one of his legs, which entirely deſtroyed his health, he expired on the 5th of September 1765, and by his death his family is extinct. The tomb erected to the honour of count Caylus is to be ſeen in the chapel of St Germain-l'Auxerrois, and deſerves to be remarked. It is perfectly the tomb of an antiquary. This monument was an ancient ſepulchral antique, of the moſt beautiful porphyry, with ornaments in the Egyptian taſte. From the moment he procured it, he had deſtined it to grace the place of his interment. While he awaited the fatal hour, he placed it in his garden, where he uſed to look upon it with a tranquil but thoughtful eye, and pointed it out to the inſpection of his friends.

The character of Count Caylus is to be traced in the different occupations which divided his cares and his life. In ſociety he had all the frankneſs of a ſoldier, and a politeneſs which had nothing in it of deceit or circumvention. Born independent, he applied to ſtudies which ſuited his taſte. His heart was yet better than his abilities. In his walks he uſed frequently to try the honeſty of the poor by ſending them with a piece of money to get change for him. In theſe caſes he enjoyed their confuſion at not finding him; and then preſenting himſelf, uſed to commend their honeſty, and give them double the ſum. He ſaid frequently to his friends, "I have this day loſt a crown; but I was ſorry that I had not an opportunity of giving a ſecond. The beggar ought not to want integrity."

CAYSTER, or Caystrus, (anc. geog.) a river of Ionia, whoſe mouth Ptolemy places between Colophon and Epheſus; commended by the poets for its ſwans, which it had in great numbers. Its ſource was in the Montes Cilbiani, (Pliny). *Cayſtrius Campus* was a part of the territory of Epheſus. *Campi Cayſtriani* of Lydia, were the plains lying in the middle between the inland parts and mount Tmolus.

CAZEROM, or Cazeron, a city of Aſia in Perſia, ſituated in E. Long. 70. N. Lat. 29. 15.

CAZIC, or Cazique, a title given by the Spaniards to the petty kings, princes, and chiefs, of the ſeveral countries of America, excepting thoſe of Peru, which are called *curatas*. The French call them *caſiques*, a denomination which they always give to the Tartarian hords.—The cazics, in ſome places, do the office of phyſicians, and in others of prieſts, as well as of captains. The dignity of cazic among the Chiites, a people of South America, does not deſcend to children, but muſt be acquired by valour and merit. One of the prerogatives annexed to it is, that the cazic may have three wives, while the other people are allowed only one. Mexico comprehended a great number of provinces and iſlands, which were governed by lords called *caziques*, dependent on and tributary to the emperor. Thirty of theſe vaſſals are ſaid to have been ſo powerful, that they were able, each of them, to bring an army of 100,000 men into the field.

CAZIMIR, a handſome town of Poland, in the palatinate of Lublin, ſituated on a hill covered with trees, in E. Long. 3. 10. N. Lat. 51. 5.

CEA. See Ceos.

CEANOTHUS, New-Jersey Tea, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 43d order, *Dumoſæ*. There are five petals pouched and arched. The fruit is a dry, trilocular and triſpermous berry. There are three ſpecies, of which the moſt remarkable is the Americanus, a native of moſt parts of North America, from whence great plenty of the ſeeds have been exported into Europe. In England, this plant ſeldom riſes more than three feet high. The ſtem, which is of a pale-brown colour, ſends out branches from the bottom. Theſe are thin, flexible, and of a reddiſh colour, which may have occaſioned this tree to go by the name of *Red Twig*. The leaves which ornament theſe branches ſtand on reddiſh pedicles, about half an inch in length. They are oval, ſerrated, pointed, about two inches and a half long, are proportionably broad, and have three nerves running lengthwiſe. From the foot-ſtalk to the point they are of a light green colour, grow irregularly on the branches, and not oppoſite by pairs, as has been aſſerted. They are late in the ſpring before they ſhoot. The flowers grow at the ends of the twigs in cluſters: They are of a white colour, and when in blow give the ſhrub a moſt beautiful appearance. Indeed it ſeems to be almoſt covered with them, as there is uſually a cluſter at the end of nearly every twig; and the leaves which appear among them ſerve as ornaments only, like myrtle in a diſtant noſegay; nature however has denied them ſmell. This tree will be in blow in July; and the flowers are ſucceeded by ſmall browniſh fruit, in which the ſeeds will ſometimes ripen in England.

This plant is propagated by layering; or from ſeeds ſown in pots of compoſt, conſiſting of two parts virgin earth well tempered and one part ſand, about a quarter of an inch deep; being equally careful to defend the young ſeedlings from an extremity of cold in winter, as from the parching drought of the ſummer months. The beſt time of layering them is in the ſummer, juſt before they begin to flower: At that time lay the tender twigs of the ſpring ſhoots in the earth, and nip off the end which would produce the flowers. By the autumn twelvemonth ſome of them will be rooted. At the ſtools, however, the plants ſhould remain until the ſpring, when they ſhould be taken off, and the beſt rooted and the ſtrongeſt may be planted in the nurſery-way, or in a dry ſoil and well ſheltered place, where they are to remain; while the bad-rooted ones and the weakeſt ſhould be planted in pots; and if theſe are plunged into a moderate warmth of dung, it will promote their growth, and make them good plants before autumn. In the winter they ſhould be guarded againſt the froſts; and in the ſpring they may be planted out where they are to remain.

CEBES, of Thebes, a Socratic philoſopher, author of the admired *Table of Cebes*; or "Dialogues on the birth, life, and death of Mankind." He flouriſhed about 405 years before Chriſt.—The above piece is mentioned by ſome of the ancient writers, by Lucian, D. Laertius, Tertullian, and Suidas: but of Cebes himſelf we have no account, ſave that he is once mentioned by Plato, and once by Xenophon. The former ſays of him, in his "Phædo," that he was a ſagacious inveſtigator of truth, and never aſſented without the moſt convincing reaſons: the latter, in his "Memorabilia," ranks him among the few intimates of Socrates, who excelled the reſt in the innocency of their lives. Cebes's *Tabula* is uſually printed with Epictetus's *Manuale*.

CECIL, (William) lord Burleigh, treaſurer of England in the reign of queen Elizabeth, was the ſon of Richard Cecil, Eſq; maſter of the robes to king Henry VIII. He was born in the houſe of his grandfather, David Cecil, Eſq; at Bourn in Lincolnſhire, in the year 1520; and received the rudiments of his education in the grammar-ſchool at Grantham. From thence he was removed to Stamford; and about the year 1535, was entered of St John's College, Cambridge. Here he began his ſtudies with a degree of enthuſiaſtic application very uncommon in young gentlemen of family. At the age of 16 he read a ſophiſtry lecture, and at 19 a voluntary Greek lecture, which was the more extraordinary, as being at a time when the Greek language was by no means univerſally underſtood. In 1541 he went to London, and became a member of the ſociety of Gray's-Inn, with an intention to ſtudy the law; but he had not been long in that ſituation, before an accident introduced him to king Henry, and gave a new bias to his purſuits. O'Neil, a famous Iriſh chief, coming to court, had brought with him two Iriſh chaplains, violent bigots to the Romiſh faith; with theſe Mr Cecil, viſiting his father, happened to have a warm diſpute in Latin, in which he diſplayed uncommon abilities. The king being informed of it, ordered the young man into his preſence, and was ſo pleaſed with his converſation, that he commanded his father to find a place for him. He accordingly requeſted the reverſion of the *cuſtos brevium*, which Mr Cecil afterwards poſſeſſed. About this time he married the ſiſter of Sir John Cheke, by whom he was recommended to the earl of Hertford, afterwards duke of Somerſet and protector.

Soon after king Edward's acceſſion, Mr Cecil came into the poſſeſſion of his office of *cuſtos brevium*, worth about L.240 a-year. His firſt lady dying in 1543, he married the daughter of Sir Anthony Cook, director of the king's ſtudies. In 1547, he was appointed by the protector, maſter of requeſts; and ſoon after, attended his noble patron on his expedition againſt the Scots, and was preſent at the battle of Muſſelburgh. In this battle, which was fought on the 10th of September 1547, Mr Cecil's life was miraculouſly preſerved by a friend, who in puſhing him out of the level of a cannon, had his arm ſhattered to pieces. The ſight and judgment of his friend muſt have been as extraordinary as his friendſhip, to perceive the preciſe direction of a cannon ſhot; unleſs we ſuppoſe, that the ball was almoſt quite ſpent; in which caſe the thing is not impoſſible. The ſtory is told in his life by a domeſtic. In the year 1548, Mr Cecil was made ſecretary of ſtate; but in the following year, the duke of Northumberland's faction prevailing, he ſuffered in the diſgrace of the protector Somerſet, and was ſent priſoner to the Tower. After three months confinement he was releaſed; and in 1551 reſtored to his office; and ſoon after knighted, and ſworn of the privy council. In 1553 he was made chancellor of the Order of the Garter, with an annual fee of 100 merks.

On the death of Edward VI. Mr Cecil prudently refuſed to have any concern in Northumberland's attempt in favour of the unfortunate Lady Jane Grey; and when queen Mary acceded to the throne, he was graciouſly received at Court; but, not chooſing to change his religion, was diſmiſſed from his employments. During this reign, he was twice elected knight of the ſhire for the county of Lincoln; and often ſpoke in the houſe of commons with great freedom and firmneſs, in oppoſition to the miniſtry. Nevertheleſs, though a Proteſtant and a *patriot* (that is, a courtier out of place), he had the addreſs to ſteer through a very dangerous ſea without ſhipwreck.

Queen Elizabeth's acceſſion in the year 1558 immediately diſpelled the cloud which had obſcured his fortunes and miniſterial capacity. During the horrid reign of her ſiſter, he had conſtantly correſponded with the princeſs Elizabeth. On the very day of her acceſſion, he preſented her with a paper containing twelve articles neceſſary for her immediate diſpatch; and, in a few days after, was ſworn of the privy-council, and made ſecretary of ſtate. His firſt advice to the queen was, to call a parliament; and the firſt buſineſs he propoſed after it was aſſembled, was the eſtabliſhment of a national church. A plan of reformation was accordingly drawn up under his immediate inſpection and the legal eſtabliſhment of the church of England was the conſequence. Sir William Cecil's next important concern, was to reſtore the value of the coin, which had in the preceding reigns been conſiderably debaſed. In 1561, he was appointed maſter of the wards; and in 1571, created baron of Burleigh, as a reward for his ſervices, particularly in having lately ſtifled a formidable rebellion in the north. The following year he was honoured with the garter, and raiſed to the office of Lord High Treaſurer of England. From this period we find him the *primum mobile* of every material tranſaction during the glorious reign of Queen Elizabeth. Notwithſtanding the temporary influence of other favourites, Lord Burleigh was, in fact, her prime miniſter, and the perſon in whom ſhe chiefly confided in matters of real importance. Having filled the higheſt and moſt important offices of the ſtate for 40 years, and guided the helm of government during the moſt glorious period of Engliſh hiſtory, he departed this life on the 4th of Auguſt 1598, in the 78th year of his age. His body was removed to Stamford, and there depoſited in the family vault, where a magnificent tomb was erected to his memory.—Notwithſtanding his long enjoyments of ſuch lucrative employments, he left only an eſtate of L.4000 *per annum*, L.11,000 in money, and effects worth about L.14,000. He lived, indeed, in a manner ſuitable to his high rank and importance. He had four places of reſidence, viz. his lodgings at court, his houſe in the Strand, his ſeat at Burleigh-Park near Stamford, and his ſeat at Theobalds. The laſt of theſe was his favourite place of retirement, where he frequently entertained the queen at a vaſt expence.

Lord Burleigh was doubtleſs a man of ſingular abilities and prudence; amiable in his private character, and one of the moſt able, upright, and indefatigable miniſters ever recorded in the annals of Britain. His principal works are, 1. *La Complainte de l'ame pechereſſe*, or the Complaint of a Sinful Soul, in French verſe, in the king's library. 2. Materials for Patten's *Diarium Exped. Scoticæ*, London 1541, 12mo. 3. Slanders and lies maliciouſly, groſsly, and impudently vomited out, in certain traiterous books and pamphlets, againſt two counſellors, Sir Francis Bacon and Sir William Cecil. 4. A ſpeech in parliament, 1562, Strype's Mem. vol. iv. p. 107. 5. Precepts or directions for the well ordering of a man's life, 1637, Harl. Cat. vol. ii. p. 755. 6. Meditations on the death of his lady, Ballard's Mem. p. 184. 7. Meditations

Meditations on the ſtate of England during the reign of queen Elizabeth, manuſcript. 8. The execution of juſtice in England for the maintenance of public and Chriſtian peace, &c. Lond. 1581, 1583, Somer's tracts, 4th collect. vol. i. p. 5. 9. Advice to queen Elizabeth in matters of religion and ſtate, ib. p. 101. 16. 10. A great number of letters. See Peck's *Deſiderata Curioſa*. Howard's collections, &c. 11. Several pedigrees, ſome of which are preſerved in the archbiſhop of Canterbury's library at Lambeth, nº 299, 747.

CECILIA, (St) the patroneſs of muſic, has been honoured as a martyr ever ſince the fifth century. Her ſtory as delivered by the notaries of the Roman church, and from them tranſcribed into the Golden Legend and other books of the like kind, ſays, that ſhe was a Roman lady born of noble parents, about the year 225. That, notwithſtanding ſhe had been converted to Chriſtianity, her parents married her to a young pagan nobleman named Valerianus ; who going to bed to her on the wedding night, *as the cuſtom is*, ſays the book, was given to underſtand by his ſpouſe, that ſhe was nightly viſited by an angel, and that he muſt forbear to approach her, otherwiſe the angel would deſtroy him. Valerianus, ſomewhat troubled at theſe words, deſired that he might ſee his rival the angel ; but his ſpouſe told him that was impoſſible, unleſs he would conſent to be baptiſed and become a Chriſtian. This he conſented to ; after which, returning to his wife, he found her in her cloſet at prayer, and by her ſide, in the ſhape of a beautiful young man, the angel clothed with brightneſs. After ſome converſation with the angel, Valerianus told him that he had a brother named Tiburtius, whom he greatly wiſhed to ſee a partaker of the grace which he himſelf had received. The angel told him that his deſire was granted, and that they ſhould be both crowned with martyrdom in a ſhort time. Upon this the angel vaniſhed, and was not long in ſhowing himſelf as good as his word ; Tiburtius was converted, and both he and his brother Valerianus were beheaded. Cecilia was offered her life upon condition that ſhe would ſacrifice to the deities of the Romans ; but ſhe refuſed : upon which ſhe was thrown into a caldron of boiling water, and ſcalded to death : others ſay, that ſhe was ſtifled in a dry bath, i. e. an incloſure, from whence the air was excluded, having a ſlow fire underneath it ; which kind of death was ſometimes inflicted by the Romans upon women of quality who were criminals. Upon the ſpot where her houſe ſtood, is a church ſaid to have been built by pope Urban I. who adminiſtered baptiſm to her huſband and his brother : it is the church of St Cecilia at Traſtevere ; within is a moſt curious painting of the ſaint, as alſo a ſtately monument with a cumbent ſtatue of her with her face downwards. There is a tradition of St Cecilia, that ſhe excelled in muſic ; and that the angel who was thus enamoured of her, was drawn from the celeſtial regions by the charms of her melody : this has been deemed authority ſufficient for making her the patroneſs of muſic and muſicians. The legend of St Cecilia has given frequent occaſion to painters and ſculptors to exerciſe their genius in repreſentations of her, playing on the organ, and ſometimes on the harp. Raphael has painted her ſinging with a regal in her hands ; and Domenichino and Mignard, ſinging and playing on the harp.

CECROPS, the founder and firſt king of Athens, about the time of Moſes the lawgiver of the Hebrews. He was the firſt who eſtabliſhed civil government, religious rites, and marriage among the Greeks ; and died after a reign of 50 years. See ATTICA, nº 4.

CEDAR, in botany. See JUNIPERUS and PINUS. The ſpecies of cedar famous for its duration, is that popularly called by us the cedar of Lebanon (Pinus cedrus), by the ancients *cedrus magna*, or the great cedar ; alſo *cedrelate*, Κεδρελατη. See the article PINUS.

CEDRENUS, (George) a Grecian monk, lived in the 11th age, and wrote "Annals, or an abridged Hiſtory, from the Beginning of the World to the Reign of Iſaac Comnenus emperor of Conſtantinople, who ſucceeded Michael IV. in 1057. This work is no more than an extract from ſeveral hiſtorians. There is an edition of it, printed at Paris in 1647, with the Latin verſion of Xylander, and the notes of father Goar a Dominican.

CEDRUS, the CEDAR-TREE, MAHOGANY, &c. See JUNIPERUS, PINUS, and SWIETENIA.

CEILING, in architecture, the top or roof of a lower room ; or a covering of plaſter, over laths nailed on the bottom of the joiſts that bear the floor of the upper room ; or where there is no upper room, on joiſts for the purpoſe ; hence called *cieling joiſts*. The word *ceiling* anſwers prettily to the Latin *lacunar*, "every thing over head."

Plaſtered ceilings, are much uſed in Britain, more than in any other country : nor are they without their advantages, as they make the room lightſome ; are good in caſe of fire ; ſtop the paſſage of the duſt ; leſſen the noiſe over head ; and, in ſummer, make the air cooler.

CEILING, in ſea-language, denotes the inſide planks of a ſhip.

CEIMELIA, from κειμαι, "to be laid up," in antiquity, denotes choice or precious pieces of furniture or ornaments, reſerved or laid up for extraordinary occaſions and uſes ; in which ſenſe, ſacred garments, veſſels, and the like, are reputed of the ceimelia of a church. Medals, antique ſtones, figures, manuſcripts, records, &c. are the ceimelia of men of letters.

CEIMELIARCHIUM, the repoſitory or place where ceimelia are preſerved.

CEIMELIOPHYLAX, (from κειμηλιον and φυλαττω, I *keep*), the keeper or curator of a collection of ceimelia ; ſometimes alſo denominated *ceimeliarcha*. The ceimeliarcha, or ceimeliophylax, was an officer in the ancient churches or monaſteries, anſwering to what was otherwiſe denominated *chartophylax*, and *cuſtos archivorum*.

CELÆNÆ, (anc. geog.) the capital of Phrygia Magna, ſituated on a cognominal mountain, at the common ſources of the Mæander and Marſyas. The king of Perſia had a ſtrong palace beneath the citadel, by the ſprings of the Marſyas, which roſe in the market-place, not leſs in ſize than the Mæander, and flowed through the city. Cyrus the younger had alſo a palace there, but by the ſprings of the Mæander, which river paſſed likewiſe through the city. He had,

had, moreover, an extenſive paradiſe or park, full of wild beaſts, which he hunted on horſeback for exerciſe or amuſement; and watered by the Mæander, which ran through the middle. Xerxes was ſaid to have built theſe palaces and the citadel after his return from his expedition into Greece.

Antiochus Soter removed the inhabitants of Celænæ into a city, which he named from his mother, Apamea; and which became afterwards a mart inferior only to Epheſus. See APAMEA.

CALANDINE, in botany. See CHELIDONIUM.

CELANO, a town of Italy, in the kingdom of Naples, in Farther Abruzzo. It is ſeated a mile from the lake Celano, anciently called FUCINUS. E. Long. 13. 39. N. Lat. 41. 56.

CELARENT, among logicians, a mode of ſyllogiſm, wherein the major and concluſion are univerſal negative propoſitions, and the minor an univerſal affirmative.

E. gr. cE None whoſe underſtanding is limited can be omniſcient.
lA Every man's underſtanding is limited.
rEnt Therefore no man is omniſcient.

CELASTRUS, in botany: A genus of the monogynia order, belonging the pentandria claſs of plants; and in the natural method ranking under the 43d order, *Dumoſæ*. The corolla is pentapetalous and patent; the capſule quinquangular and trilocular; the ſeeds veiled. There are 11 ſpecies; two of which are enured to Britain.

1. The bullatus, an uncertain deciduous ſhrub, is a native of Virginia. It is about four feet in growth, riſing from the ground with ſeveral ſtalks, which divide into many branches, and are covered with a browniſh bark. The leaves are of a fine green colour, and grow alternately on the branches. They are of an oval figure, and have their edges undivided. The flowers are produced in July, at the ends of the branches, in looſe ſpikes. They are of a white colour, and in their native countries are ſucceeded by very ornamental ſcarlet fruit; but in Britain this ſeldom happens. It is eaſily propagated from ſeeds ſown, about an inch deep, in beds of good freſh mould made fine. They ſeldom come up until the ſecond, and ſometimes not before the third ſpring. It is alſo propagated by layers; which work muſt be performed on the young wood, in the autumn, by a ſlit at the joint. Theſe layers may be expected to ſtrike root by the autumn following; when they may be taken up and planted in the nurſery-ground. This ſhrub muſt have a well-ſheltered ſituation, otherwiſe the leaves are apt to fall off at the approach of froſty weather. And Millar ſays, that, growing naturally in moiſt places, it will not thrive well in a dry ſoil.

2. The ſcandens, or baſtard euonymus, with woody twining ſtalks, riſing by the help of neighbouring trees or buſhes to the height of 12 feet. The leaves are oblong, ſerrated, of a pleaſant green colour, pale, and veined underneath, and grow alternately on the branches. The flowers are produced in ſmall bunches, from the ſides of the branches, near the ends. They are of a greeniſh colour, appear in June; and are ſucceeded by roundiſh, red, three-cornered capſules, containing ripe ſeeds, in the autumn. This ſpecies is exceeding hardy, and makes a beautiful appearance among other trees in the autumn, by their beautiful red berries, which much reſemble thoſe of the Spindle-tree, and will be produced in vaſt profuſion on the tops of other trees, to the height of which theſe plants by their twiſting property aſpire. They ſhould not be planted near weak or tender trees, to climb on; for they embrace the ſtalks ſo cloſely as to bring on death to any but the hardieſt trees and ſhrubs. It is propagated, 1. By laying down the young ſhoots in the ſpring. By the autumn they will have ſtruck root, and may then be taken off and ſet in the places where they are deſigned to remain. 2. By ſeeds; which ſhould be ſoon ſown after they are ripe, otherwiſe they will be two and ſometimes three years before they come up. When they make their appearance, nothing more need be done than keeping them clear from weeds all ſummer and the winter following; and in the ſpring the ſtrongeſt plants may be drawn out, and ſet in the nurſery for a year, and then removed to the places where they are deſigned to remain; whilſt the weakeſt, being left in the ſeed-bed one year more, may undergo the ſame diſcipline.

In Senegal the negroes uſe the powder of the root as a ſpecific againſt gonorrhœas, which it is ſaid to cure in eight or ſometimes in three days. An infuſion of the bark of a ſpecies of ſtaff-tree, which grows in the Iſle of France, is ſaid to poſſeſs the ſame virtues.

CELEBES, an iſland in the Indian ſea, ſeated under the equator, and called by ſome *Macaſſar*. The length and breadth has not been accurately computed; but the circumference, at a medium, is about 800 miles. It had formerly ſix kingdoms, which are reduced to one. The air is hot and moiſt; and ſubject to great rains during the north-weſt winds, which blow from November to March, at which time the country is overflowed, and for this reaſon they build their houſes on piles of wood 10 feet high. The moſt healthful time is during the northern monſoons, which ſeldom fail blowing regularly in one part of the year. The chief vegetables are rice and cocoas; but they have ebony, ſanders, &c. Their fruits and flowers are much the ſame as in the neighbouring parts of the Indies. They have pepper, ſugar, betel, arcca, the fineſt cotton, and opium. The natives have bright olive complexions, and the women have ſhining black hair. They are thought to be very handſome by the Dutch and Chineſe, who often purchaſe them for bedfellows. The men are induſtrious, robuſt, and make excellent ſoldiers. Their arms are ſabres, and trunks, from whence they blow poiſoned darts, which are pointed with the tooth of a ſea-fiſh. Some likewiſe uſe poiſoned daggers. They were the laſt of the Indian nations that were enſlaved by the Dutch, which could not be effected till after a long war. They teach their children to read and write, and their characters have ſome reſemblance of the Arabic. Their religion being Mahometan, the men indulge themſelves in many wives and concubines. The employment of the women is ſpinning, cookery, and making their own and their huſbands cloaths. The men wear jewels in their ears, and the women gold chains about their necks. The inhabitants in general go half naked, without any thing on their head, legs, or feet, and ſome have nothing but a cloth about their middle. The ſtreets of the town Macaſſar are ſpacious, and planted with trees on every ſide. It ſtands by the ſide of the only large river they have in the iſland. The Dutch have a fort here, mounted with 40 guns, and garriſoned with 700 men. There is only one other town of note, called Jampandam, where they alſo have a fort. The iſland is not near ſo populous as when the Dutch conquered it; the men being hired for ſoldiers in moſt of the neighbouring countries.

The religion of theſe iſlands was formerly idolatry. They worſhipped the ſun and moon. They ſacrificed to them in the public ſquares, having no materials which they thought valuable enough to be employed in raiſing temples. About two centuries ago, ſome Chriſtians and Mahometans having brought their opinions to Celebes, the principal king of the country took a diſlike to the national worſhip. Having convened a general aſſembly, he aſcended an eminence, when, ſpreading out his hands towards heaven, he told the Deity, that he would acknowledge for truth that doctrine whoſe miniſters ſhould firſt arrive in his dominions, and as the winds and waves were at his command, the Almightly would have himſelf to blame if he embraced a falſehood. The aſſembly broke up, determined to wait the orders of heaven, and to obey the firſt miſſionaries that ſhould arrive. The mahometans were the moſt active, and their religion accordingly prevailed.

CELERES, in Roman antiquity, a regiment of body-guards belonging to the Roman kings, eſtabliſhed by Romulus, and compoſed of 300 young men, choſen out of the moſt illuſtrious Roman families, and approved by the ſuffrages of the curiæ of the people, each of which furniſhed ten. The name comes from *celer*; "quick, ready;" and was given them becauſe of their promptneſs to obey the king.

The celeres always attended near the king's perſon, to guard him, to be ready to carry his orders, and to execute them. In war, they made the van-guard in the engagement, which they always began firſt; in retreats, they made the rear-guard.

Though the celeres were a body of horſe, yet they uſually diſmounted, and fought on foot; their commander was called tribune, or prefect of the celeres. They were divided into three troops, of 100 each, commanded by a captain called centurio: their tribune was the ſecond perſon in the kingdom.

Plutarch ſays, Numa broke the celeres; if this be true, they were ſoon re-eſtabliſhed; for we find them under moſt of the ſucceeding kings: witneſs the great Brutus, who expelled the Tarquins, and who was the tribune of the celeres.

CELERI, in botany, the Engliſh name of a variety of the APIUM GRAVEOLENS.

The ſeed of celeri ſhould be ſown at two or three different times, the better to continue it for uſe thro' the whole ſeaſon without running up to ſeed. The firſt ſowing ſhould be in the beginning of March, upon a gentle hot-bed; the ſecond may be at the end of the ſame month, which ought to be in an open ſpot of light earth, where it may enjoy the benefit of the ſun; the third time of ſowing ſhould be in the latter end of April, or beginning of May, on a moiſt ſoil; and if expoſed to the morning-ſun only, it will be ſo much the better, but it ſhould not be under the drip of trees. The middle of May, ſome of the plants of the firſt ſowing will be fit to tranſplant for blanching.

The manner of tranſplanting it is as follows: after having cleared the ground of weeds, you muſt dig a trench by a line about 10 inches wide, and 8 or 9 inches deep, looſening the earth in the bottom, and laying it level: and the earth that comes out of the trench ſhould be equally laid on each ſide the trench, to be ready to draw in again to earth the celeri as it advances in height. Theſe trenches ſhould be made at three feet diſtance from each other: then plant your plants in the middle of the trench, at about four or five inches diſtance, in one ſtraight row, having before trimmed the plants, and cut off the tops of the long leaves: and as they are planted, you muſt obſerve to cloſe the earth well to their roots with your feet, and to water them plentifully until they have taken new root. As theſe plants advance in height, you muſt obſerve to draw the earth on each ſide cloſe to them, being careful not to bury their hearts, nor ever to do it but in dry weather; otherwiſe the plants will rot. When your plants have advanced a conſiderable height above the trenches, and all the earth, which was laid on the ſides thereof, hath been employed in earthing them up, you muſt then make uſe of a ſpade to dig up the earth between the trenches, which muſt alſo be made uſe of for the ſame purpoſe continuing from time to time to earth it up until it is fit for uſe. The laſt crop ſhould be planted in a drier ſoil, to prevent its being rotted with too much wet in the winter. You will do well to cover your ridges of celeri with ſome peaſe-haulm, or ſome ſuch light covering, when the froſt is very hard, which will admit the air to the plants; for if they are covered too cloſe, they will be very ſubject to rot: by this means you will preſerve your celeri till ſpring; but you muſt remember to take off the covering whenever the weather will permit, otherwiſe it will be apt to cauſe the celeri to pipe, and run to feed. The celeri, when full blanched, will not continue good above three weeks or a month before it will rot or pipe; therefore, in order to continue it good, you ſhould have, at leaſt, ſix or ſeven different ſeaſons of planting, proportioned to the conſumption.

The other ſort of celeri, which is commonly called celeriac, is to be managed in the ſame manner; excepting that this ſhould be planted on the level ground, or in very ſhallow drills: for this plant ſeldom grows above eight or ten inches high, ſo requires but little earthing up; the great excellency of this being in the ſize of the root, which is often as large as ordinary turnips.

The beſt method to ſave the ſeed of celeri, is to make choice of ſome long good roots of the upright celeri, which have not been too much blanched, and plant them out, at about a foot aſunder, in a moiſt ſoil, early in the ſpring; and when they run up to ſeed, keep them ſupported with ſtakes, to prevent their being broken down with the wind: and in July, when the ſeed begins to be formed, if the ſeaſon ſhould prove very dry, it will be proper to give ſome water to the plant, which will greatly help its producing good ſeeds. In Auguſt theſe ſeeds will be ripe, at which time it ſhould be cut up, in a dry time, and ſpread upon cloths in the ſun to dry; then beat out the ſeeds, and preſerve it in bags for uſe.

Celeri, *wild, (Apium antarcticum)*, was found in conſiderable quantities by Mr Banks and Dr Solander, on the coaſt of Terra del Fuego. It is like the garden celeri in the colour and diſpoſition of the flowers, but the leaves are of a deep green. The taſte is between that of celeri and parſley. It is a very uſeful ingredient in the ſoup for ſeamen, becauſe of its antiſcorbutic quality.

CELERITY, in mechanics, the ſwiftneſs of any body in motion. It is alſo defined to be an affection of motion, by which any moveable body runs through a given ſpace in a given time.

CELESTINS, a religious order ſo called from their founder Peter de Meuron, afterwards raiſed to the pontificate under the name of Celeſtin V. This Peter, who was born at Iſernia, a little town in the kingdom of Naples, in the year 1215, of but mean parents, retired, while very young, to a ſolitary mountain, in order to dedicate himſelf wholly to prayer and mortification. The fame of his piety brought ſeveral, out of curioſity, to ſee him; ſome of whom, charmed with his virtues, renounced the world to accompany him in his ſolitude. With theſe he formed a kind of community in the year 1254; which was approved by Pope Urban IV. in 1264, and erected into a diſtinct order, called the *hermits of St Damien*. Peter de Meuron governed this order till 1286, when his love of ſolitude and retirement induced him to quit the charge. In July 1294, the great reputation of his ſanctity raiſed him, though much againſt his will, to the pontificate. He then took the name of Celeſtin V. and his order that of *Celeſtins* from him. By his bull he approved their conſtitutions, and confirmed all their monaſteries to the number of 20. But he ſat too ſhort time in the chair of St Peter to do many great things for his order; for having governed the church five months and a few days, and conſidering the great burden he had taken upon him, to which he thought himſelf unequal, he ſolemnly renounced the pontificate in a conſiſtory held at Naples.

After his death, which happened in 1296, his order made great progreſs not only in Italy, but in France likewiſe; whither the then general Peter of Tivoli ſent 12 religious, at the requeſt of king Philip the Fair, who gave them two monaſteries; one in the foreſt of Orleans, and the other in the foreſt of Compeigne at mount Chartres. This order likewiſe paſſed into ſeveral provinces of Germany. They have about 96 convents in Italy, and 21 in France, under the title of priories.

The Celeſtins riſe two hours after midnight, to ſay matins. They eat no fleſh at any time, except when they are ſick. They faſt every Wedneſday and Friday, from Eaſter to the feaſt of the exaltation of the holy croſs; and, from that feaſt to Eaſter, every day. As to their habit, it conſiſts of a white gown, a capuche, and a black ſcapulary. In the choir, and when they go out of the monaſtry, they wear a black cowl with the capuche: their ſhirts are of ſerge.

CELETES, or Celetæ, (from κελης, *a race-horſe,)* in antiquity, denote ſingle or ſaddle-horſes; by way of contradiſtinction from thoſe yoked or harneſſed together, called *bigarii, quadrigarii*, &c. The ſame denomination is alſo given to the cavaliers or riders on horſeback; and hence ſome duduce celeres, the name of Romulus's guard.

CELEUSMA, or Celeuma, in antiquity, the ſhout or cry of the ſeamen, whereby they animated each other in their work of rowing. The word is formed from κελευειν, *to call, to give the ſignal.*

Celeusma was alſo a kind of ſong or formula, rehearſed or played by the maſter, or others, to direct the ſtrokes and movements of the mariners, as well as to encourage them to labour. See Celeustes.

CELEUSTES, in ancient navigation, the boatſwain or officer appointed to give the rowers the ſignal when they were to pull, and when to ſtop. He was alſo denominated *epopeus*, and by the Romans *portiſculus*, ſometimes ſimply *hortator*.

CELIBACY, the ſtate of unmarried perſons. Scaliger derives the word from the Greek κοιτη, "bed," and λειπω *linquo*, "I leave" others ſay it is formed from *cæli beatitudo*; q. d. *the bleſſedneſs of heaven.*

The ancient Romans uſed all means imaginable to diſcourage celibacy. Nothing was more uſual than for the cenſors to impoſe a fine on bachelors. Dionyſius Halicarnaſſenſis mentions an ancient conſtitution whereby all perſons of full age were obliged to marry. But the firſt law of that kind, of which we have any certainty, is that under Auguſtus, called *lex Julia de maritandis ordinibus*. It was afterwards denominated *Papia Poppæa*, and more uſually *Julia Papia*, in regard of ſome new ſanction, and amendments made to it under the conſuls Papius and Poppæus. By this law divers prerogatives were given to perſons who had many children; penalties impoſed on thoſe who lived a ſingle life, as that they ſhould be incapable of receiving legacies, and not exceeding a certain proportion.

CELIBATE, the ſame with celibacy; but it is chiefly uſed in ſpeaking of the ſingle life of the Popiſh clergy, or the obligation they are under to abſtain from marriage. In this ſenſe we ſay the law of *celibate.* Monks and religious take a vow of celibate; and what is more, of chaſtity.

The church of Rome impoſes an univerſal celibacy on all its clergy, from the pope to the loweſt deacon and ſubdeacon. The advocates for this uſage pretend, that a vow of perpetual celibacy was required in the ancient church as a condition of ordination, even from the earlieſt apoſtolic ages. But the contrary is evident from numerous examples of biſhops and archbiſhops, who lived in a ſtate of matrimony, without any prejudice to their ordination or their function. It is generally agreed that moſt of the apoſtles were married. Some ſay all of them, except St Paul and St John. Others ſay St Paul himſelf was married, becauſe be writes to his *yoke-fellow*, whom they interpret his wife. Be this as it will, in the next ages after the apoſtles, we have accounts of divers married biſhops, preſbyters, and deacons, without any reproof or mark of diſhonour ſet on them; *e. g.* Valens, preſbyter of Philippi, mentioned by Polycarp; and Chæremon, biſhop of Nilus. Novatus was a married preſbyter of Carthage, as we learn from Cyprian; who himſelf was alſo a married man, as Pagi confeſſes; and ſo was Cæcilius the preſbyter who converted him; and Numidius another preſbyter of Carthage. The reply which the Romaniſts give to this is, that all married perſons, when they came to be ordained, promiſed to live ſeparate from their wives by conſent, which anſwered the vow of celibacy in other perſons. But this is not only ſaid without proof, but againſt it. For Novatus preſbyter of Carthage, was certainly allowed to cohabit with his wife after ordination; as appears from the charge that Cyprian brings againſt him, that he had ſtruck and abuſed his wife, and thereby cauſed her to miſcarry. There ſeems indeed to have been, in ſome caſes, a tendency towards the introduction of ſuch a law, by one or two zealots; but the motion was no ſooner made, than it was quaſhed by the authority of wiſer men. Thus Euſebius obſerves, that Pinytus, biſhop of Gnoſſus in Crete, was for laying the law of celibacy upon his brethren; but Dionyſius biſhop of Corinth wrote to him, that he ſhould conſider the weakneſs of men, and not impoſe that heavy burden on them. In the council of Nice, *anno* 325, the motion was renewed for a law to oblige the clergy to abſtain from all conjugal ſociety with their wives, whom they had married before their ordination: but Paphnutius, a famous Egyptian biſhop, and one who himſelf never was married, vigorouſly declaimed againſt it, upon which it was unanimouſly rejected. So Socrates and Sozomen tell the ſtory; to which all that Valeſius, after Bellarmin, has to ſay, is, that he ſuſpects the truth of it. The council in Trullo, held in 692, made a difference in this reſpect between biſhops and preſbyters; allowing preſbyters, deacons, and all the inferior orders, to cohabit with their wives after ordination; and giving the Roman church a ſmart rebuke for the contrary prohibition, but at the ſame time laying an injunction upon biſhops to live ſeparate from their wives, and appointing the wives to betake themſelves to a monaſtic life, or become deaconeſſes in the church. And thus was a total celibate eſtabliſhed in the Greek church, as to biſhops, but not any others. In the Latin church, the like eſtabliſhment was alſo made, but by ſlow ſteps in many places. For in Africa, even biſhops themſelves cohabited with their wives at the time of the council of Trullo. The celibacy of the clergy, however, appears of an ancient ſtanding, if not of command and neceſſity, yet as of counſel and choice. But as it is clearly neither of divine nor apoſtolical inſtitution, it is, at firſt, hard to conceive from what motive the court of Rome perſiſted ſo very obſtinately to impoſe this inſtitution on the clergy. But we are to obſerve that this was a leading ſtep to the execution of the project formed of making the clergy independent of princes, and rendering them a ſeparate body to be governed by their own laws. In effect, while prieſts had children, it was very difficult to prevent their dependence on princes, whoſe favours have ſuch an influence on private men; but having no family, they were more at liberty to adhere to the Pope.

CELIDOGRAPHIA, the deſcription of the ſpots which appear on the ſurfaces of the ſun and planets. See ASTRONOMY, n° 58, &c.

CELL, CELLA, in ancient writers, denotes a place or apartment uſually under ground, and vaulted, in which were ſtored up ſome ſort of neceſſaries, as wine, honey, and the like; and according to which it was called *Cella Vinaria, Olearia, Mellaria,* &c. The word is formed from the Latin *celare,* to conceal.

CELLA was alſo uſed for the lodge or habitation of a common proſtitute, as being anciently under ground, hence alſo denominated *fornix.*

Intravit calidum veteri centone lupanar,
Et cellam vacuam. Juv. Sat. vi. ver. 121.

On which place an ancient ſcholiaſt remarks, that the names of the whores were written on the doors of their ſeveral cells; by which we learn the meaning of *inſcripta cella* in Martial, lib. xi. ep. 46.

CELLA was alſo applied to the bed-chambers of domeſtics and ſervants; probably as being low and narrow.—Cicero, inveighing againſt the luxury of Antony, ſays, the beds in the very cellæ of his ſervants were ſpread with pompous purple coverlets.

CELLA is alſo applied to the members or apartments of baths. Of theſe there were three principal, called *frigidaria, tepidaria,* and *caldaria;* to which may be added a fourth, called *cella aſſa,* and ſometimes *ſudatoria.*

CELLA likewiſe ſignified the *adyta,* or inmoſt and moſt retired parts of temples, wherein the images of the gods to whom the edifices were conſecrated were preſerved. In this ſenſe we meet with *cella Jovis, cella Concordiæ,* &c.

CELL is alſo uſed for a leſſer or ſubordinate ſort of miniſter dependent on a great one, by which it was erected, and continues ſtill to be governed. The great abbeys in England had moſt of them *cells* in places diſtant from the mother abbey, to which they were accountable, and from which they received their ſuperiors. The alien priories in England were cells to abbeys in Normandy, France, Italy, *&c.* The name *cell* was alſo given to rich and conſiderable monaſteries not dependent on any other.

CELL ſignifies alſo a little apartment or chamber, ſuch as thoſe wherein the ancient monks, ſolitaries, and hermits, lived in retirement. Some derive the word from the Hebrew כלא, *i. e.* "a priſon, or place where any thing is ſhut up."

The ſame name is ſtill retained in divers monaſteries. The dormitory is frequently divided into ſo many cells or lodges. The Carthuſians have each a ſeparate houſe, which ſerves them as a cell. The hall wherein the Roman conclave is held, is divided, by partitions, into divers cells, for the ſeveral cardinals to lodge in.

CELL is alſo a name given to the little diviſions in honey-combs, which are always regular hexagons. See BEE.

CELL, in botany, is applied to the hollow places between the partitions in the pods, huſks, and other ſeed-veſſels of plants; according as there is one, two, three, *&c.* of theſe cells, the veſſel is ſaid to be unilocular, bilocular, trilocular, *&c.*

CELLS, in anatomy, little bags, or bladders, where fluids or other matters are lodged; called *loculi, cellulæ,* &c. Thus the *cellulæ adipoſæ* are the little cells where the fat is contained; *cellulæ* in the *colon,* are ſpaces wherein the excrements are detained till voided, &c.

CELLAR, *(Cellarium)* in ancient writers, denotes the ſame with cella, viz. a conſervatory of eatables, or drinkables.

Cellar differs from vault, as the latter is ſuppoſed to be deeper, the former being frequently little below the ſurface of the ground. In which ſenſe, *cellarium* only differed from *penus*, as the former was only a ſtore-houſe for ſeveral days, the latter for a long time. Thus it is, the bactroperatæ, a ſort of ancient Cynics, are ſaid by St Jerome to carry cellar about with them.

Cellarium alſo denoted an allowance of bread, wine, oil, or other proviſion, furniſhed out of the cella, to the uſe of the governor of the province and his officers, &c. In which ſenſe, the word amounts to much the ſame with *annona*.

Cellars, in modern building, are the loweſt rooms in a houſe, the ceilings of which uſually lie level with the ſurface of the ground on which the houſe is built; or they are ſituated under the pavement before the houſe, eſpecially in ſtreets and ſquares.

Cellars, and other places vaulted under ground, were called by the Greeks *hypogæa*: the Italians ſtill call them *fundi delle caſe*.

CELLARER, or Cellerer, (*Cellerarius* or *Cellarius*), an officer in monaſteries, to whom belong the care and procurement of proviſions for the convent. The denomination is ſaid to be borrowed from the Roman law, where *cellarius* denotes an examiner of accounts and expences. Ulpian defines it thus: ‘ Cellerarius, id eſt, ideo præpoſitus ut rationes ſalvæ ſint.”

The *cellerarius* was one of the four *obedientiarii*, or great officers of monaſteries: under his ordering was the *piſtrinum* or bakehouſe, and the *bracinum*, or brewhouſe. In the richer houſes there were particular lands ſet apart for the maintenance of his office, called in ancient writings *ad cibum monachorum*. The *cellerarius* was a great man in the convent. His whole office in ancient times had a reſpect to that origin: he was to ſee his lord's corn got in, and laid up in granaries; and his appointment conſiſted in a certain proportion thereof, uſually fixed at a thirteenth part of the whole, together with a furred gown. The office of cellarer then only differed in name from thoſe of bailiff and minſtrel; excepting that the cellarer had the receipt of his lord's rents through the whole extent of his juriſdiction.

Cellarer was alſo an officer in chapters, to whom belonged the care of the temporals, and particularly the diſtributing of bread, wine, and money to canons, on account of their attendance in the choir. In ſome places he was called *cellarer*, in others *burſer*, and in others *currier*.

CELLARIUS, (Chriſtopher) was born in 1638, at Smalcade in Franconia, of which town his father was miniſter. He was ſucceſſively rector of the colleges at Weymar, Zeits, and Merſbourg; and the king of Pruſſia having founded an univerſity at Hall in 1693, he was prevailed on to be profeſſor of eloquence and hiſtory there, where he compoſed the greateſt part of his works. His great application to ſtudy haſtened the infirmities of old age; for it is ſaid, he would ſpend whole days and nights together at his books, without any attention to his health, or even the calls of nature. His works relate to grammar, geography, hiſtory, and the oriental languages, and the number of them is amazing. He died in 1707.

CELLINI, (Benvenuto) an eminent ſtatuary, who was bred a jeweller and goldſmith, but ſeems to have had an extraordinary genius for the fine arts in general. He was cotemporary with Michael Angelo, and Julio Romano, and was employed by popes, kings, and other princely patrons of ſciences and arts, ſo highly cultivated in the days of Leo X. and Charles V. ſome of his productions being eſteemed moſt exquiſite. He lived to a very conſiderable old age; and his life, almoſt to the laſt, was a continued ſcene of adventure, perſecution, and misfortune, truly wonderful. He wrote his own hiſtory, which was not, however, publiſhed till the year 1730, probably on account of the exceſſive freedom with which he therein treated many diſtinguiſhed perſonages of Italy and other countries. It was tranſlated into Engliſh by Dr Nugent in 1771, to which the reader is referred, as it will not admit of an abridgement ſuitable to the deſign of this work.

CELLULAR, in a general ſenſe, is applied to any thing conſiſting of ſingle cells.

Cellular *Membrane*. See Anatomy, n° 83, *et ſeq.*

CELOSIA, cocks-comb: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 54th order, *Miſcellaneæ*. The calyx is triphyllous; the corolla is five-petalled in appearance; the ſtamina are conjoined at the baſe to the plaited nectarium; the capſule gaping horizontally. There are eight ſpecies, of which the moſt worthy of notice is the *criſtata*, or common cocks-comb, ſo called on account of its creſted head of flowers, reſembling a cock's comb; of theſe there are a great variety of ſpecies. The principal colours of their flowers are red, purple, yellow, and white; but there are ſome whoſe heads are variegated with two or three colours. The heads are ſometimes divided like a plume of feathers, and are of a beautiful ſcarlet colour. Theſe plants are very tender exotics, and require a great deal of care to cultivate them in England. Three hot-beds muſt be prepared; a ſmall one in March, on which to raiſe the plants an inch or two in height; a ſecond in April, of larger dimenſions, in which to tranſplant them when proper; and a third in May for a large frame, to receive them tranſplanted into pots, to remain till the end of June or beginning of July to grow to full ſize: all of which hot-beds muſt be covered with frames and glaſſes, and have five or ſix inches depth of fine rich light earth for the reception of the ſeed and plants; and in the ſecond and third hot-bed, the frames muſt occaſionally be raiſed or augmented, according as the plants ſhall riſe in height.

CELSIA, in botany: A genus of the angioſpermia order, belonging to the tridynamia claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The calyx is quinquepartite: the corolla wheel-ſhaped; the filaments bearded or woolly; the capſule bilocular.

CELSUS, (Aurelius Cornelius) a celebrated phyſician of the firſt century, who wrote eight books on medicine, in elegant Latin. He was the Hippocrates of the Latins, and Quintilian gives him a high eulogium. The great Boerhaave tells us, that Celſus is one of the beſt authors of antiquity for letting us into the true meaning and opinions of Hippocrates; and that, without him, the writings of this father in phyſic would be often unintelligible, often miſunderſtood by us. He ſhows us alſo, how the ancients cured diſtempers by friction, bathing, &c. His eight books *de Midicina* have been ſeveral times printed. The Elzivir edition, in the year 1650, by Vander Linden, is the beſt, as being entirely corrected from his manuſcripts.

Celsus, an Epicurean philoſopher, in the ſecond century. He wrote a work againſt the Chriſtians, entitled, *The true Diſcourſe* ; to which Origen, at the deſire of Ambroſe his friend, wrote a learned anſwer. To this philoſopher Lucian dedicated his *Pſeudomanies.*

CELTÆ, or **Celtes**, an ancient nation, by which moſt of the countries of Europe are thought to have been peopled. The compilers of the Univerſal Hiſtory are of opinion, that they are deſcended from Gomer the eldeſt ſon of Japhet, the ſon of Noah. They think that Gomer ſettled in the province of Phrygia in Aſia: Aſhkenaz his eldeſt ſon, or Togarmah his youngeſt, or both, in Armenia, and Riphath the ſecond ſon in Cappadocia. When they ſpread themſelves wider, they ſeem to have moved regularly in columns without interfering with or diſturbing their neighbours. The deſcendants of Gomer, or the Celtæ, took the left hand, inſenſibly ſpreading themſelves weſtward towards Poland, Hungary, Germany, France, and Spain; while the deſcendants of Magog, Gomer's brother, moving eaſtward, peopled Tartary.

In this large European tract, the Celtes began to appear a powerful nation under a regular monarchy, or rather under ſeveral conſiderable kingdoms. Mention is made of them indeed in ſo many parts of Europe, by ancient geographers and hiſtorians, that Ortelius took *Celtica* to be a general name for the continent of Europe, and made a map of it bearing this title. In thoſe parts of Aſia, which they poſſeſſed, as well as in the different parts of Europe, the Celtes went by various names. In Leſſer Aſia they were known by the names of *Titans*, and *Sacks* ; in the northern parts of Europe, by thoſe of *Cymmerians*, *Cymbrians*, &c.; and in the ſouthern parts they were called *Celtes*, *Gauls*, or *Galatians*.

With reſpect to the government of the Celtes we are entirely in the dark. All we know is, that the curetes, and afterwards druids and bards, were the interpreters of their laws; judged all cauſes whether criminal or civil; and their ſentence was reckoned ſo ſacred, that whoever refuſed to abide by it was by them excluded from aſſiſting at their ſacred rites; after which no man dared converſe with him; ſo that this puniſhment was reckoned the moſt ſevere of all, even ſeverer than death itſelf.

They neither reared temples nor ſtatues to the deity, but deſtroyed them wherever they could find them, planting in their ſtead large ſpacious groves; which being open on the top and ſides, were, in their opinion, more acceptable to the divine Being, who is abſolutely unconfined. In this their religion ſeems to have reſembled that of the Perſees and diſciples of Zoroaſter. The Celtes only differed from them in making the oak inſtead of the fire the emblem of the deity; in chooſing that tree above all others to plant their groves with, and attributing ſeveral ſupernatural virtues both to its wood, leaves, fruit, and miſsietoe; all which were made uſe of in their ſacrifices and other parts of their worſhip. But after they had adopted the idolatrous ſuperſtition of the Romans and other nations, and the apotheoſis of their heroes and princes, they came to worſhip them much in the ſame manner: as Jupiter under the name of *Taran*, which in the Celtic ſignifies thunder: Mercury, whom ſome authors call *Heus* or *Heſus*, probably from the Celtic *huadh*, which ſignifies a dog, and might be the *Anubis latrans* of the Egyptians. But Mars was held in the greateſt veneration by the warlike, and Mercury by the trading part of the nation. The care of religion was immediately under their curetes, ſince known by the name of druids and bards. Theſe were, as Cæſar tells us, the performers of ſacrifices and all religious rites, and expounders of religion to the people. They alſo inſtructed youth in all kinds of learning, ſuch as philoſophy, aſtronomy, aſtrology, &c. Their doctrines were taught only by word of mouth, eſteeming them too ſacred to be committed to writing. Other more common ſubjects, ſuch as their hymns to their gods, the exploits of princes and generals in time of war, and eſpecially before a battle, were couched in elegant verſe, and recited, or rather ſung, on all proper occaſions; though even theſe were alſo kept from vulgar eyes, and either committed to memory, or if to writing, the whole was a ſecret to all the laity. The latter indeed ſeems the moſt probable, if what Cæſar hints be true; namely, that theſe poetic records were increaſed in his time to ſuch a bulk, that it took up a young bard near 20 years to learn them by heart. Diodorus tells us farther, that theſe poets uſed to accompany their ſongs with inſtrumental muſic, ſuch as that of organs, harps, and the like; and that they were held in ſuch veneration, that if, in the time of an engagement between two armies, one of theſe bards appeared, both ſides immediately ceaſed fighting. The reaſon of this was, that they were univerſally believed to be prophets as well as poets; ſo that it was thought dangerous as well as injurious to diſobey what they ſuppoſed came from their gods. Theſe prophetic philoſophers kept academies, which were reſorted to not only by a great number of their own youth, but alſo of thoſe from other countries, inſomuch that Ariſtotle ſays their philoſophy paſſed from thence into Greece, and not from Greece thither. Diodorus likewiſe quotes a paſſage from Hecateus, which is greatly in their praiſe; *viz.* that the druids had ſome kind of inſtruments by which they could draw diſtant objects nearer, and make them appear larger and plainer; and by which they could diſcover even ſeas, mountains, and valleys, in the moon. But whatever might be their learning, it is certain, that in proceſs of time, they adopted ſeveral very barbarous cuſtoms, ſuch as ſacrificing human victims to their gods as more acceptable to them than thoſe of any other animals. And Diodorus tells us of another inhuman cuſtom they uſed in their divinations, eſpecially in great matters, which was done by killing ſome of their ſlaves, or ſome priſoners of war, if any they had, with a ſcimetar, to draw their augury from the running of his blood from his mangled limbs.

For the hiſtory, &c. of the different Celtic nations ſee the article **Gaul**, &c.

Celtes, certain ancient inſtruments of a wedge-like form, of which ſeveral have been diſcovered in different parts of Great-Britain. Antiquarians have generally attributed them to the Celtæ; but, not agreeing as to their uſe, diſtinguiſhed them by the above unmeaning appellation. But Mr Whittaker makes it probable that they were Britiſh battle-axes. See *Battle-Ax*.

CELTIBERIA, (anc. geog.) a county of the Hither Spain, along the right or ſouth-weſt ſide of the river Iberus; though ſometimes the greateſt part of Spain was called by the name of *Celtiberia*. The people were denominated *Celtiberi*, or the Celtæ ſeated on the Iberus. They were very brave and warlike, their cavalry in particular was excellent. They wore a black and rough cloak, the ſhag of which was like goat's hair. Some of them had light bucklers like the Gauls; other hollow and round ones like thoſe of other nations. They all wore boots made of hair, and iron helmets adorned with creſts of a purple colour. They uſed ſwords which cut on both ſides, and poinards of a foot long. Their arms were of an admirable temper, and are ſaid to have been prepared in the following manner: they buried plates of iron under ground, where they let them remain till the ruſt had eaten the weakeſt part of the metal, and the reſt was conſequently hard and firm. Of this excellent iron they made their ſwords, which were ſo ſtrong and well tempered, that there was neither buckler nor helmet that could reſiſt their edge. The Celtiberians were very cruel towards their enemies and malefactors, but ſhowed the greateſt humanity to their gueſts. They not only cheerfully granted their hoſpitality to ſtrangers who travelled in their country, but were deſirous that they ſhould ſeek protection under their roof.

CELTIS, in botany: A genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ*. It is an hermaphrodite plant: The female calyx is quinquepartite; there is no corolla; there are five ſtamina, and two ſtyles. The fruit is a monoſpermous plum. In the male, there is no calyx: the corolla is hexapetalous; there are ſix ſtamina, and an embryo of a piſtillum. There are three ſpecies, all of them deciduous, viz.

1. The Auſtralis or Southern Celtis, a deciduous tree, native of Africa and the South of Europe. 2. The Occidentalis or Weſtern Celtis, a native of Virginia. And 3. The Orientalis or Eaſtern Celtis, a native of Armenia. The two firſt ſpecies grow with large, fair, ſtraight ſtems; their branches are numerous and diffuſe; their bark is of a darkiſh grey colour; their leaves are of a pleaſant green; three or four inches long, deeply ſerrated, end in a narrow point, nearly reſemble the leaves of the common ſtinging-nettle, and continue on the trees till late in the autumn: So that one may eaſily conceive what an agreeable variety theſe trees would make. Add to this, their ſhade is admirable. The leaves are late in the ſpring before they ſhow themſelves; but they make amends for this, by retaining their verdure till near the cloſe of autumn, and then do not reſemble moſt deciduous trees, whoſe leaves ſhow their approaching fall by the change of their colour; but continue to exhibit themſelves of a pleaſant green even to the laſt. Hanbury ſpeaks highly of the celtis as a timber-tree: he ſays, "The wood of the Lote-tree is extremely durable. In Italy they make their flutes, pipes, and other wind-inſtruments of it. With us the coach-makers uſe it for the frames of their vehicles." Millar mentions alſo the wood of the Occidentalis being uſed by the coach-makers. The third ſpecies will grow to about twelve feet; and the branches are numerous, ſmooth, and of a greeniſh colour. The leaves are ſmaller than thoſe of the other ſorts, though they are of a thicker texture, and of a lighter green. The flowers come out from the wings of the leaves, on ſlender foot-ſtalks: They are yellowiſh, appear early in the ſpring, and are ſucceeded by large yellow fruit.

Propagation, &c. All the ſpecies are propagated from ſeeds, which ripen in England, if they have a favourable autumn; but the foreign ſeeds are the moſt certain of producing a crop. Theſe ſeeds ſhould be ſown, ſoon after they are ripe, either in boxes, or in a fine warm border of rich earth, a quarter of an inch deep; and in the following ſpring many of the young plants will appear; though a great part often lie till the ſecond ſpring before they ſhow their heads. If the ſeeds in the beds ſhoot early in the ſpring, they ſhould be hooped, and protected by mats from the froſts, which would nip them in the bud. When all danger from froſts is over, the mats ſhould be laid aſide till the parching beams of the ſun get powerful; when, in the day time, they may be laid over the hoops again, to ſcreen the plants from injury. The mats ſhould be conſtantly taken off every night, and the young plants ſhould never be covered either in rainy or cloudy weather. During the whole ſummer, theſe ſeedlings ſhould be frequently watered in dry weather, and the beds kept clean of weeds, &c. In the autumn, they muſt be protected from the froſts, which often come early in that ſeaſon, and would not fail to deſtroy their tops. The like care ſhould be continued all winter to defend them from the ſame enemies. In this ſeminary they may remain, being kept clean of weeds and watered in dry weather, till the end of June, when they ſhould be taken out of their beds, and planted in others at ſix inches diſtance. And here let no one (continues Hanbury) be ſtartled at my recommending the month of June for this work; for I have found by repeated experience, that the plants will be then almoſt certain of growing, and will continue their ſhoots till the autumn; whereas I have ever perceived, that many of thoſe planted in March, have frequently periſhed, and that thoſe which did grow made hardly any ſhoot that year, and ſhowed the early figure of a ſtunted tree. In June, therefore, let the ground be well dug, and prepared for this work; and let the mould be rich and good: But the operation of removing muſt be deferred till rain comes; and if the ſeaſon ſhould be dry, this work may be poſtponed till the middle of July. After a ſhower, therefore, or a night's rain, let the plants be taken out of their beds, and pricked out at ſix inches diſtance from each other. After this, the beds in which they are planted ſhould be hooped, and covered with mats when the ſun ſhines; but theſe muſt always be taken away at night, as well as in rainy or cloudy weather. With this management, they will have ſhot to a good height by the autumn, and have acquired ſo much hardneſs and ſtrength as to need no farther care than to be kept clear of weeds for two or three years; when they may by planted out in places where they are to remain, or ſet in the nurſery, to be trained up for larger ſtandards. The beſt ſeaſon for planting out theſe ſtandard trees is the latter end of October, or beginning of November; and in performing that operation, the uſual rules muſt be obſerved with care. The ſoil for the lote-tree ſhould be light, and in good heart; and the ſituation ought to be well defended, the young ſhoots being very liable to be deſtroyed by the winter's froſts.

CEMENT, in a general ſenſe, any glutinous ſubſtance capable of uniting and keeping things together in cloſe coheſion. In this ſenſe the word *cement* comprehends mortar, ſolder, glue, *&c.* but has been generally reſtrained to the compoſitions uſed for holding together broken glaſſes, china, and earthen ware. For this purpoſe the juice of garlic is recommended as exceedingly proper, being both very ſtrong, and, if the operation is performed with care, leaving little or no mark. Quicklime and the white of an egg mixed together, and expeditiouſly uſed, are alſo very proper for this purpoſe. Dr Lewis recommends a mixture of quicklime and cheeſe, in the following manner: "Sweet cheeſe ſhaved thin and ſtirred with boiling hot water, changes into a tenacious ſlime which does not mingle with the water. Worked with freſh parcels of hot water, and then mixed upon a hot ſtone with a proper quantity of unſlaked lime, into the conſiſtence of a paſte, it proves a ſtrong and durable cement for wood, ſtone, earthen-ware, and glaſs. When thoroughly dry, which will be in two or three days, it is not in the leaſt acted upon by water. Cheeſe barely beat with quicklime, as directed by ſome of the chemiſts for luting cracked glaſſes, is not near ſo efficacious." A compoſition of the drying oil of linſeed and white-lead is alſo uſed for the ſame purpoſes, but is greatly inferior.

Cement in building, is uſed to denote any kind of mortar of a ſtronger kind than ordinary. The cement commonly uſed is of two kinds; hot, and cold. The hot cement is made of roſin, bees wax, brick duſt, and chalk, boiled together. The bricks to be cemented are heated, and rubbed one upon another, with cement between them. The cold cement is that above deſcribed for cementing china, *&c.* which is ſometimes, though rarely, employed in building.

The ruins of the ancient Roman buildings are found to cohere ſo ſtrongly, that moſt people have imagined the ancients were acquainted with ſome kind of mortar, which, in compariſon of ours, might juſtly be called *cement;* and that to our want of knowledge of the materials they uſed, is owing the great inferiority of modern buildings in their durability. In 1770, one M. Loriot, a Frenchman, pretended to have diſcovered the ſecret of the ancient cement, which, according to him, was no more than a mixture of powdered *quick-lime* with lime which had been long ſlaked and kept under water. The ſlaked lime was firſt to be made up with ſand, earth, brick-duſt, *&c.* into mortar after the common method, and then about a third part of quick-lime in powder was added to the mixture. This produced an almoſt inſtantaneous petrification, ſomething like what is called the *ſetting* of alabaſter, but in a much ſtronger degree; and was poſſeſſed of many wonderful qualities needleſs here to relate, ſeeing it has never been known to ſucceed with any other perſon who tried it. Mr Anderſon, in his eſſays on agriculture, has diſcuſſed this ſubject at conſiderable length, and ſeemingly with great judgment. He is the only perſon we know, who has given any rational theory of the uſes of lime in building, and why it comes to be the proper baſis of all cements. His account is in ſubſtance as follows:

Lime which has been ſlaked and mixed with ſand, becomes hard and conſiſtent when dry, by a proceſs ſimilar to that which produces the natural *ſtalactites* in caverns. Theſe are always formed by water dropping from the roof. By ſome unknown and inexplicable proceſs of nature, this water has diſſolved in it a ſmall portion of calcareous matter in a *cauſtic* ſtate. As long as the water continues covered from the air, it keeps the earth diſſolved in it; it being the natural property of calcareous earths, when deprived of their fixed air, to diſſolve in water. But when the ſmall drop of water comes to be expoſed to the air, the calcareous matter contained in it begins to attract the fixable part of the atmoſphere. In proportion as it does ſo, it alſo begins to ſeparate from the water, and to reaſſume its native form of limeſtone or marble. This proceſs Mr Anderſon calls a *cryſtallization;* and when the calcareous matter is perfectly *cryſtallized* in this manner, he affirms that it is to all intents and purpoſes limeſtone or marble of the ſame conſiſtence as before: and "in this manner (ſays he), within the memory of man, have huge rocks of marble been formed near Matlock in Derbyſhire." If lime in a cauſtic ſtate is mixed with water, part of the lime will be diſſolved, and will alſo begin to cryſtallize. The water which parted with the cryſtallized lime, will then begin to act upon the remainder, which it could not diſſolve before; and thus the proceſs will continue, either till the lime be all reduced to an *effete,* or (as he calls it) *cryſtalline* ſtate, or ſomething hinders the action of the water upon it. It is this cryſtallization which is obſerved by the workmen when a heap of lime is mixed with water, and left for ſome time to macerate. A hard cruſt is formed upon the ſurface, which is ignorantly called *froſting,* though it takes place in ſummer as well as in winter. If therefore the hardneſs of the lime, or its becoming a cement, depends entirely on the formation of its cryſtals, it is evident, that the perfection of the cement muſt depend on the perfection of the cryſtals, and the hardneſs of the matters which are entangled among them. The additional ſubſtances uſed in making of mortar, ſuch as ſand, brick-duſt, or the like, according to Mr Anderſon, ſerve only for a purpoſe ſimilar to what is anſwered by ſticks put into a veſſel full of any ſaline ſolution, namely, to afford the cryſtals an opportunity of faſtening themſelves upon it. If therefore the matter interpoſed between the cryſtals of the lime is of a friable, brittle nature, ſuch as brick duſt or chalk, the mortar will be of a weak and imperfect kind; but when the particles are hard, angular, and very difficult to be broken, ſuch as thoſe of river or pit-ſand, the mortar turns out exceedingly good and ſtrong. Sea-ſand is found to be an improper material for mortar, which Mr Anderſon aſcribes to its being leſs angular than the other kinds. That the cryſtallization may be the more perfect, he alſo recommends a large quantity of water, that the ingredients be perfectly mixed together, and that the drying be as ſlow as poſſible. An attention to theſe circumſtances, he thinks, would make the buildings of the moderns equally durable with thoſe of the ancients; and from what remains of the ancient Roman works, he thinks a very ſtrong proof of his hypotheſis might be adduced. The great thickneſs of their walls neceſſarily required a vaſt length of time to dry. The middle of them was compoſed of pebbles thrown in at random, and which have evidently had mortar ſo thin as to be *poured* in among them. By this means, a great quantity of the lime would be diſſolved, and the cryſtallization performed in the moſt perfect manner; and the indefatigable pains and perſeverance for which the Romans were ſo remarkable in all their undertakings, leave no room to doubt that they would take care to have the ingredients mixed together as well as poſſible. The conſequence of all this is, that the buildings formed in this manner are all as firm as if cut out of a ſolid rock; the mortar being equally hard, if not more ſo, than the ſtones themſelves.

Notwithſtanding the bad ſucceſs of thoſe who have attempted to repeat M. Loriot's experiments, however, Dr Black informs us, that a cement of this kind is certainly practicable. It is done, he ſays, by powdering the lime while hot from the kiln, and throwing it into a thin paſte of ſand and water; which, not flaking immediately, abſorbs the water from the mortar by degrees, and forms a very hard maſs. "It is plain (he adds) that the ſtrength of this mortar depends on uſing the lime hot or freſh from the kiln."

By mixing together gypſum and quick-lime, and then adding water, we may form a cement of tolerable hardneſs, and which apparently might be uſed to advantage in making troughs for holding water, or lining ſmall canals for it to run in. Mr Wiegleb ſays, that a good mortar or cement, which will not crack, may be obtained by mixing three parts of a thin magma of ſlaked lime with one of powdered gypſum; but adds, that it is uſed only in a dry ſituation. A mixture of tarras with ſlacked lime acquires in time a ſtoney hardneſs, and may be uſed for preventing water from entering. See Mortar and Stucco.

Cement, among engravers, jewellers, *&c.* is the ſame with the hot cement uſed in building*; and is uſed for keeping the metals to be engraven firm to the block, and alſo for filling up what is to be chiſſeled.

Cement, in chemiſtry, is uſed to ſignify all thoſe powders and paſtes with which any body is ſurrounded in pots or crucibles, and which are capable by the help of fire of producing changes upon that body. They are made of various materials; and are uſed for different purpoſes, as for parting gold from ſilver, converting iron into ſteel, copper into braſs: and by cementation more conſiderable changes can be effected upon bodies, than by applying to them liquids of any kind; becauſe the active matters are then in a ſtate of vapour, and aſſiſted by a very conſiderable degree of heat.

Cement which quickly hardens in Water. This is deſcribed in the poſthumous works of Mr Hooke, and is recommended for gilding live craw-fiſh, carps, *&c.* without injuring the fiſh. The cement for this purpoſe is prepared, by putting ſome Burgundy pitch into a new earthen pot, and warming the veſſel till it receives ſo much of the pitch as will ſtick round it; then ſtrewing ſome finely powdered amber over the pitch when growing cold, adding a mixture of three pounds of linſeed oil, and one of oil turpentine, covering the veſſel and boiling them for an hour over a gentle fire, and grinding the mixture as it is wanted with as much pumice-ſtone in fine powder as will reduce it to the conſiſtence of paint. The fiſh being wiped dry, the mixture is ſpread upon it; and the gold leaf being then laid on, the fiſh may be immediately put into water again, without any danger of the gold coming off, for the matter quickly grows hard in the water.

Cement-Pots, are thoſe earthen pots uſed in the cementation of metals.

CEMENTATION, the act of corroding or otherwiſe changing a metal by means of a Cement.

CEMETERY (Κοιματηριον, from Κοιμαω to "*ſleep*;") a place ſet apart or conſecrated for the burial of the dead.

Anciently none were buried in churches or churchyards: it was even unlawful to inter in cities, and the cemeteries were without the walls. Among the primitive Chriſtians theſe were held in great veneration. It even appears from Euſebius and Tertullian, that, in the early ages, they aſſembled for divine worſhip in the cemeteries. Valerian ſeems to have confiſcated the cemeteries and other places of divine worſhip, but they were reſtored again by Gallienus. As the martyrs were buried in theſe places, the Chriſtians choſe them for building churches on, when Conſtantine eſtabliſhed their religion; and hence ſome derive the rule which ſtill obtains in the church of Rome, never to conſecrate an altar without putting under it the relics of ſome ſaint. The practice of conſecrating cemeteries is of ſome antiquity. The biſhop walked round it in proceſſion, with the crozier or paſtoral ſtaff in his hand, the holy water-pot being carried before, out of which the aſperſions were made.

CENCHRUS, in botany: A genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 4th order, *Gramina.* The involucrum is laciniated, and echinated, or beſet with ſmall prickles, and biflorous. The calyx is a biflorous glume, with one floret-male, and the other hermaphrodite. The hermaphrodite corolla is a pointleſs glume; there are three ſtamina; one ſeed: the male corolla a pointleſs glume; with three ſtamina.

CENEGILD, in the Saxon Antiquities, an expiatory mulct, paid by one who had killed a man, to the kindred of the deceaſed. The word is compounded of the Saxon *cinne*, i. e. *cognatio*, "relation," and *gild*, *ſolutio*, "payment."

CENOBITE. See Coenobite.

CENOTAPH, in antiquity, an empty tomb, erected by way of honour to the deceaſed. It is diſtinguiſhed from a ſepulchre, in which a coffin was depoſited. Of theſe there were two ſorts; one for thoſe who had, and another for thoſe who had not, been honoured with funeral rites in another place.

The ſign whereby honorary ſepulchres were diſtinguiſhed from others, was commonly the wreck of a ſhip, to denote the deceaſe of the perſon in ſome foreign country.

CENSER, in antiquity, a vaſe containing incenſe to be uſed in ſacrifices. Cenſer is chiefly uſed in ſpeaking

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* See the foregoing article.

ing of the Jewiſh worſhip. Among the Greeks and Romans it is more frequently called *thuribulum*, λιϐανωτις, and *acerra*.

The Jewiſh cenſer was a ſmall ſort of chafing-diſh, covered with a dome, and ſuſpended by a chain. Joſephus tells us, that Solomon made twenty thouſand gold cenſers for the temple of Jeruſalem, to offer perfumes in, and fifty thouſand others to carry fire in.

CENSIO, in antiquity, the act or office of the cenſor. See CENSUS.

Cenſio included both the rating or valuing a man's eſtate, and the impoſing mulcts and penalties.

Censio haſtaria, a puniſhment inflicted on a Roman ſoldier for ſome offence, as lazineſs or luxury, whereby his *haſta* or ſpear was taken from him, and conſequently his wages and hopes of preferment ſtopped.

CENSITUS, a perſon cenſed, or entered in the cenſual table. See CENSUS.

In an ancient monument found at Ancyra, containing the actions of the emperor Octavius, we read,

Quo luſtro civium Romanorum
Cenſita ſunt capita quadragies
Centum millia & ſexaginta tria.

CENSITUS is alſo uſed in the civil law for a ſervile ſort of tenant, who pays capitation to his lord for the land he holds of him, and is entered as ſuch in the lord's rent-roll. In which ſenſe, the word amounts to the ſame with *capite cenſus*, or *capite cenſius*. See *CAPITE Cenſi*

CENSOR, (from *cenſere* to "ſee" or "perceive"), one of the prime magiſtrates in ancient Rome.—Their buſineſs was to regiſter the effects of the Roman citizens, to impoſe taxes in proportion to what each man poſſeſſed, and to take cognizance or inſpection of the manners of the citizens. In conſequence of this laſt part of their office, they had a power to cenſure vice or immorality by inflicting ſome public mark of ignominy on the offender. They had even a power to create the *princeps ſenatus*, and expel from the ſenate ſuch as they deemed unworthy of that office. This power they ſometimes exerciſed without ſufficient grounds; and therefore a law was at length paſſed that no ſenator ſhould be degraded or diſgraced in any manner, until he had been formally accuſed and found guilty by both the cenſors. It was alſo a part of the cenſorian juriſdiction, to fill up the vacancies in the ſenate, upon any remarkable deficiency in their number; to let out to farm all the lands, revenues, and cuſtoms, of the republic; and to contract with artificers for the charge of building and repairing all the public works and edifices both in Rome and the colonies of Italy. In all parts of their office, however, they were ſubject to the juriſdiction of the people; and an appeal always lay from the ſentence of the cenſors to that of an aſſembly of the people.

The firſt two cenſors were created in the year of Rome 311, upon the ſenate's obſerving that the conſuls were ſo much taken up with war, as not to have time to look into other matters. The office continued to the time of the emperors, who aſſumed the cenſorial power, calling themſelves *morem præfecti*; though Veſpaſian, and his ſons took the title of cenſors. Decius attempted to reſtore the dignity to a particular magiſtrate. After this we hear no more of it, till Conſtantine's time, who made his brother cenſor, and he ſeems to have been the laſt that enjoyed the office.

The office of cenſor was ſo conſiderable, that for a long time none aſpired to it till they had paſſed all the reſt; ſo that it was thought ſurpriſing that Craſſus ſhould be admitted cenſor without having been either conſul or Prætor. At firſt the cenſors enjoyed their dignity for five years, but in 420 the dictator Mamertinus made a law reſtraing it to a year and an half, which was afterwards obſerved very ſtrictly. At firſt one of the cenſors was elected out of a patrician, and the other out of a plebeian family; and upon the death of either, the other was diſcharged from his office, and two new ones elected, but not till the next luſtrum. In the year of Rome 622, both cenſors were choſen from among the plebeians; and after that time the office was ſhared between the ſenate and people.—After their election in the Comitia Centurialia, the cenſors proceeded to the capitol, where they took an oath not to manage either by favour or diſaffection, but to act equitably and impartially throughout the whole courſe of their adminiſtration.

The republic of Venice ſtill has a cenſor of the manners of their people, whoſe office laſts ſix months.

CENSORS of Books, are a body of doctors or others eſtabliſhed in divers countries, to examine all books before they go to the preſs, and to ſee they contain nothing contrary to faith and good manners.

At Paris the faculty of theology claim this privilege, as granted to them by the pope; but, in 1624, new commiſſions of four doctors were created, by letters-patent, the ſole cenſors of all books, and anſwerable for every thing contained therein.

In England, they had formerly an officer of this kind, under the title of licenſer of the preſs: but, ſince the revolution the preſs has been laid under no ſuch reſtraint.

CENSORINUS, a celebrated writer in the third century, well known by his treatiſe *De Die Natali*. This treatiſe, which was written about the year 238, Gerard Voſſius calls a little book of gold; and declares it to be a moſt learned work of the higheſt uſe and importance to chronologers, ſince it connects and determines with great exactneſs, ſome of the principal æras in pagan hiſtory. It was printed at Cambridge, with the notes of Lindenbrokius, in 1695.

CENSURE, a judgment which condemns ſome book, perſon, or action, or, more particularly, a reprimand from a ſuperior. Eccleſiaſtical cenſures are penalties by which, for ſome remarkable miſbehaviour, Chriſtians are deprived of the communion of the church, or prohibited to execute the ſacerdotal office.

CENSUS, in Roman antiquity, an authentic declaration made before the cenſors, by the ſeveral ſubjects of the empire, of their reſpective names and places of abode. This declaration was regiſtered by the cenſors; and contained an enumeration, in writing, of all the eſtates, lands, and inheritances they poſſeſſed; their quantity, quality, place, wives, children, domeſtics, tenants, ſlaves. In the provinces the cenſus ſerved not only to diſcover the ſubſtance of each perſon, but where, and in what manner and proportion, taxes might be beſt impoſed. The cenſus at Rome is commonly thought to have been held every five years; but Dr Middleton hath ſhown, that both cenſus and luſtrum were held irregularly and uncertainly at various intervals. The cenſus was an excellent expedient for diſcovering the ſtrength of the ſtate: for by it they diſcovered the number of the citizens, how many were fit for war, and how many for offices of other kinds; how much each was able to pay of taxes, *&c.* It went through all ranks of people, though under different names: that of the common people was called *cenſus*; that of the knights, *cenſus, recenſio, recognitio*; that the ſenators, *lectio, relectio*.—Hence alſo *cenſus* came to ſignify a perſon who had made ſuch a declaration; in which ſenſe it was oppoſed to *incenſus*, a perſon who had not given in his eſtate, or name, to be regiſtered.

The cenſus, according to Salmaſius, was peculiar to the city of Rome. That in the provinces was properly called *profeſſio* and απογραφη. But this diſtinction is not every where obſerved by the ancients themſelves.

CENSUS was alſo uſed for the book or regiſter wherein the profeſſions of the people were entered: In which ſenſe the cenſus was frequently cited and appealed to, as evidence in the courts of juſtice.

CENSUS is alſo uſed to denote a man's whole ſubſtance or eſtate.

CENSUS Senatorius, the patrimony of a ſenator, which was limited to a certain value; being at firſt rated at eight hundred thouſand ſeſterces, but afterwards, under Auguſtus, enlarged to twelve hundred thouſand.

CENSUS Equeſter, the eſtate or patrimony of a knight, rated at four hundred thouſand ſeſterces, which was required to qualify a perſon for that order, and without which no virtue or merit was available.

CENSUS was alſo uſed for a perſon worth an hundred thouſand ſeſterces, or who was entered as ſuch in the cenſual tables on his own declaration. In which ſenſe, cenſus amounts to the ſame with *claſſicus*, or a man of the firſt claſs; though Gellius limits the eſtate of thoſe of this claſs to an hundred and twenty-five thouſand aſſes. By the Voconian law, no cenſus was allowed to give by his will above a fourth part of what he was worth to a woman.

CENSUS was alſo uſed to denote a tax or tribute impoſed on perſons, and called alſo capitation. See *CAPITE Cenſi*.

CENSUS Dominicatus, in writers of the lower age, denotes a rent due to the lord.

CENSUS Duplicatus, a double rent or tax, paid by vaſſals to their lord on extraordinary or urgent occaſions; as expeditions to the Holy Land, &c.

CENSUS Eccleſiæ Romanæ, was an annual contribution voluntarily paid to the ſee of Rome by the ſeveral princes of Europe.

CENT, ſignifies properly an hundred, being an abridgement of the word *centum*; but is often uſed in commerce to expreſs the profit or loſs ariſing from the ſale of any commodity: ſo that when we ſay there is 10 *per cent.* profit, or 10 *per cent.* loſs, upon any merchandize that has been ſold, it is to be underſtood, that the ſeller has either gained or loſt ten pounds on every hundred pounds of the price at which he bought that merchandize; which is $\frac{1}{10}$ of profit, or $\frac{1}{10}$ of loſs, upon the total of the ſale.

CENTAUREA, in botany: A genus of the polygamia fruſtanea order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is briſtly; the pappus ſimple; the corollulæ of the radius funnel-ſhaped, longer than thoſe of the diſk, and irregular.

CENTAUR, in aſtronomy, a part or moiety of a ſouthern conſtellation, in form half-man half-horſe; uſually joined with the wolf. The word comes from κενταυρος, formed of κεντεω, *pungo*; ταυρος, *bull*; q. d. *bull pricker*. The ſtars of this conſtellation, in Ptolemy's Catalogue are 37; in Tycho's 4; and in the Britannic Catalogue, with Sharp's Appendix, 35.

CENTAURS, in mythology a kind of fabulous monſters, half men, and half horſes. The poets pretend that the centaurs were the ſons of Ixion and a cloud; the reaſon of which fancy is, that they retired to a caſtle called νεφελη, which ſignifies a "cloud."—This fable is differently interpreted; ſome will have the centaurs to have been a body of ſhepherds and herdſmen, rich in cattle, who inhabited the mountains of Arcadia, and to whom is attributed the invention of bucolic poetry. Palæphætus, in his book of incredibles, relates, that under the reign of Ixion, king of Theſſaly, a herd of bulls on mount Theſſaly run mad, and ravaged the whole country, rendering the mountains inacceſſible; that ſome young men who had found the art of taming and mounting horſes undertook to clear the mountains of theſe animals, which they purſued on horſeback, and thence obtained the appellation of *Centaurs*. This ſucceſs rendering them inſolent, they inſulted the Lapithæ, a people of Theſſaly: and becauſe when attacked they fled with great rapidity, it was ſuppoſed they were half horſes and half men.—The Centaurs in reality were a tribe of Lapithæ, who inhabited the city Pelethronium adjoining to mount Pelion, and firſt invented the art of breaking horſes, as is intimated by Virgil.

CENTAUREA, GREATER CENTAURY: A genus of the polygamia fruſtanea order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is briſtly, the pappus ſimple, the corollulæ of the radius funnel-ſhaped, longer than thoſe of the diſk, and irregular. There are 61 ſpecies. The root of one of them called *glaſtifolia*, is an article in the materia medica. It has a rough, ſomewhat acrid taſte, and abounds with a red viſcid juice. Its rough taſte has gained it ſome eſteem as an aſtringent; its acrimony as an aperient; and its glutinous quality as a vulnerary: but the preſent practice takes very little notice of it in any intention. Another of the ſpecies in the cyanus or blue bottle, which grows commonly among corn. The expreſſed juice of this flower ſtains linen of a beautiful blue colour, but is not permanent. Mr Boyle ſays that the juice of the inner petals, with a little alum, makes a beautiful permanent colour, equal to ultramarine.

Leſſer CENTAURY. See GENTIANA.

CENTELLA, in botany: A genus of the tetrandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The male involucrum is tetraphyllous and quinqueflorous, with four petals; the female in-

involucrum is diphyllous and uniflorous; the petals four; the germen inferior; two ſtyles; and a bilocular ſeed-caſe.

CENTENARIUS, or Centenario, in the middle age, an officer who had the government or command, with the adminiſtration of juſtice, in a village. The centenarii as well as vicarii were under the juriſdiction and command of the court. We find them among the Franks, Germans, Lombards, Goths, &c.

Centenarius was alſo uſed for an officer who had the command of 100 men; moſt frequently called a Centurion.

Centenarius, in monaſteries, was an officer who had the command of 100 monks.

CENTENINUM ovum, among naturaliſts, denotes a ſort of hen's egg much ſmaller than ordinary, vulgarly called a *cock's egg;* from which it has been fabulouſly held that the cockatrice or baſiliſk is produced. The name is taken from an opinion, that theſe are the laſt eggs which hens lay, having laid 100 before; whence *centeninum,* q. d. the hundredth egg.—Theſe eggs have no yolks, but in other reſpects differ not from common ones; having the albumen, chalazes, membranes, &c. in common with others. In the place of the yolk is found a little body like a ſerpent coiled up, which doubtleſs gave riſe to the fable of the baſiliſk's origin from thence. Their origin is with probability aſcribed by Hervey to this, that the yolks in the vitellary of the hen are exhauſted before the albumina.

CENTER, or Centre, in a general ſenſe, ſignifies a point equally diſtant from the extremities of a line, figure, or body. The word is formed from the Greek κεντρον, a *point.*

Center of Gravity, in mechanics, that point about which all the parts of a body do in any ſituation exactly balance each other.

Center of Motion, that point which remains at reſt, while all the other parts of a body move about it.

Center of a Sphere, a point in the middle, from which all lines drawn to the ſurface are equal.

Hermes Triſmegiſtus defines God an intellectual ſphere, whoſe center is every where, and circumference no where.

CENTESIMA usura, that wherein the intereſt in an hundred months became equal to the principal; *i. e.* when the money is laid out at one *per cent.* per month; anſwering to what in our ſtyle would be called 12 *per cent.* for the Romans reckoned their intereſt not by the year, but by the month.

CENTESIMATION, a milder kind of military puniſhment, in caſes of deſertion, mutiny, and the like, where only every hundredth man is executed.

CENTILOQUIUM, denotes a collection of 100 ſentences, opinions, or ſayings.

The centiloquium of Hermes, contains 100 aphoriſms, or aſtrological ſentences, ſuppoſed to have been written by ſome Arab, falſely fathered on Hermes Triſmegiſtus. It is only extant in Latin, in which it has ſeveral times been printed.—The centiloquium of Ptolemy is a famous aſtrological piece, frequently confounded with the former, conſiſting likewiſe of 100 ſentences or doctrines, divided into ſhort aphoriſms, intitled alſo in Greek καρπος, as being the fruit or reſult of the former writings of that celebrated aſtronomer, *viz.* his *quadripartitum* and *almageſtum*; or rather, by reaſon that herein is ſhown the uſe of aſtrological calculations.

CENTIPES, in zoology. See Scolopendra.

CENTIPED worm, a term uſed for ſuch worms as have a great many feet, though the number does not amount to 100, as the term ſeems to import.—M. Maloet relates the hiſtory of a man, who, for three years, had a violent pain in the lower part of the forehead near the root of the noſe: at length he felt an itching, and afterwards ſomething moving within his noſtril, which he brought away with his finger; it was a worm of the centiped kind, an inch and an half long, which run ſwiftly. It lived five or ſix days among tobacco. The patient was free of his pain ever after. Mr Littre mentioned a like caſe in 1708, of a larger centiped voided at the noſe, after it had thrown the woman, in whoſe frontal ſinus it was, into convulſions, and had almoſt deprived her of her reaſon.

CENTLIVRE, (Suſanna) a celebrated comic writer, was the daughter of Mr Freeman of Holbeach, in Lincolnſhire, England; and had ſuch an early turn for poetry, that it is ſaid ſhe wrote a ſong before ſhe was ſeven years old. Before ſhe was twelve years of age, ſhe could not only read Moliere in French, but enter into the ſpirit of all the characters. Her father dying, left her to the care of a ſtep-mother; whoſe treatment not being agreeable to her, ſhe determined, though almoſt deſtitute of money and every other neceſſary, to go up to London to ſeek a better fortune than what ſhe had hitherto experienced. As ſhe was proceeding on her journey on foot, ſhe was met by a young gentleman from the univerſity of Cambridge, the afterwards well-known Anthony Hammond, Eſq; who was ſo extremely ſtruck with her youth and beauty, that he fell inſtantly in love with her; and inquiring into the particulars of her ſtory, ſoon prevailed upon her unexperienced innocence to ſeize on the protection he offered her, and go with him to Cambridge. After ſome months cohabitation, he perſuaded her to come to London; where, in a ſhort time ſhe was married to a nephew of Sir Stephen Fox. But that gentleman not living with her above a twelvemonth, her wit and beauty ſoon procured her a ſecond huſband, whoſe name was Carrol and who was an officer in the army; but he having the misfortune to be killed in a duel about a year and an half after their marriage, ſhe became a ſecond time a widow. For the ſake of ſupport ſhe now applied to her pen, and became a votary of the muſes; and it is under this name of Carrol that ſome of her earlier pieces were publiſhed. Her firſt attempt was in tragedy, in a play called the *Perjured Huſband;* yet her natural vivacity leading her afterwards to comedy, we find but one more attempt in the buſkin among 18 dramatic pieces which ſhe afterwards wrote.

In 1706, ſhe wounded the heart of one Mr Joſeph Centlivre, yeoman of the mouth, or in other words principal cook to her Majeſty, who married her; and, after paſſing ſeveral years happily together, ſhe died at his houſe in Spring-Garden, Charing-Croſs, in December 1723.

This lady for many years enjoyed the intimacy and eſteem of the moſt eminent wits of the times, viz. Sir Richard Steele, Mr Rowe, Budgell, Farquhar, Dr Sewell, &c. and very few authors received more tokens of eſteem and patronage from the great. With regard to her merit as a writer, it muſt be allowed that her plays do not abound with wit, and that the language of them is ſometimes even poor, enervate, incorrect, puerile; but then her plots are buſy and well conducted, and her characters in general natural and well marked.

CENTNER, or Docimastic Hundred, in metallurgy and aſſaying, is a weight diviſible, firſt into an hundred, and thence into a greater number of other ſmaller parts; but though the word is the ſame both with the aſſayers and metallurgiſts, yet it is to be underſtood as expreſſing a very different quantity in their different acceptation of it. The weights of the metallurgiſts are eaſily underſtood, as being of the common proportion, but thoſe of the aſſayers are a thouſand times ſmaller than theſe, as the portions of metals or ores examined by the aſſayers are uſually very ſmall.

The metallurgiſts, who extract metals out of their ores, uſe a weight divided into an hundred equal parts, each part a pound; the whole they call a *centner* or *hundred weight*; the pound is divided into thirty-two parts, or half ounces, and the half ounce into two quarters of ounces, and theſe each into two drams.

Theſe diviſions and denominations of the metallurgiſts are eaſily underſtood; but the ſame words, tho' they are equally uſed by aſſayers, with them expreſs very different quaintities; for as the centner of the metallurgiſts contains an hundred pounds, the centner of the aſſayers is really no more than one dram, to which the other parts are proportioned.

As the aſſayers weights are divided into ſuch an extreme degree of minuteneſs, and are ſo very different from all the common weights, the aſſayers uſually make them themſelves in the following manner, out of ſmall ſilver, or fine ſolder plates, of ſuch a ſize, that the mark of their weight, according to the diviſion of the dram, which is the *docimaſtic* or aſſaying *centner*, may be put upon them. They firſt take for a baſis one weight, being about two-thirds of a common dram: this they mark (64*lb.*) Then having at hand ſome granulated lead, waſhed clean, well dried, and ſifted very fine, they put as much of it into one of the ſmall diſhes of a fine balance as will equipoiſe the (64*lb.*) as it is called, juſt mentioned: then dividing this granulated lead into very nice halves, in the two ſcales, after taking out the firſt ſilver weight, they obtain a perfect equilibrium between the two ſcales; they then pour the granulated lead out of one diſh of the ſcales, and inſtead of it put in another ſilver weight, which they make exactly equiponderant with the lead in the other ſcale, and mark it (32*lb.*) If this ſecond weight, when firſt put into the ſcale, exceed by much the weight of the lead, they take a little from it by a very fine file; but when it comes very near, they uſe only a whetſtone to wear off an extremely ſmall portion at a time. When it is brought to be perfectly even and equal to the lead, they change the ſcales to ſee that no error has been committed, and then go on in the ſame manner till they have made all the diviſions, and all the ſmall weights. Then to have an entire centner or hundred weight, they add to the (64*lb.*) as they call it, a 32*lb.* and a 4*lb.* and weighing againſt them one ſmall weight, they make it equal to them, and mark it (100). This is the docimaſtical, or aſſaying centner, and is really one dram.

CENTO, in poetry, a work wholly compoſed of verſes or paſſages promiſcuouſly taken from other authors, only diſpoſed in a new form and order.—Proba Falconia has written the life of Jeſus Chriſt in centos taken from Virgil. Alexander Roſs has done the like in his Chriſtrados, and Stephen de Pleure the ſame.

CENTONARII, in antiquity, certain of the Roman army, who provided different ſorts of ſtuff called centones, made uſe of to quench the fire which the enemies engines threw into the camp.

Theſe centonarii kept with the carpenters and other officers of artillery.

CENTRAL forces, the powers which cauſe a moving body to tend towards, or recede from, the center of motion. See Mechanics.

Central Rule, a rule diſcovered by Mr Thomas Baker, whereby to find the centre of a circle deſigned to cut the parabola in as many points as an equation to be conſtructed hath real roots. Its principal uſe is in the conſtruction of equations, and he hath applied it with good ſucceſs as far as biquadratics.

The central rule is chiefly founded on this property of the parabola, that, if a line be inſcribed in that curve perpendicular to any diameter, a rectangle formed of the ſegments of the inſcript is equal to the rectangle of the intercepted diameter and parameter of the axis.

The central rule has the advantage over Cartes and De Latere's methods of conſtructing equations, in that both theſe are ſubject to the trouble of preparing the equation by taking away the ſecond term.

CENTRIFUGAL force, that force by which all bodies that move round any other body in a curve endeavour to fly off from the axis of their motion in a tangent to the periphery of the curve, and that in every part of it. See Mechanics.

Centrifugal-Machine, a very curious machine, invented by Mr Erſkine, for raiſing water by means of a centrifugal force combined with the preſſure of the atmoſphere.

It conſiſts of a large tube of copper, *&c.* in the form of a croſs, which is placed perpendicular in the water, and reſts at the bottom on a pivot. At the upper part of the tube is a horizontal cog-wheel, which touches the cogs of another in a vertical poſition; ſo that by the help of a double winch, the whole machine is moved round with very great velocity.

Near the bottom of the perpendicular part of the tube is a valve opening upwards; and near the two extremities, but on the contrary ſides of the arms, or croſs part of the tube, are two other valves opening outwards. Theſe two valves are, by the aſſiſtance of ſprings, kept ſhut till the machine is put in motion, when the centrifugal velocity of the water forces them open, and diſcharges itſelf in a ciſtern or reſervoir placed there for that purpoſe.

On the upper part of the arms are two holes, which are cloſed by pieces ſcrewing into the metal of the tube. Before the machine can work, theſe holes muſt be opened, and water poured in through them, till the whole tube be full: by this means all the air will be forced out of the machine, and the water ſupported in the tube by means of the valve at the bottom.

The tube being thus filled with water, and the holes cloſed by their ſcrew caps, it is turned round by means of the winch, when the water in the arms of the tube acquires a centrifugal force, opens the valves near the extremities of the arms, and flies out with a velocity nearly equal to that of the extremities of the ſaid arms.

Plate CXXXVI.

The above deſcription will be very eaſily underſtood by the figure we have added on Plate CXXXVI. which is a perſpective view of the centrifugal machine, erected on board a ſhip. ABC is the copper tube. D, a horizontal cog-wheel, furniſhed with twelve cogs. E, a vertical cog-wheel, furniſhed with thirty-ſix cogs. F, F, the double winch. *a*, the valve near the bottom of the tube. *b*, *b*, the two pivots on which the machine turns. *c*, one of the valves in the croſs-piece; the other at *d*, cannot be ſeen in this figure, being on the other ſide of the tube. *e*, *e*, the two holes through which the water is poured into the machine. GH, the ciſtern or reſervoir. I, I, part of the ſhip's deck. The diſtance between the two valves, *c*, *d*, is ſix feet. The diameter of theſe valves is about three inches; and that of the perpendicular tube about ſeven inches.

If we ſuppoſe the men who work the machines can turn the winch round in three ſeconds, the machine will move round its axis in one ſecond; and conſequently each extremity of the arms will move with a velocity of 18.8 feet in a ſecond. Therefore a column of water of three inches diameter will iſſue through each of the valves with a velocity of 18.8 feet in a ſecond: but the area of the aperture of each of the valves is 7.14 inches; which being multiplied by the velocity in inches=225.6, gives 1610.784 cubic inches, the quantity of water diſcharged through one of the apertures in one ſecond; ſo that the whole quantity diſcharged in that ſpace of time through both the apertures is=3221.568 inches; or 193294.08 cubic inches in one minute. But 60812 cubic inches make a tun, beer-meaſure; conſequently, if we ſuppoſe the centrifugal machine revolves round its axis in one ſecond, it will raiſe nearly 3 tuns 44 gallons in one minute: but this velocity is certainly too great, at leaſt to be held for any conſiderable time; ſo that, when this and other deficiences in the machine are allowed for, two tuns is nearly the quantity that can be raiſed by it in one minute.

It will perhaps be unneceſſary to obſerve, that as the water is forced up the perpendicular tube by the preſſure of the atmoſphere, this machine cannot raiſe water above 32 feet high.

An attempt was made to ſubſtitute this machine in place of the pumps commonly uſed on ſhip-board, but the labour of working was found to be ſo great as to render the machine inferior to the chain-pump. A conſiderable improvement, we apprehend, would be, to load with a weight of lead the ends of the tubes thro' which the water iſſues, which would make the machine turn with a great deal more eaſe, as the centrifugal force of the lead would in ſome meaſure act the part of a fly.

CENTRIPETAL FORCE, that force by which a body is every where impelled, or any how tends, towards ſome point as a centre. See MECHANICS.

CENTRISCUS, in ichthyology, a genus of fiſhes belonging to the order of amphibia nantes. The head gradually ends in a narrow ſnout, the aperture is broad and flat; the belly is carinated; and the belly-fins united. There are two ſpecies, *viz.* 1. The ſcutatus has its back covered with a ſmooth bony ſhell, which ends in a ſharp ſpine under which is the tail; but the back fins are between the tail and the ſpine. It is a native of the Eaſt Indies. 2. The ſcolopax has a rough ſcabrous body, and a ſtraight extended tail. It has two belly-fins, with four rays in each, and has no teeth. It is found in the Mediterranean.

CENTRONIA, in natural hiſtory, a name by which the echini marini have been lately diſtinguiſhed. Dr Hill makes them a diſtinct claſs of animals living under the defence of ſhelly coverings formed of one piece, and furniſhed with a vaſt number of ſpines moveable at the creature's pleaſure.

CENTUMCELLÆ, (anc. geog.) Trajan's villa in Tuſcany, on the coaſt, three miles from Algæ; with an excellent port, called *Trajanus Portus*, (Ptolemy); and a factitious iſland at the mouth of the port, made with a huge block of ſtone, on which two turrets roſe, with two entrances into the baſon or harbour, Rutilius. Now *Civita Vecchia*. E. Long. 12. 30. N. Lat. 42.

CENTUMVIRI, in Roman antiquity, judges appointed to decide common cauſes among the people: they were choſen, three out of each tribe; and though five more than an hundred, were nevertheleſs called *centumviri*, from the round number *centum*, an hundred.

CENTUNCULUS, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 20th order, *Rotaceæ*. The calyx is quadrifid; the corolla quadrifid, and patent; the ſtamina are ſhort; the capſule is unilocular, cut round, or parting horizontally.

CENTURION, among the Romans, an officer in the infantry, who commanded a century, or an hundred men.

In order to have a proper notion of the centurions, it muſt be remembered, that every one of the thirty manipuli * in a legion was divided into two *ordines*, or ranks; and conſequently the three bodies of the haſtati, principes, and triarii, into 20 orders a piece, as into 10 manipuli. Now, every manipulus was allowed two centurions, or captains, one to each order or century: and, to determine the point of priority between them, they were created at two different elections. The 30 who were made firſt always took the precedency of their fellows: and therefore commanded the right-hand orders, as the others did the left. The triarii, or *pilani*, ſo called from their weapon the *pilum*, being eſteemed the moſt honourable, had their centurions elected firſt, next to them the principes, and afterwards the haſtati; whence they were called *primus et ſecundus pilus*, *primus et ſecundus princeps*, *primus et ſecundus haſtatus*; and ſo on. Here it may be obſerved, that *primi ordines* is ſometimes uſed in hiſtorians for the centu-

* See *Manipulus*.

rions of theſe orders ; and the centurions are ſometimes ſtyled *principes ordinum*, and *principes centurionum*. We may take notice too what a large field there lay for promotion : firſt through all the orders of the haſtati ; then quite through the principes ; and afterwards from the laſt order of the triarii to the primipilus, the moſt honourable of the centurions, and who deſerves to be particularly deſcribed This officer, beſides his title of primipilus, went under the ſeveral titles of *dux legionis*, *præfectus legionis*, *primus centurionum*, and *primus centurio* ; and was the firſt centurion of the triarii in every legion. He preſided over all the other centurions, and generally gave the word of command by order of the tribunes. Beſides this, he had the care of the eagle, or chief ſtandard, of the legion : hence, *aquilæ præeſſe*, is to bear the dignity of primipilus ; and hence *aquila* is taken by Pliny for the ſaid office. Nor was this ſtation only honourable, but very profitable too : for he had a ſpecial ſtipend allowed him, probably as much as a knight's eſtate ; and, when he left that charge, was reputed equal to the members of the equeſtrian order, bearing the title of *primipilarius*, in the ſame manner as thoſe who had diſcharged the greateſt civil offices were ſtyled ever after, *conſulares*, *cenſorii*, &c.

CENTURIPÆ, Centoripa, or Centuripe, (anc. geog) a town in the ſouth-weſt of the territory of Etna, on the river Cyamaſorus : Now *Centorbi*, or *Centurippi*. It was a democratical city, which, like Syracuſe, received its liberty from Timoleon. Its inhabitants cultivated the fine arts, particularly ſculpture and engraving. In digging for the remains of antiquities, cameos are no where found in ſuch abundance as at Centurippi and its environs. The ſituation of the place is romantic : it is built on the ſummit of a vaſt group of rocks, which was probably choſen as the moſt difficult of acceſs, and conſequently the propereſt in times of civil commotion. The remains ſtill exiſting of its ancient bridge are a proof of its having been a conſiderable city. Cicero ſpeaks of it as ſuch. It was taken by the Romans, plundered and oppreſſed by Verres, deſtroyed by Pompey, and reſtored by Octavius, who made it the reſidence of a Roman colony.

CENTURY, in a general ſenſe, any thing divided into, or conſiſting of, an hundred parts.

The marquis of Worceſter publiſhed a *Century* of inventions, (for a ſpecimen of which, ſee Acoustics, n° 27.) ; and Dr Hooke has given a *decimate* of inventions, as part of a *Century*, of which he affirmed himſelf maſter. It is remarkable, that both in the century of the former, and the decimate of the latter, we find the principle on which Savary's fire or ſteam engine is founded. See *Steam-Engine*.

Century in antiquity. The Roman people, when they were aſſembled for the electing of magiſtrates, enacting of laws, or deliberating upon any public affair, were always divided into centuries, and voted by centuries, in order that their votes might be the more eaſily collected, whence theſe aſſemblies were called *comitia centuriata*. The Roman cohorts were alſo divided into centuries. See Centurion and Cohort.

Century, in chronology, the ſpace of one hundred years. This method of computing by centuries is generally obſerved in church hiſtory, commencing from the time of our Saviour's incarnation : in which ſenſe we ſay the firſt century, the ſecond century, &c.

Centuries of Magdeburg, a famous eccleſiaſtical hiſtory, ranged into 13 centuries, carried down to the year 1298, compiled by ſeveral hundred proteſtants of Magdeburg, the chief of whom was Flacius Illyricus.

CENTUSSIS, in Roman antiquity, a coin containing 100 aſſes.

CENTZONTLI, in ornithology, the Mexican name of the *Turdus polyglottus*. See Turdus.

CEODES, in botany : A genus of the diœcia order, belonging to the polygamia claſs of plants. There is no calyx ; the corolla is monopetalous, with a ſhort turbinated tube ; the ſtamina are ten ſubulated filaments ; the antheræ roundiſh.

CEORLES, the name of one of the claſſes or orders into which the people were diſtinguiſhed among the Anglo-Saxons. The ceorles, who were perſons completely free, and deſcended from a long race of freemen, conſtituted a middle claſs between the labourers and mechanics (who were generally ſlaves, or deſcended from ſlaves) on the one hand, and the nobility on the other. They might go where they pleaſed, and purſue any way of life that was moſt agreeable to their humour ; but ſo many of them applied to agriculture, and farming the lands of the nobility, that a ceorl was the moſt common name for a huſbandman or farmer in the Anglo-Saxon times. Theſe ceorls, however, ſeem in general to have been a kind of gentlemen farmers ; and if any one of them proſpered ſo well as to acquire the property of five hides of land, upon which he had a church, a kitchen, a bell-houſe, and great gate, and obtained a ſeat and office in the king's court, he was eſteemed a nobleman or thane. If a ceorl applied to learning, and attained to prieſt's orders, he was alſo conſidered as a thane ; his weregild, or price of his life, was the ſame, and his teſtimony had the ſame weight in a court of juſtice. When he applied to trade, and made three voyages beyond ſea, in a ſhip of his own, and with a cargo belonging to himſelf, he was alſo advanced to the dignity of a thane. But if a ceorl had a greater propenſity to arms than to learning, trade, or agriculture, he then became the ſithcundman, or military retainer, to ſome potent and warlike earl, and was called the *húſcarle* of ſuch an earl. If one of theſe huſcarles acquitted himſelf ſo well as to obtain from his patron either five hydes of land, or a gilt ſword, helmet, and breaſtplate, as a reward of his valour, he was likewiſe conſidered as a thane. Thus the temple of honour ſtood open to theſe ceorls, whether they applied themſelves to agriculture, commerce, letters, or arms, which were then the only profeſſions eſteemed worthy of a freeman.

CEOS, Cea, Cia, or Cos, (anc. geog.) one of the Cyclades, lies oppoſite to the promontory of Achaia called *Sunium*, and is 50 miles in compaſs. This iſland is commended by the ancients for its fertility and richneſs of its paſtures. The firſt ſilk ſtuffs, if Pliny and Solinus are to be credited, were wrought here. Ceos was particularly famous for the excellent figs it produced. It was firſt peopled by Ariſtæus, the ſon of Apollo and Cyrene, who, being grieved for the death of his ſon Actæon, retired from Thebes, at the perſuaſion of his mother, and went over with ſome Thebans

bans to Ceos, as that time uninhabited. Diodorus Siculus tells us, that he retired to the iſland of Cos; but the ancients, as Servius obſerves, called both theſe iſlands by the name Cos. Be that as it will, the iſland of Ceos became ſo populous, that a law prevailed there, commanding all perſons upwards of ſixty to be poiſoned, that others might be able to ſubſiſt; ſo that none above ſixty were to be ſeen in the iſland, being obliged, after they arrived at that age, either to ſubmit to the law, or abandon the country, together with their effects. Ceos had, in former times, four famous cities, viz. Julis, Carthæa, Coreſſus, and Præeſſa. The two latter were, according to Pliny, ſwallowed up by an earthquake. The other two flouriſhed in Strabo's time. Carthæa ſtood on a riſing ground, at the end of a valley, about three miles from the ſea. The ſituation of it agrees with that of the preſent town of Zia, which gives name to the whole iſland. The ruins both of Carthæa and Julis are ſtill remaining; thoſe of the latter take up a whole mountain, and are called by the modern inhabitants Polis, that is, *the city*. Near this place are the ruins of a ſtately temple, with many pieces of broken pillars, and ſtatues of moſt exquiſite wormanſhip. The walls of the city were of marble, and ſome pieces are ſtill remaining above 12 feet in length. Julis was, according to Strabo, the the birth place of Simonides, Bacchylides, Eraſiſtratus, and Ariſto. The Oxford marbles tell us, that Simonides, the ſon of Leoprepis, invented a ſort of artificial memory, the principles of which he explained at Athens, and add, that he was deſcended of another Simonides, who was a poet no leſs renowned than himſelf. One of theſe two poets invented thoſe melancholly verſes which were ſung at funerals, and are called by the Latins *næniæ*. Strabo ſays, that the Athenians, having beſieged the city of Julis, raiſed the ſiege, upon advice that the inhabitants had reſolved to murder all the children under a certain age, that uſeful perſons might not be employed in looking after them. Ceos was, with the other Greek iſlands, ſubdued by the Romans, and beſtowed upon the Athenians by Marc Anthony the triumvir, together with Egina, Tinos, and ſome other adjoining iſlands, which were all reduced to one Roman province by Veſpaſian. The iſland is now called *Zea*.

CEPA, the ONION. See ALLIUM.

CEPHALANTHUS, BUTTON-WOOD: A genus of the monogynia order, belonging to tetrandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ.* There is no common calyx; the proper one is ſuperior, and funnel-ſhaped; the receptacle globoſe and naked, with one downy ſeed. There is only one ſpecies, the *Occidentalis*; a deciduous ſhrub native of North-America. It grows to about five or ſix feet high; and is not a very buſhy plant, as the branches are always placed thinly in proportion to the ſize of the leaves, which will grow more than three inches long, and one and a half broad, if the trees are planted in a ſoil they like. The leaves ſtand oppoſite by pairs on the twigs, and alſo ſometimes by threes, and are of a light green colour: Their upper ſurface is ſmooth; they have a ſtrong nerve running from the foot-ſtalk to the point, and ſeveral others from that on each ſide to the borders: Theſe, as well as the foot-ſtalk, in the autumn dye to a reddiſh colour. The flowers, which are aggregate flowers, properly ſo called, are produced at the ends of the branches, in globular heads, in July. The florets which compoſe theſe heads are funnel-ſhaped, of a yellow colour, and faſtened to an axis which is in the middle.—The cephalanthus is propagated from ſeeds, which are exported to Great-Britain. Theſe ſhould be ſown as ſoon as they arrive, and there will be a chance of their coming up the firſt ſpring; though they often lie till the ſpring after before they make their appearance. They may be ſown in good garden mould of almoſt any ſoil, if ſomewhat moiſt the better, and ſhould be covered about a quarter of an inch deep. This ſhrub is alſo propagated by layers. If the young ſhoots are laid in autumn, they will have ſtruck good root by the autumn following, and may be then taken up, and ſet in the places where they are deſigned to remain. Cuttings of this tree, alſo, planted in the autumn in a rich, light, moiſt ſoil, will grow; and by that means alſo plenty of theſe plants may be ſoon obtained.

CEPHALIC, in a general meaning, ſignifies any thing belonging to the head.

CEPHALIC Medicines, are remedies for diſorders of the head. Cordials are comprehended herein, as are alſo whatever promotes a free circulation of the blood through the brain.

Except when the diſorder ariſes from exceſs of heat, or an inflammatory diſpoſition in the head, moiſt topicals ſhould never be uſed; but always dry ones.

To rub the head after it is ſhaved proves an inſtantaneous cure for a cephalalgia, a ſtuffing of the head, and a weakneſs of the eyes, ariſing from a weak and relaxed ſtate of the fibres. And as by every freſh evacuation of the humours their quantity is not only leſſened, but alſo their recrementitious parts derived thither, the more frequently the head is ſhaved, the larger quantity of humour is diſcharged; ſo that the frequent ſhaving of the head and beard is likewiſe a perpetual bliſter; and in as much as it is uſeful, it is a cephalic.

CEPHALIC Vein, in anatomy, creeps along the arm between the ſkin and the muſcles, and divides it into two branches: the external goes down to the wriſt, where it joins the baſilica, and turns up to the back of the hand; the internal branch, together with a ſmall one of the baſilica, makes the mediana.

The ancients uſed to open this vein for diſorders of the head, for which reaſon it bears this name; but a better acquaintance with the circulation of the blood informs us, that there is no foundation for ſuch a notion.

CEPHALENIA, or CEPHALLENIA, an iſland of the Ionian ſea between Ithaca and Zacynthus, known in Homer's time by the names of Samus and Epirus Melæna, is about eighty miles in length, forty in breadth, and a hundred and thirty in compaſs. It had anciently four cities, one of which bore the name of the iſland. Strabo tells us, that in his time there were only two cities remaining; but Pliny ſpeaks of three; adding, that the ruins of Same, which had been deſtroyed by the Romans, were ſtill in being. Same was the metropolis of the iſland, and is ſuppoſed to have ſtood in the place which the Italians call Porto Guiſcardo. The names of the four cities were, according to Thucydides, Same, Prone, Cranii, and Palæ. This iſland was ſubdued by the Thebans, under the conduct of Amphitryo, who is ſaid to have killed Pterelas, who then reigned here. While Amphitryo was carrying on the war in Cephalenia, then called Samos, one Cephalus, a man of great diſtinction at Athens, having accidentally killed his wife Procris in ſhooting at a deer, fled to Amphitryo, who, pitying his caſe, not only received him kindly, but made him governor of the iſland, which thenceforth was called Cephalenia. After it had been long in ſubjection to the Thebans, it fell under the power of the Macedonians, and was taken from them by the Ætolians, who held it till it was reduced by M. Fulvius Nobilior, who, having gained the metropolis after a four months ſiege, ſold all the citizens for ſlaves, adding the whole iſland to the dominions of his republic. Now called CEPHALONIA.

CEPHALONIA, the capital of an iſland of the ſame name, ſituated in the Mediterranean, near the coaſt of Epirus, and ſubject to the Venetians. E. Long. 21. N. Lat. 30. 30.

CEPHEUS, in fabulous hiſtory, a king of Arcadia, on whoſe head Minerva faſtening one of Meduſa's hairs, he was rendered invincible.

CEPHEUS, in aſtronomy, a conſtellation of the northern hemiſphere. See ASTRONOMY, n° 406.

CERAM, an iſland in the Indian ocean, between the Molucca iſlands on the north, and thoſe of Ambona and Banda on the ſouth, lying between E. Long. 126. and 129. in S. Lat. 3. It is about 150 miles long, and 60 broad; and here the Dutch have a fortreſs, which keeps the natives in ſubjection.

CERAMBYX, in zoology, a genus of inſects of the beetle kind, belonging to the order of inſecta coleopatera. The antennæ are long and ſmall; the breaſt is ſpinous or gibbous; and the elytra are linear. There are no leſs than 83 ſpecies enumerated by Linnæus, principally diſtinguiſhed by the figure of the breaſt.

CERASTES, in zoology, the trivial name of ſpecies of ANGUIS and COLUBER.

CERASTIUM, MOUSE-EAR: A genus of the pentagynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophylleæ*. The calyx is pentaphyllous; the petals are bifid; the capſule is unilocular, and opening at the top. There are 16 ſpecies, but none of them poſſeſſed of any remarkable property.

CERASUS, in botany. See PRUNUS.

CERATE, in pharmacy, a thickiſh kind of ointment, applied to ulcerations, excoriations, &c. See PHARMACY, *Index*.

CERATION, the name given by the ancients to the ſmall ſeeds of Ceratonia, uſed by the Arabian phyſicians as a weight to adjuſt the doſes of medicines; as the grain weight with us took its riſe from a grain of barley.

CERATON, or *ceratium*, was alſo a ſilver coin, equal to one-third of an obolus.

CERATOCARPUS, in botany: A genus of the monandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The male calyx is bipartite; there is no corolla; the filament is long: The female calyx is diphyllous, and grown to the germen; there is no corolla; the ſtyles are two; the ſeed is two-horned and compreſſed.

CERATONIA, the CAROB TREE, or *St John's bread*: A genus of the polyæcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 33d order, *Lomentaceæ*. The calyx is hermaphrodite and quinquepartite; there is no corolla; the ſtamina are five; the ſtyle is filiform; the legumen coriaceous and polyſpermous. It is alſo diœcious, or male and female diſtinct on different plants. There is but one ſpecies, the ſiliqua, a native of Spain, of ſome parts of Italy and the Levant. It is an ever-green; and, in the countries where it is a native, grows in the hedges. It produces a quantity of long, flat, brown-coloured pods, which are thick, meally, and of a ſweetiſh taſte. Theſe pods are many times eaten by the poorer ſort of inhabitants when there is a ſcarcity of other food; but they are apt to looſen the belly, and cauſe gripings of the bowels. They are called *St John's-bread*, from an ill-founded aſſertion of ſome writers on ſcripture, that theſe pods were the locuſts St John eat with his honey in the wilderneſs. The tree may be propagated in England from ſeeds, which are to be ſown in a moderate hot-bed, and the plants inured to the open air by degrees.

CERATOPHYLLUM, in botany: a genus of the polyandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 15th order, *Inundatæ*. The male calyx is multipartite; no corolla; ſtamina from 16 to 20: the female calyx is multipartite; no corolla; one piſtil; no ſtyle; one naked ſeed.

CERAUNIA, CERAUNIAS, or CERAUNIUS *Lapis*, in natural hiſtory, a ſort of flinty ſtone, of no certain colour, but of a pyramidal or wedge-like figure; popularly ſuppoſed to fall from the clouds in the time of thunder-ſtorms, and to be poſſeſſed of divers notable virtues, as promoting ſleep, preſerving from lightning, &c. The word is from the Greek κεραυνος, *thunderbolt*. The ceraunia is the ſame with what is otherwiſe called the thunder-ſtone, or thunder-bolt; and alſo ſometimes *ſagitta*, or arrow's-head, on account of its ſhape. The ceranniæ are frequently confounded with the ombriæ and brontiæ, as being all ſuppoſed to have the ſame origin. The generality of naturaliſts take the ceraunia for a native ſtone, formed among the Pyrites, of a ſame, concrete, mineral juice. Mercatus and Dr Woodward aſſert it to be artificial, and to have been faſhioned thus by tools. The ceraunia, according to theſe authors, are the heads of the ancient weapons of war, in uſe before the invention of iron; which, upon the introduction of that metal, growing into diſuſe, were diſperſed in the fields through this and that neighbouring country. Some of them had poſſibly ſerved in the early ages for axes, others for wedges, others for chiſſels; but the greater part for arrow-heads, darts, and lances. The ceraunia is alſo held by Pliny for a white or cryſtal-coloured gem, that attracted lightning to itſelf. What this was, is hard to ſay. Prudentius alſo ſpeaks of a yellow ceraunia; by which he is ſuppoſed to mean the carbuncle or pyropus.

CERBERA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. The fruit is a monoſpermous plum. The moſt remarkable ſpecies is the *atroucer*, a native of the warm parts of America. It riſes with an irregular ſtem to the height of eight or ten feet, ſending out many crooked diffuſed branches, which towards their tops are garniſhed with thick ſucculent leaves of a lucid green, ſmooth, and very full of a milky juice. The flowers come out in looſe bunches at the end of the branches; they are of a cream colour, having long narrow tubes, and at the top are cut into five obtuſe ſegments, which ſeem twiſted, ſo as as ſtand oblique to the tube. The wood of this tree ſtinks moſt abominably, and the kernels of the nuts are a deadly poiſon to which there is no antidote; ſo that the Indians will not even uſe the wood for fuel.

CERBERUS, in fabulous hiſtory, a dreadful three-headed maſtiff, born of Typhon and Echidna, and placed to guard the gates of hell. He fawned upon thoſe who entered, but devoured all who attempted to get back. He was, however, maſtered by Hercules, who dragged him up to the earth, when, in ſtruggling, a foam dropped from his mouth, which produced the poiſonous herb called *aconite* or *wolf's-bane*.

Some have ſuppoſed that Cerberus is the ſymbol of the earth, or of all-devouring time; and that its three mouths repreſent the preſent, paſt, and future. The victory obtained by Hercules over this monſter, denotes the conqueſt which this hero acquired over his paſſions. Dr Bryant ſuppoſes that Cerberus was the name of a place, and that it ſignified the temple of the Sun; deriving it from *Kir-Abor, the place of light.* This temple was alſo called *Tor-Caph-El*, which was changed to τρικηφαγος; and hence Cerberus was ſuppoſed to have had three heads. It was likewiſe called *Tor-Keren, Turris Regia*; whence τρι καρηνος, from τρεις, *three*, and καρηνον, *head*.

CERCELE, in heraldry: a croſs cercele is a croſs which, opening at the ends, turns round both ways like a ram's horn. See CROSS.

CERCIS, the JUDAS-TREE: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 33d order, *Lomentaceæ*. The calyx is quinquedentated, and gibbous below; the corolla papilionaceous, with a ſhort vexillum or flag-petal under the wings or ſide-petals: a leguminous plant. There are only two ſpecies, both deciduous.

1. The ſiliquaſtrum, common Judas-tree, or Italian cercis, a native of Italy and other parts of the ſouth of Europe.—Theſe differ in the height of their growth in different places: In ſome they will arrive to be fine trees, of near twenty feet high; whilſt in others they will not riſe to more then ten or twelve feet, ſending forth young branches irregularly from the very bottom. The ſtem of this tree is of a dark-greyiſh colour, and the branches, which are few and irregular, have a purpliſh caſt. The leaves are ſmooth, heart-ſhaped, and roundiſh, of a pleaſant green on their upper ſurface, hoary underneath, and grow alternately on long foot-ſtalks. The flowers are of a fine purple: They come out early in the ſpring, in cluſters, from the ſide of the branches, growing upon ſhort foot-ſtalks; and in ſome ſituations they are ſucceeded by long flat pods, containing the ſeeds, which, in very favourable ſeaſons, ripen in England. Some people are fond of eating theſe flowers in ſallads, on which account alone in ſome parts this tree is propagated. The varieties of this ſpecies are, 1. The Fleſh-coloured: 2. The White-flowered; and, 3. The Broad-podded Judas-tree.

2. The Canadenſis, or Canadian cercis, will grow to the ſize of the firſt ſort in ſome places. The branches are alſo irregular. The leaves are cordated, downy, and placed alternately. The flowers uſually are of a paliſh red colour, and ſhow themſelves likewiſe in the ſpring, before the leaves are grown to their ſize. Theſe too are often eaten in ſallads, and afford an excellent pickle. There is a variety of this with deep red, and another with purple flowers. The pleaſure which theſe trees will afford in a plantation may be eaſily conceived, not only as they exhibit their flowers in cluſters, in different colours, early in the ſpring, before the leaves are grown to ſuch a ſize as to hide them; but from the difference of the upper and lower ſurface of the leaves; the one being of a fine green, the other of a hoary caſt; ſo that on the ſame tree, even in this reſpect, is ſhown variety; an improvement whereof is made by the waving winds, which will preſent them alternately to view.

Propagation. As theſe ſpecies will not take root by layers, they muſt be propagated by ſeeds, which may be had from abroad. They are generally brought us ſound and good, and may be ſown in the months of February or March. Making any particular compoſt for their reception is unneceſſary; common garden mould, of almoſt every ſort, will do very well: And this being well dug, and cleared of all roots, weeds, &c. lines may be drawn for the beds. The mould being fine, part of it ſhould be taken out, and ſifted over the ſeeds, after they are ſown, about half an inch thick. Part of the ſeeds will come up in the ſpring, and the others will remain until the ſpring following; ſo that whoever is deſirous of drawing the ſeedlings of a year old to plant out, muſt not deſtroy the bed, but draw them carefully out, and after that there will be a ſucceeding crop. However, be this as it will, the ſeeds being come up, they muſt be weeded, and encouraged by watering in the dry ſeaſon; and they will require no farther care during the firſt ſummer. In the winter alſo they may be left to themſelves, for they are very hardy; though not ſo much but that the ends of the branches will be killed by the froſt, nay, ſometimes to the very bottom of the young plant, where it will ſhoot out again afreſh in the ſpring. Whoever, therefore, is deſirous of ſecuring his ſeedling-plants from this evil, ſhould have his beds hooped, in order to throw mats over them during the hard froſts. Toward the latter end of March, or beginning of April the plants having been in the ſeed-bed one or two years, they ſhould be taken out, and planted in the nurſery: The diſtance of one foot aſunder, and two feet in the rows, ſhould be given them. Hoeing the weeds down in the ſummer muſt alſo be allowed, as well as digging between the rows in the winter. Here they may ſtand until they are to be removed finally; but they muſt be gone over in the winter with the knife, and ſuch irregular branches taken off as are produced near the root; by which management the tree may be trained up to a regular ſtem. Such, continues Hanburry is the culture of the ſpecies of cercis; ſorts that are not to be omitted where there are any pretenſions to a collection. Beſides, the wood itſelf is of great value; for it poliſhes exceedingly well, and is admirably veined with black and green.

CERCOPITHECI, in natural hiſtory, the name given by Mr Ray to monkeys, or the claſs of apes with long tails. See APE and SIMIA.

CERDA, (John Lewis de la) a learned Jeſuit of Toledo, wrote large commentaries on Virgil, which have been much eſteemed; alſo ſeveral other works. He died in 1643, aged 80.

CERDONIANS, ancient heretics, who maintained moſt of the errors of Simon Magus, Saturninus, and the Manichees. They took their name from their leader *Cerdon*, a Syrian, who came to Rome in the time of pope Hyginus, and there abjured his errors: but in appearance only; for he was afterwards convicted of perſiſting in them, and accordingly caſt out of the church again. Cerdon aſſerted two principles, the one good and the other evil: this laſt, according to him, was the creator of the world, and the god that appeared under the old law. The firſt, whom he called *unknown*, was the father of Jeſus Chriſt; who, he taught, was incarnate only in appearance, and was not born of a virgin; nor did he ſuffer death but in appearance. He denied the reſurrection; and rejected all the books of the Old Teſtament, as coming from an evil principle. Marcion, his diſciple, ſucceeded him in his errors.

CEREALIA, in antiquity, feaſts of Ceres, inſtituted by Triptolemus, ſon of Celeus king of Eleuſine in Attica, in gratitude for his having been inſtructed by Ceres, who was ſuppoſed to have been his nurſe, in the art of cultivating corn and making bread.

There were two feaſts of this kind at Athens; and one called *Eleuſinia*, the other *Theſmophoria*. See the article ELEUSINIA. What both agreed in, and was common to all *cerealia*, was, that they were celebrated with a world of religion and purity; ſo that it was eſteemed a great pollution to meddle, on thoſe days, in conjugal matters. It was not Ceres alone that was honoured here, but alſo Bacchus. The victims offered were hogs, by reaſon of the waſte they make in the products of the earth: whether there was any wine offered or not, is matter of much debate among the critics. Plautus and Macrobius ſeem to countenance the negative ſide; Cato and Virgil the poſitive. Macrobius ſays, indeed, they did not offer wine to Ceres, but *mulſum*, which was a compoſition of wine and honey boiled up together: that the ſacrifice made on the 21ſt of December to that goddeſs and Hercules, was a pregnant ſow, together with cakes and mulſum; and that this is what Virgil means by *Mili Baccho*. The *cerealia* paſſed from the Geeks to the Romans, who held them for eight days ſucceſſively; commencing, as generally held, on the fifth of the ides of April. It was the women alone who were concerned in the celebration, all dreſſed in white: the men, likewiſe in white, were only ſpectators. They eat nothing till after ſun-ſet; in memory of Ceres, who in her ſearch after her daughter took no repaſt but in the evening.

After the battle of Cannæ, the deſolation was ſo great at Rome, that there were no women to celebrate the feaſt, by reaſon they were all in mourning; ſo that it was omitted that year.

CEREALIA, in botany, from *Ceres* the goddeſs of corn; Linnæus's name for the larger eſculent ſeeds of the graſſes: theſe are rice, wheat, rye, barley, oats, millet, panic graſs, Indian millet, holcus, zizania, and maize. To this head may be likewiſe referred darnel, (*lolium*); which, by preparation, is rendered eſculent.

CEREBELLUM, the hinder part of the head. See ANATOMY, nº 133.

CEREBRUM, the BRAIN. Its ſtructure and uſe are not ſo fully known as ſome other parts of the body, and different authors conſider it in various manners. However, according to the obſervations of thoſe moſt famed for their accuracy and dexterity in anatomical inquiries, its general ſtructure is as given in ANATOMY, nº 132.

Dr Hunter obſerves, that the principal parts of the medullary ſubſtance of the brain in ideots and madmen, ſuch as the *thalami nervorum opticorum* and *medulla oblongata*, are found entirely changed from a medullary to a hard, tough, dark-coloured ſubſtance, ſometimes reſembling white leather.

CEREMONIAL, (*ceremoniale*) a book in which is preſcribed the orders of the ceremonies to be obſerved in certain actions and occaſions of ſolemnity and pomp. The ceremonial of the Roman church is called *ordo Romanus*. It was publiſhed in 1516 by the biſhop of Corcyra; at which the college of cardinals were ſo ſcandalized, that ſome of them voted to have the author as well as book burnt, for his temerity in expoſing the ſacred ceremonies to the eyes of profane people.

CEREMONIAL is alſo uſed for the ſet or ſyſtem of rules and ceremonies which cuſtom has introduced for regulating our behaviour, and which perſons practiſe towards each other, either out of duty, decency, or civility.

CEREMONIAL, in a more particular ſenſe, denotes the manner in which princes and ambaſſadors uſe to receive and to treat one another. There are endleſs diſputes among ſovereigns about the *ceremonial*: ſome endeavouring to be on a level, and others to be ſuperior; inſomuch that numerous ſchemes have been propoſed for ſettling them. The chief are, 1. To accommodate the difference by compromiſe or alternation, ſo that one ſhall precede now, the other the next time; or one in one place, and the other in another; 2. By ſeniority; ſo that an elder prince in years ſhall precede a younger, without any other diſtinction. Theſe expedients, however, have not yet been accepted of by any, except ſome *alternate princes*, as they are called, in Germany.

CEREMONIAL is more particularly uſed in ſpeaking of the laws and regulations given by Moſes relating to the worſhip of God among the ancient Jews. In this ſenſe it amounts to much the ſame with what is called the *Levitical law*, and ſtands contradiſtinguiſhed from the moral as well as judicial law.

CEREMONY, an aſſemblage of ſeveral actions, forms, and circumſtances, ſerving to render a thing more magnificent and ſolemn.

In 1646, M. Ponce publiſhed a hiſtory of ancient ceremonies, tracing the riſe, growth, and introduction of each rite into the church, and its gradual advancement to ſuperſtition therein. Many of them were borrowed from Judaiſm; but more ſeemingly from Paganiſm. Dr Middleton has given a fine diſcourſe on the conformity between the pagan and popiſh ceremonies, which he exemplifies in the uſe of incenſe, holy water, lamps, and candles, before the ſhrines of ſaints, votive gifts or offerings round the ſhrines of the deceaſed, &c. In effect, the altars, images, croſſes, proceſſions, miracles, and legends; nay, even the very hierarchy, pontificate, religious orders, &c. of the preſent Romans, he ſhows, are all copied from their heathen anceſtors.—We have an ample and magnificent account of the religious ceremonies and cuſtoms of all nations in the world, repreſented in figures deſigned by Picart, with hiſtorical explanations, and many curious diſſertations.

Maſter of the CEREMONIES, an officer inſtituted by king James I. for the more honourable reception of ambaſſadors and ſtrangers of quality. He wears about his neck a chain of gold, with a medal under the crown of Great Britain, having on one ſide an emblem of peace, with this motto, *Beati pacifici*; and on the other, an emblem of war, with *Dieu et mon droit*: his ſalary is 300*l.* *per annum.*

Aſſiſtant Maſter of the CEREMONIES, is to execute the employment in all points, whenſoever the maſter of the ceremonies is abſent. His ſalary is 141*l.* 13*s.* and 4*d.* *per annum.*

Marſhall of the CEREMONIES is their officer, being ſubordinate to them both. His ſalary is 100*l.* *per annum.*

CERENZA, a town of Italy in the kingdom of Naples, and in the Hither Calabria, with a biſhop's ſee. It is ſeated on a rock, in E. Long. 17. 5. N. Lat. 39. 23.

CERES, a Pagan deity, the inventor or goddeſs of corn, in like manner as Bacchus was of wine.

According to the poets, ſhe was the daughter of Saturn and Ops, and the mother of Proſerpine, whom ſhe had by Jupiter. Pluto having ſtolen away Proſerpine, Ceres travelled all over the world in queſt of her daughter, by the help of a torch, which ſhe had lighted in Mount Ætna.

As Ceres was thus travelling in ſearch of her daughter, ſhe came to Celeus king of Eleuſis, and undertook to bring up his infant ſon Triptolemus. Being deſirous to render her charge immortal, ſhe fed him in the day-time with divine milk, and in the night covered him with fire. Celeus obſerving an unuſual improvement in his ſon, reſolved to watch his nurſe, to which end he hid himſelf in that part of the houſe where ſhe uſed to cover the child with fire; but when he ſaw her put the infant under the embers, he cried out and diſcovered himſelf. Ceres puniſhed the curioſity and indiſcretion of the father with death. Afterwards ſhe taught the youth the art of ſowing corn and other fruits, and mounted him in a chariot drawn by winged dragons, that he might traverſe the world, and teach mankind the uſe of corn and fruits. After this, having diſcovered, by means of the nymph Arethuſa, that Proſerpine was in the infernal regions, ſhe applied to Jupiter, and obtained of him that Proſerpine ſhould be reſtored, on condition that ſhe had taſted nothing during her ſtay in that place: but it being diſcovered, by the information of Aſcalaphus, that, as ſhe was walking in Pluto's orchard, ſhe had gathered an apple, and had taſted of ſome of the ſeeds, ſhe was for ever forbidden to return. Ceres, out of revenge, turned Aſcalaphus into an owl. At length, Jupiter, to mitigate her grief, permitted that Proſerpine ſhould paſs one half of the year in the infernal regions with Pluto, and the other half with her mother on earth.

Cicero ſpeaks of a temple of Ceres at Catanea in Sicily, where was a very ancient ſtatue of that goddeſs, but entirely concealed from the ſight of men, every thing being performed by matrons and virgins.

CERET, a town of France in Rouſſillon, with a magnificent bridge of a ſingle arch. It is ſeated near the river Tec, in E. Long. 2. 46. N. Lat. 42. 23.

CEREUS, in botany. See CACTUS.

CERIGO, an iſland in the Archipelago, anciently called *Cytherea*; noted for being the birth-place of Helen, and, as the poets ſay, of Venus. At preſent, there is nothing very delightful in the place; for the country is mountainous, and the ſoil dry. It abounds in hares, quails, turtle, and excellent falcons. It is about 50 miles in circumference, and had formerly good towns; but there is now none remaining but that which gives name to the iſland. This is ſtrong both by art and nature, it being ſeated on a craggy rock. The inhabitants are Chriſtian Greeks, and ſubject to the Venetians, who keep a governor there, whom they change every two years.

CERINES, a town in the iſland in Cyprus, with a good caſtle, an harbour, and a biſhop's ſee. E. Long. 33. 35. N. Lat. 35. 22.

CERINTHE, HONEYWORT: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The limb of the corolla is a ventricoſe tube with the throat pervious; and there are two bilocular ſeeds. There are three ſpecies, natives of Germany, Italy, and the Alps. They are low annual plants with purple, yellow, and red flowers, which may be propagated by ſeed ſown in autumn, in a warm ſituation.

CERINTHIANS, ancient heretics, who denied the deity of Jeſus Chriſt.—They took their name from Cerinthus, one of the firſt hereſiarchs in the church, being cotemporary with St John. See CERINTHUS.

They believed that Jeſus Chriſt was a mere man, born of Joſeph and Mary; but that, in his baptiſm, a celeſtial virtue deſcended on him in form of a dove; by means whereof he was conſecrated by the holy Spirit, and made Chriſt. It was by means of this celeſtial virtue, therefore, that he wrought ſo many miracles; which, as he received it from heaven, quitted him after his paſſion, and returned to the place whence it came; ſo that Jeſus, whom they called a *pure man*, really died and roſe again; but that Chriſt, who was diſtinguiſhed from Jeſus, did not ſuffer at all. It was partly to refute this ſect, that St John wrote his goſpel. They received the goſpel of St Matthew, to countenance their doctrine of circumciſion, from Chriſt's being circumciſed; but they omitted the genealogy. They diſcarded the epiſtles of St Paul, becauſe that apoſtle held circumciſion aboliſhed.

CERINTHUS, a hereſiarch, cotemporary with the apoſtles, aſcribed the creation not to God, but to angels. He taught that Jeſus Chriſt was the ſon of Joſeph, and that circumciſion ought to be retained under the goſpel. He is looked upon as the head of the converted Jews, who raiſed in the church of Antioch the tumult of which St Luke has given the hiſtory in the 15th chapter of the Acts. Some authors aſcribe the book of the apocalypſe to Cerinthus; adding, that he put it off under the name of St John, the better to authoriſe his reveries touching Chriſt's reign upon earth: and it is even certain that he publiſhed ſome works of this kind under the title of *Apocalypſe*. See Apocalypse.

CEROPEGIA, in botany: a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. There are two erect follicles; the ſeeds plumoſe or covered with a feathered pappus; the limb of the corolla connivent or cloſing at top.

Plate CXXV.

CERTHIA, in orinthology, the creeper or ox-eye, a genus belonging to the order of picæ. The beak is arched, ſlender, ſharp, and triangular; the tongue is ſharp at the point; and the feet are of the walking kind, *i. e.* having the toes open and unconnected. Of this genus near 50 ſpecies have been enumerated by ornithologiſts; but Mr Latham ſuppoſes that many now deſcribed as ſpecies, will be found hereafter to be mere varieties; which, he adds, is no wonder, ſince many creepers do not gain their full plumage till the third year's moult. The following are a few of the moſt remarkable:

1. The familiaris, or common ox-eye, is grey above, and white underneath, with brown wings, and ten white ſpots on the ten prime feathers. This bird is found in moſt parts of Europe, though it is believed no where ſo common as in Britain. It may be thought more ſcarce than it really is by the leſs attentive obſerver; for, ſuppoſing it on the body or branch of any tree, the moment it obſerves any one, it gets to the oppoſite ſide, and ſo on, let a perſon walk round the tree ever ſo often. The facility of its running on the bark of a tree, in all directions, is wonderful: This it does with as much eaſe as a fly on a glaſs window. Its food is principally, if not wholly, inſects, which it finds in the chinks and among the moſs of trees. It builds its neſt in ſome hole of a tree, and lays generally five eggs, very rarely more than ſeven: theſe are aſh-coloured, marked at the end with ſpots and ſtreaks of a deeper colour; and the ſhell is obſerved to be pretty hard. It remains in the places which it frequents during the winter, and builds its neſt early in the ſpring.

2. The hook-billed green creeper has a bill an inch and three quarters long, and bent quite in the ſhape of a ſemicircle; the plumage in general is olive green, paleſt beneath, and ſomewhat inclined to yellow: the quills and tail are duſky; the legs duſky brown; and the feathers juſt above the knee, or garter, white. It inhabits the Sandwich Iſlands in general, and is one of the birds whoſe plumage the natives make uſe of in conſtructing their feathered garments; which, having theſe olive-green feathers intermixed with the beautiful ſcarlet and yellow ones belonging to the next ſpecies, and yellow-tufted Bee-eater*, make ſome of the moſt beautiful coverings of theſe iſlanders.

3. The hook-billed red creeper has the bill ſomewhat leſs hooked than the laſt ſpecies; the general colour of the plumage is ſcarlet; wings and tail black. In ſome birds the forehead is of a buff-colour; and the parts about the head and neck have both a mixture of buff and duſky black, which are ſuſpected to be the birds not yet arrived at their full plumage.

4. The puſilla, or brown and white creeper, according to Edwards, is not above half the ſize of the European creeper. The upper part of the body is brown, with a changeable gloſs of copper: the under parts are white; the quills brown, edged with gloſſy copper; the tail blackiſh, the outer feather tipped with white. The bird from which Edwards drew his figure had a label tied to it, by the name of Honey-thief. And that they are fond of honey is manifeſt, from thoſe who keep birds at the Cape of Good Hope having many ſorts in large cages, and ſupplying them with only honey and water; but beſides this, they catch a great many flies, which come within the reach of their confinement; and theſe two make up their whole ſubſiſtence; indeed, it has been attempted to tranſport them further, but the want of flies on board a ſhip prevented them living more than three weeks; ſo neceſſary are inſects to their ſubſiſtence.

5. The Loteni, or Loten's creeper, has the head, neck, back, rump, ſcapulars, and upper tail-coverts, of green gold: beneath, from the breaſt to the vent, of velvet black, which is ſeparated from the green on the neck by a tranſverſe bright violet band, a line and half in breadth: the leſſer wing coverts are of this laſt colour; the middle coverts are green gold; and the greater coverts are very fine black, edged with green gold on the outer edge: the quills are of the ſame colour, as are alſo the tail feathers. The female differs in having the breaſt, belly, ſides, thighs, under wing and tail coverts, of a dirty white, ſpotted with black; and the wings and tail not of ſo fine a black. It inhabits Ceylon, and Madagaſcar; and is called Angaladian.

Buffon tells us, that it makes its neſt of the down of plants, in form of a cup, like that of a chaffinch, the female laying generally five or ſix eggs; and that it is ſometimes chaſed by a ſpider as large as itſelf, and very voracious, which ſeizes on the whole brood, and ſucks the blood of the young birds.

6. The cœrulea, or blue creeper, has the head of a moſt elegant blue; but on each ſide there is a ſtripe of black like velvet, in which the eye is placed: the chin and throat are marked with black in the ſame manner; the reſt of the body violet blue. It inhabits Cayenne. Seba ſays, that it makes its neſt with great art. The outſide is compoſed of dry ſtalks of graſs, or ſuch like; but within of very downy ſoft materials, in the ſhape of a retort, which it ſuſpends from ſome weak twig, at the end of a branch of a tree; the opening or mouth downwards, facing the ground: the neck is a foot in length, but the real neſt is quite at the top, ſo that the bird has to climb up this funnel-like opening to get at the neſt. Thus it is ſecure from every harm; neither monkey, ſnake, nor lizard, daring to venture at the end of the branch, as it would not ſteadily ſupport them.

7. The cardinal creeper, (*Lev. Muſ.*) has the head, neck, and breaſt, of crimſon colour; down the middle

of

* See *Merope.*

of the back is a ſtripe of the ſame colour to the rump; the reſt of the body is black; and the wings and tail are black. It inhabits the cultivated parts of the iſland of Tanna; is there called Kuyameta, and lives by ſucking the nectar of flowers.

8. The mocking creeper is of the ſize of the leſſer thruſh. On the cheeks is a narrow white ſpot: the head, eſpecially on the crown, is inclined to violet; the plumage in general is olive green, inclining to yellow on the under parts: the quills are brown; the ſecondaries edged with olive: the colour of the tail is like that of the ſecondaries, and ſomewhat forked: the legs are duſky blue, and the claws black. It inhabits both the iſlands of New Zealand. It has an agreeable note in general; but at times ſo varies and modulates the voice, that it ſeems to imitate the notes of all other birds; hence it was called by the Engliſh the Mocking-bird. This bird being fond of thruſting its head in the the boſom of flowers which have a purpliſh-coloured farina, much of it adheres to the feathers about the head and bill, and in courſe gives the appearance abovementioned; but this in time rubs off, and the colour of the head appears the ſame with the reſt of the plumage.

CERTIFICATE, *(Trial by)* in the law of England, a ſpecies of trial allowed in ſuch caſes where the evidence of the perſon certifying is the only proper criterion of the point in diſpute*. For when the fact in queſtion lies out of the cognizance of the court, the judges muſt rely on the ſolemn averment or information of perſons in ſuch a ſtation as affords them the moſt clear and competent knowledge of the truth. As therefore ſuch evidence, if given to a jury, muſt have been concluſive, the law, to ſave trouble and circuity, permits the fact to be determined upon ſuch certificate merely. Thus, 1. If the iſſue be whether A was abſent with the king in his army out of the realm in time of war, this ſhall be tried by the certificate of the mareſchal of the king's hoſt in writing under his ſeal, which ſhall be ſent to the juſtices. 2. If, in order to avoid an outlawry, or the like, it was alledged that the defendant was in priſon, *ultra mare*, at Bourdeaux, or in the ſervice of the mayor of Bourdeaux, this ſhould have been tried by the certificate of the mayor; and the like of the captain of Calais. But when this was law, thoſe towns were under the dominion of the crown of England. And therefore, by a parity of reaſon, it ſhould now hold, that in ſimilar caſes ariſing at Jamaica or Minorca, the trial ſhould be by certificate from the governor of thoſe iſlands. We alſo find that the certificate of the queen's meſſenger, ſent to ſummon home a peereſs of the realm, was formerly held a ſufficient trial of the contempt in refuſing to obey ſuch ſummons. 3. For matters within the realm; the cuſtoms of the city of London ſhall be tried by the certificate of the mayor and aldermen, certified by the mouth of their recorder; upon a ſurmiſe from the party alleging it, that the cuſtom ought to be thus tried: elſe it muſt be tried by the country. As, the cuſtom of diſtributing the effects of freemen deceaſed; of enrolling apprentices; or that he who is free of one trade may uſe another; if any of theſe, or other ſimilar points come in iſſue. 4. The trial of all cuſtoms and practiſe of the courts ſhall be by certificate from the proper officers of thoſe courts reſpectively; and what return was made on a writ by the ſheriff or under-ſheriff, ſhall be only tried by his own certificate.

*See *Trial.*

Blackſtone's Comment.

CERTIORARI, in law, a writ which iſſues out of the chancery, directed to an inferior court, to call up the records of a cauſe there depending, in order that juſtice may be done. And this writ is obtained upon complaint, that the party who ſeeks it has received hard uſage, or is not like to have an impartial trial in the inferior court. A certiorari is made returnable either in the king's bench, common pleas, or in chancery.

It is not only iſſued out of the court of chancery, but likewiſe out of the king's bench, in which laſt mentioned court it lies where the king would be certified of a record. Indictments from inferior courts, and proceedings of the quarter-ſeſſions of the peace, may alſo be removed into the king's bench by a certiorari: and here the very record muſt be returned, and not a tranſcript of it; though uſually in chancery, if a certiorari be returnable there, it removes only the tenor of the record.

CERTITUDE, conſidered in the things or ideas which are the objects of our underſtanding, is a neceſſary agreement or diſagreement of one part of our knowledge with another: as applied to the mind, it is the perception of ſuch agreement or diſagreement; or ſuch a firm well-grounded aſſent, as excludes not only all manner of doubt, but all conceivable poſſibility of a miſtake.

There are three ſorts of certitude, or aſſurance, according to the different natures and circumſtances of things. 1. A phyſical or natural certitude, which depends upon the evidence of ſenſe; as that I ſee ſuch or ſuch a colour, or hear ſuch or ſuch a ſound; no body queſtions the truth of this, where the organs, the medium, and the object, are rightly diſpoſed. 2. Mathematical certitude is that ariſing from mathematical evidence; ſuch is, that the three angles of a triangle are equal to two right ones. 3. Moral certitude is that founded on moral evidence, and is frequently equivalent to a mathematical one; as that there was formerly ſuch an emperor as Julius Cæſar, and that he wrote the commentaries which paſs under his name; becauſe the hiſtorians of theſe times have recorded it, and no man has ever diſproved it ſince: this affords a moral certitude, in common ſenſe ſo great, that one would be thought a fool or a madman for denying it.

CERTOSA, a celebrated Carthuſian monaſtery, in the territory of the Paveſe, in the duchy of Milan, four miles from Pavia; its park is ſurrounded with a wall 20 miles in circumference; but there are ſeveral ſmall towns and villages therein.

CERVANTES. See SAAVEDRA.

CERVERA, a town of Spain, in Catalonia, ſeated on a ſmall river of the ſame name, in E. Long. 1. 9. N. Lat. 41. 28.

CERVIA, a ſea-port town of Italy, in Romagna, with a biſhop's ſee, ſeated on the gulph of Venice, in E. Long. 13. 5. N. Lat. 44. 16.

CERVICAL NERVES, are ſeven pair of nerves, ſo called, as having their origin in the *cervix*.

CERVICAL Veſſels, among anatomiſts, denote the arteries, veins, &c. which paſs through the *vertebræ* and muſcles of the neck, up to the ſkull.

CERVIX, in anatomy, properly denotes the hind part of the neck; as contradiſtinguiſhed from the fore part, which is called *jugulum*, or the throat.

Cervix of the *Scapula*, denotes the head of the ſhoulder-blade, or that upper proceſs whoſe *ſinus* receives the head of the *humerus*.

Cervix of the *Uterus*, the neck of the *uterus*, or that oblong canal, or paſſage between the internal and external orifices, which receives and incloſes the *penis* like a ſheath, whence it is alſo called Vagina.

CERUMEN, a thick, viſcous, bitter, excrementitious humour, ſeparated from the blood by proper glands placed in the *meatus auditorius*, or outer paſſage of the ear.

CERUSS, white-lead, a ſort of calx of lead, made by expoſing plates of that metal to the vapour of vinegar. See Chemistry-*Index*.

Ceruſs, as a medicine, is uſed externally either mixed in ointments, or by ſprinkling it on old gleeting and watery ulcers, and in many diſeaſes of the ſkin. If, when it is reduced into a fine powder, it is received in with the breath in inſpiration, and carried down into the lungs, it cauſes incurable aſthmas. Inſtances of the very pernicious effects of this metal are too often ſeen among thoſe perſons who work lead in any form, but particularly among the workers in white-lead.

The painters uſe it in great quantities; and that it may be afforded cheap to them, it is generally adulterated with common whiting.

Plate CXXIX, CXXX, and CXXXI.

CERVUS, or Deer, in zoology, a genus of quadrupeds belonging to the order of Pecora. The horns are ſolid, brittle, covered with a hairy ſkin, and growing from the top; they likewiſe fall off and are renewed annually. There are eight fore-teeth in the under jaw, and they have no dog-teeth. The ſpecies of this genus enumerated by Linnæus are ſeven, *viz.*

1. The Camelopardalis, or Giraffe, with ſimple or unbranched horns, ſtraight, about ſix inches long, covered with hair, and truncated at the end and tufted; in the forehead a tubercle, about two inches high, reſembling a third horn. The fore legs are not much longer than the hind legs; but the ſhoulders are of a vaſt length, which gives the diſproportionate height between the fore and hind parts: the head is like that of a ſtag; the neck is ſlender and elegant, and on the upper ſide is a ſhort mane: the ears are large: tail is long, with ſtrong hairs at the end: the colour of the whole animal a dirty white, marked with large broad ruſty ſpots. This is an uncommon animal, few of them having been ever ſeen in Europe. It inhabits the foreſts of Ethiopia, and other interior parts of Africa, almoſt as high as Senegal; but is not found in Guinea, or any of the weſtern parts; nor farther ſouth than about lat. 28. 10. It is very timid, but not ſwift; and has been repreſented as living only by browſing the trees, being unable from the diſproportionate length of its fore legs to graze or feed from the ground. When it would leap, it lifts up its fore legs and then its hind, like a horſe whoſe fore legs are tied. It runs very badly and aukwardly, and is very eaſily taken. The lateſt and beſt deſcription of this extraordinary quadruped is given in the 16th number of a work entitled, "A Deſcription of the uncommon Animals and remarkable Productions in the Cabinet and *Menagerie* of his Serene Highneſs the Prince of Orange;" by M. Voſmaer, Director of his Highneſs's Collections of Natural Hiſtory. His account of the giraffe is compoſed partly from the notices of M. Vaillant and Mr Gordon of the Cape of Good Hope, and partly from his own obſervations on the ſkins of four of theſe animals, together with a complete ſkeleton, in the cabinet of curioſities under his care.

All the accounts we have of the giraffe, agree in repreſenting its hind quarters as about 2½ feet lower than its withers: but from obſervations made by the late profeſſor Camper on the abovementioned ſkeleton, it would appear that naturaliſts have been greatly miſtaken in this particular. That its fore legs are longer than its hind legs, is indeed true; but the difference is not more than ſeven inches, which, in a height of ſeven feet, is no great matter. It may, however (the profeſſor obſerves), be rendered apparently more conſiderable by the obliquity of the thigh-bone with reſpect to the tibia, when compared with that of the humerus to the radius.

The giraffe has always been celebrated for the gentleneſs of its diſpoſition. Antonius Conſtantius, a writer of the 15th century, in a letter to Galeas Manfredi, Prince of Faenza, dated Fano, 16th December 1486, gives an account of a giraffe which he ſaw there. He ſays it was ſo gentle, that it would eat bread, hay, or fruit, out of the hand of a child; and that, when led through the ſtreet, it would take whatever food of this kind was offered to it by the ſpectators at the windows, as it paſſed along. This character is confirmed by Mr Gordon, who relates, that a giraffe, which he had wounded, ſuffered him to approach it as it lay on the ground, without offering to ſtrike with its horns, or ſhowing any inclination to revenge itſelf: he even ſtroked it over its eyes ſeveral times, when it only cloſed them, without any ſigns of reſentment. Its throat was afterwards cut for the ſake of its ſkin; and when in the pangs of death, it ſtruck the ground with its feet with a force much exceeding that of any other animal, and theſe ſeem to be its principal means of defence. M. Voſmaer obſerves, that both the male and female are furniſhed with horns, which, from their ſize and form, ſeem intended merely for ornament: they appear to be excreſcences of the *os frontis*, and therefore are probably not deciduous. The notion of ſome writers, that the giraffe cannot feed from the ground, is confuted by the teſtimony of M. Vaillant, who aſſerts, that it can even drink from a river, the ſurface of which is lower than the bank on which it ſtands. M. Voſmaer obſerves, that this account is confirmed by conſidering the ſtructure of the neck, the vertebræ of which are connected with thoſe of the back by a very ſtrong ligament.

The giraffe here deſcribed, which Mr Gordon, who diſſected it, ſays was the largeſt he had ever ſeen, was 15 feet 4 inches Rhinland meaſure (about 15 feet 10 inches Engliſh) from the ground to the top of its head; the length of the body, from the cheſt to the rump, was 5 feet 7 inches Rhinland meaſure. M. Vaillant aſſerts, that he has ſeen ſeveral which were at leaſt 17 feet high; and M. Voſmaer declares, that he has been aſſured by ſome very reſpectable inhabitants of the Cape, that they had ſeen and killed giraffes, which,

CERVUS

Camelopardalis

Plate CXXIX

Scot Philad^{a}

which, including the horns, were 22 Rhinland feet in height.

The giraffe was known to the Romans in early times. It appears among the figures in the aſſemblage of eaſtern animals on the celebrated Præneſtine Pavement, made by the direction of Sylla; and is repreſented both grazing and browſing, in its natural attitudes. It was exhibited at Rome by the popular Cæſar, among other animals in the Circæan games.

2. The Alces, Elk, or Mooſe Deer, has palmated horns, without any proper ſtem, and a fleſhy protuberance on the throat. The neck is much ſhorter than the head, with a ſhort, thick, upright mane, of a light brown colour. The eyes are ſmall; the ears a foot long, very broad and ſlouching; noſtrils very large; the upper lip ſquare, hangs greatly over the lower, and has a deep ſulcus in the middle, ſo as to appear almoſt bifid. This is the bulkieſt animal of the deer kind, being ſometimes 17 hands high, and weighing above 1200 pounds. The female is leſs than the male, and wants horns. The elks inhabit the iſle of Cape Breton, Nova Scotia, and the weſtern ſide of the bay of Fundy; Canada, and the country round the great lakes, almoſt as far ſouth as the river Ohio. Theſe are its preſent northern and ſouthern limits. In all ages it affected the cold and woody regions in Europe, Aſia, and America. They are found in all the woody tracts of the temperate parts of Ruſſia, but not on the Arctic flats, nor yet in Kamtſchatka. In Siberia they are of a monſtrous ſize, particularly among the mountains. The elk and the mooſe, according to Mr Pennant, are the ſame ſpecies; the laſt derived from *muſu*, which in the Algonkin language ſignifies that animal. The Engliſh uſed to call it the black mooſe, to diſtinguiſh it from the ſtag, which they named the grey mooſe. The French call it *l'orignal*.

Theſe animals reſide amidſt foreſts, for the conveniency of browſing the boughs of trees, becauſe they are prevented from grazing with any kind of eaſe, by reaſon of the ſhortneſs of their necks and length of their legs. They often have recourſe to water-plants, which they can readily get at by wading. M. Sarraſin ſays, that they are very fond of the anagyris fœtida, or ſtinking bean trefoil, and will uncover the ſnow with their feet in order to get at it. In paſſing through the woods, they raiſe their heads to a horizontal poſition, to prevent their horns from being entangled in the branches. They have a ſingular gait: their pace is a ſhambling trot, but they go with great ſwiftneſs. In their common walk they lift their feet very high, and will without any difficulty ſtep over a gate five feet high. They feed principally in the night. If they graze, it is always againſt an aſcent; an advantage they uſe for the reaſon above aſſigned. They ruminate like the ox. They go to rut in autumn; are at that time very furious, ſeeking the female by ſwimming from iſle to iſle. They bring two young at a birth, in the month of April, which follow the dam a whole year. During the ſummer they keep in families. In deep ſnows they collect in numbers in the foreſts of pines, for protection from the inclemency of the weather under the ſhelter of thoſe evergreens. They are very inoffenſive, except in the rutting-ſeaſon; or except they are wounded, when they will turn on the aſſailant, and attack him with their horns, or trample him to death beneath their great hoofs.

The fleſh of the mooſe is extremely ſweet and nouriſhing. The Indians ſay, that they can travel three times farther after a meal of mooſe, than after any other animal food. The tongues are excellent; but the noſe is perfect marrow, and eſteemed the greateſt delicacy in Canada. The ſkin makes excellent buff; being ſtrong, ſoft, and light. The Indians dreſs the hide, and, after ſoaking it for ſome time, ſtretch and render it ſupple by a lather of the brains in hot water. They not only make their ſnow-ſhoes of the ſkin, but after a chaſe form the canoes with it: they ſew the ſkins neatly together, cover the ſeams with an unctuous earth, and embark in them with their ſpoils to return home. The hair on the neck, withers, and hams of a full-grown elk, is of much uſe in making mattreſſes and ſaddles; being by its great length well adapted for thoſe purpoſes. The palmated parts of the horns are farther excavated by the ſavages, and converted into ladles, which will hold a pint.

It is not ſtrange that ſo uſeful an animal ſhould be a principal object of chaſe. The ſavages perform it in different ways. The firſt, and the more ſimple, is before the lakes or rivers are frozen. Multitudes aſſemble in their canoes, and form with them a vaſt creſcent, each horn touching the ſhore. Another party perform their ſhare of the chaſe among the woods; they ſurround an extenſive tract, let looſe their dogs, and preſs towards the water with loud cries. The animals, alarmed with the noiſe, fly before the hunters, and plunge into the lake, where they are killed by the perſons in the canoes, prepared for their reception, with lances or clubs. The other method is more artful. The ſavages incloſe a large ſpace with ſtakes hedged with branches of trees, forming two ſides of a triangle: the bottom opens into a ſecond incloſure, completely triangular. At the opening are hung numbers of ſnares, made of ſlips of raw hides. The Indians, as before, aſſemble in great troops, and with all kinds of noiſes drive into the firſt incloſure not only the mooſes, but the other ſpecies of deer which abound in that country: ſome, in forcing their way into the fartheſt triangle, are caught in the ſnares by the neck or horns; and thoſe which eſcape the ſnares, and paſs the little opening, find their fate from the arrows of the hunters, directed at them from all quarters. They are often killed with the gun. When they are firſt unharboured, they ſquat with their hind parts and make water, at which inſtant the ſportſman fires; if he miſſes, the mooſe ſets off in a moſt rapid trot, making, like the rein-deer, a prodigious rattling with its hoofs, and will run for 20 or 30 miles before it comes to bay or takes the water. But the uſual time for their diverſion is the winter. The hunters avoid entering on the chaſe till the ſun is ſtrong enough to melt the frozen cruſt with which the ſnow is covered, otherwiſe the animal can run over the firm ſurface: they wait till it becomes ſoft enough to impede the flight of the mooſe; which ſinks up to the ſhoulders, flounders, and gets on with great difficulty. The ſportſman purſues at his eaſe on his broad rackets, or ſnow-

ſnow-ſhoes, and makes a ready prey of the diſtreſſed animals.

> As weak againſt the mountain heaps they puſh
> Their beating breaſt in vain, and piteous bray,
> He lays them quivering on th' enſanguin'd ſnows,
> And with loud ſhouts rejoicing bears them home.
> Thompson.

The opinion of this animal's being ſubject to the epilepſy ſeems to have been univerſal, as well as the cure it finds by ſcratching its ear with the hind hoof till it draws blood. That hoof has been uſed in Indian medicine for the falling-ſickneſs; they apply it to the heart of the afflicted, make him hold it in his left hand, and rub his ear with it. They uſe it alſo in the colic, pleuriſy, vertigo, and purple fever; pulveriſing the hoof, and drinking it in water. The Algonkins pretend that the fleſh imparts the diſeaſe; but it is notorious that the hunters in a manner live on it with impunity. The ſavages eſteem the mooſe a beaſt of good omen; and are perſuaded that thoſe who dream often of it may flatter themſelves with long life.

The elk was known to the Romans by the name of *Alce* and *Machlis:* they believed that it had no joints in its legs; and, from the great ſize of the upper lip, imagined it could not feed without going backward as it grazed.

3. The Elaphus, or Stag, with long cylindrical ramified horns bent backwards, and ſlender ſharp brow antlers. The colour is generally a reddiſh brown with ſome black about the face, and a black liſt down the hind part of the neck and between the ſhoulders. Stags are common to Europe, Barbary, the north of Aſia, and America. In ſpring, they ſhed their horns, which fall off ſpontaneouſly, or by rubbing them gently againſt the branches of trees. It is ſeldom that both horns fall off at the ſame time, the one generally preceding the other a day or two. The old ſtags caſt their horns firſt, which happens about the end of February or beginning of March. An aged ſtag, or one in the ſeventh year or upwards, does not caſt his horns before the middle of March; a ſtag of ſix years ſheds his horns in April; young ſtags, or thoſe from three to five years old, ſhed their horns in the beginning, and thoſe which are in their ſecond year, not till the middle or end of May. But in all this there is much variety; for old ſtags ſometimes caſt their horns ſooner than thoſe which are younger. Beſides, the ſhedding of the horns is advanced by a mild, and retarded by a ſevere and long winter.

As ſoon as the ſtags caſt their horns, they ſeparate from each other, the young ones only keeping together. They no longer haunt the deepeſt receſſes of the foreſt, but advance into the cultivated country, and remain among bruſhwood during the ſummer, till their horns are renewed. In this ſeaſon, they walk with their heads low to prevent their horns from rubbing againſt the branches; for they continue to have ſenſibility till they acquire their full growth. The horns of the oldeſt ſtags are not half completed in the middle of May, and acquire their full length and hardneſs before the end of July. Thoſe of the younger ſtags are proportionally later both in ſhedding and being renewed. But as ſoon as they have acquired their full dimenſions and ſolidity, the ſtags rub them againſt the trees, in order to clear them of a ſkin with which they are covered.

Soon after the ſtags have poliſhed their horns, they begin to feel the impreſſions of love. Towards the end of Auguſt or beginning of September, they leave the coppice, return to the foreſts, and ſearch for the hinds. They cry with a loud voice; their neck and throat ſwell; they become perfectly reſtleſs, and traverſe in open day the fields and the fallow grounds; they ſtrike their horns againſt trees and hedges; in a word, they ſeem to be tranſported with fury, and run from country to country till they find the hinds or females, whom they purſue and compel into compliance; for the female at firſt avoids and flies from the male, and never ſubmits to his embraces till ſhe be fatigued with the purſuit. The old hinds likewiſe come in ſeaſon before the younger ones. When two ſtags approach the ſame hind, they muſt fight before they enjoy. If nearly equal in ſtrength, they threaten, paw the ground, ſet up terrible cries, and attack each other with ſuch fury, that they often inflict mortal wounds with the ſtrokes of their horns. The combat never terminates but in the defeat or flight of one of the rivals. The conqueror loſes not a moment in enjoying his victory, unleſs another rival approaches, whom he is again obliged to attack and repel. The oldeſt ſtags are always maſters of the field; becauſe they are ſtronger and more furious than the young ones, who muſt wait patiently till their ſuperiors tire, and quit their miſtreſſes. Sometimes, however, the young ſtags accompliſh their purpoſes when the old ones are fighting, and, after a haſty gratification, fly off. The hinds prefer the old ſtags, not becauſe they are moſt courageous, but becauſe they are much more ardent. They are likewiſe more inconſtant, having often ſeveral females at a time; and when a ſtag has but one hind, his attachment to her does not continue above a few days: He then leaves her, goes in queſt of another, with whom he remains a ſtill ſhorter time; and in this manner paſſes from one to another till he is perfectly exhauſted.

This ardour of love laſts only three weeks, during which the ſtags take very little food, and neither ſleep nor reſt. Night and day, they are either walking, running, fighting, or enjoying the hinds. Hence, at the end of the rutting ſeaſon, they are ſo meagre and exhauſted, that they recover not their ſtrength for a conſiderable time. They generally retire to the borders of the foreſts, feed upon the cultivated fields, where they find plenty of nouriſhment, and remain there till their ſtrength is re-eſtabliſhed. The rutting ſeaſon of old ſtags commences about the beginning, and ends about the 20th day of September. In thoſe of ſix or ſeven years old, it begins about the 10th of September, and concludes in the beginning of October. In young ſtags, or thoſe in their third, fourth, or fifth year, it begins about the 20th of September, and terminates about the 15th of October; and at the end of October, the rutting is all over, excepting among the *prickets*, or thoſe which have entered into their ſecond year; becauſe they, like the young hinds, are lateſt of coming into ſeaſon. Hence, at the beginning of November, the ſeaſon of love is entirely finiſhed; and the ſtags, during this period of weakneſs and laſſitude, are eaſily hunted down. In ſeaſons when acorns and other nuts are plentiful, the ſtags ſoon recover their ſtrength, and a ſecond rutting frequently happens at the end of October; but it is of much ſhorter duration than the firſt.

In climates warmer than that of France, the rutting time, like the ſeaſons, is more forward. Ariſtotle informs us, that, in Greece, it commences in the beginning of Auguſt, and terminates about the end of September. The hinds go with young eight months and ſome days, and ſeldom produce more than one fawn. They bring forth in May or the beginning of June, and ſo anxiouſly conceal their fawns, that they often expoſe themſelves to be chaſed, with a view to draw off the dogs, and afterwards return to take care of their young. All hinds are not fertile; for ſome of them never conceive. Theſe barren hinds are groſſer and fatter than thoſe which are prolific, and alſo come ſooneſt in ſeaſon. The young are not called *fawns* or *calves* after the ſixth month: The (knobs of their horns then begin to appear, and they take the name of *knobbers* till their horns lengthen into *ſpears*, and then they are called *brocks* and *ſtaggards*. During the firſt ſeaſon they never leave their mothers. In winter, the ſtags and hinds of all ages, keep together in flocks, which are always more numerous in proportion to the rigour of the ſeaſon. They ſeparate in ſpring: The hinds retire to bring forth; and, during this period, the flocks conſiſt only of knobbers and young ſtags. In general, the ſtags are inclined to aſſociate, and nothing but fear or neceſſity obliges them to diſperſe.

The life of the ſtag is ſpent in alternate plenty and want, vigour and debility, health and ſickneſs, without having any change introduced into his conſtitution by theſe oppoſite extremes. He lives as long as other animals which are not ſubjected to ſuch viciſſitudes. As he grows five or ſix years, he lives ſeven times that number, or from 35 to 40 years. What has been reported concerning the longevity of the ſtag merits no credit. It is only a popular prejudice which prevailed in the days of Ariſtotle, and which that philoſopher conſidered as improbable, becauſe neither the time of geſtation nor of the growth of the young ſtag, indicated long life. This authority ought to have aboliſhed the prejudice; but it has been renewed, in the ages of ignorance, by a fabulous account of a ſtag taken by Charles VI. in the foreſt of Senlis, with a collar upon which was written this inſcription, *Cæſar hoc me donavit*. The love of the marvellous inclined men to believe that this animal had lived 1000 years, and had his collar from a Roman Emperor, rather than to ſuppoſe that he came from Germany, where all the emperors take the name of *Cæſar*.

The ſtag appears to have a fine eye, an acute ſmell, and an excellent ear. When liſtening, he raiſes his head, erects his ears, and hears from a great diſtance. When he is going into a coppice, or other half covered place, he ſtops to look round him on all ſides, and ſcents the wind, to diſcover if any object is near that might diſturb him. He is a ſimple and yet a curious and crafty animal. When hiſſed or called to from a diſtance, he ſtops ſhort, and looks ſteadfaſtly, and with a kind of admiration at carriages, cattle, or men; and if they have neither arms nor dogs, he moves on unconcernedly, and without flying. He appears to liſten with great tranquillity and delight to the ſhepherd's pipe; and the hunters ſometimes employ this artifice to encourage and deceive him. In general, he is leſs afraid of men than of dogs, and is never ſuſpicious, or uſes any arts of concealment, but in proportion to the diſturbances he has received. He eats ſlow, and has a choice in his aliment; and after his ſtomach is full, he lies down, and ruminates at leiſure. He ſeems to ruminate with leſs facility than the ox. It is only by violent ſhakes that the ſtag can make the food riſe from his firſt ſtomach. This difficulty proceeds from the length and direction of the paſſage through which the aliment has to go. The neck of the ox is ſhort and ſtraight, but that of the ſtag is long and arched; and therefore greater efforts are neceſſary to raiſe the food. Theſe efforts are made by a kind of hiccup, the movement of which is apparent, and continues during the time of rumination. His voice is ſtronger and more quivering, in proportion as he advances in years. The voice of the hind is ſhorter and more feeble. She never bellows from love, but from fear. The ſtag during the rutting ſeaſon, bellows in a frightful manner: He is then ſo tranſported, that nothing diſturbs or terrifies him. He is therefore eaſily ſurpriſed; as he is loaded with fat, he cannot keep long before the dogs. But he is dangerous when at bay, and attacks the dogs with a ſpecies of fury. He drinks none in winter nor in ſpring, the dews and tender herbage being then ſufficient to extinguiſh his thirſt; but during the parching heats of ſummer, to obtain drink, he frequents the brooks, the marſhes, and the fountains; and in the ſeaſon of love, he is ſo over-heated, that he ſearches every where for water, not only to ſatisfy his immoderate thirſt, but to bathe and refreſh his body. He then ſwims eaſier than at any other times on account of his fatneſs. He has been obſerved croſſing very large rivers. It has even been alleged, that, attracted by the odour of the hinds, the ſtags, in the rutting ſeaſon, throw themſelves into the ſea, and paſs from one iſland to another at the diſtance of ſeveral leagues. They leap ſtill more nimbly than they ſwim; for, when purſued, they eaſily clear a hedge or a pale fence of ſix feet high. Their food varies in different ſeaſons. In autumn, after rutting, they ſearch for the buds of green ſhrubs, the flowers of broom or heath, the leaves of brambles, &c. During the ſnows of winter, they feed upon the bark, moſs, &c. of trees; and in mild weather, they browſe in the wheat-fields. In the beginning of ſpring, they go in queſt of the catkins of the trembling popular, willow, and hazel-trees, the flowers and buds of the cornel tree, &c. In ſummer, when they have great choice, they prefer rye to all other grain, and the black berry-bearing alder to all other wood. The fleſh of the fawn is very good: that of the hind and knobber not abſolutely bad; but that of the ſtag has always a ſtrong and diſagreeable taſte. The ſkin and the horns are the moſt uſeful parts of this animal. The ſkin makes a pliable and very durable leather. The horns are uſed by cutlers, ſword-ſlippers, &c. and a volatile ſpirit, much employed in medicine, is extracted from them by the chymiſts.

In America, ſtags feed eagerly on the broad-leaved kalmia; yet that plant is a poiſon to all other horned animals: their inteſtines are found filled with it during winter. If their entrails are given to dogs, they become ſtupified, and as if drunk, and often are ſo ill as hardly to eſcape with life. The American ſtags grow very fat: their tallow is much eſteemed for making of candles. The Indians ſhoot them. As they are very ſhy animals, the natives cover themſelves with a hide, leaving the horns erect; under the ſhelter of which they walk within the reach of the herd. De Brie, in the 25th plate of the Hiſtory of Florida, gives a very curious repreſentation of this artful method of chaſe, when it was viſited by the French in 1564. Their ſkins are an article of commerce imported by the Hudſon's Bay Company; but brought from the diſtant parts far inland by the Indians, who bring them from the neighbourhood of the lakes. In moſt parts of North America they are called the grey mooſe, and the elk; this has given occaſion to the miſtaken notion of that great animal being found in Virginia and other ſouthern ſtates.

In Britain the ſtag is become leſs common than formerly; its exceſſive viciouſneſs during the rutting ſeaſon, and the badneſs of its fleſh, induce moſt people to part with the ſpecies. Stags are ſtill found wild in the Highlands of Scotland, in herds of four or five hundred together, ranging at full liberty over the vaſt hills of the north. Formerly the great Highland chieftains uſed to hunt with the magnificence of an eaſtern monarch, aſſembling four or five thouſand of their clan; who drove the deer into the toils, or to the ſtations the lairds had placed themſelves in: but as this pretence was frequently uſed to collect their vaſſals for rebellious purpoſes, an act was paſſed prohibiting any aſſemblies of this nature. Stags are likewiſe met with on the moors that border on Cornwall and Devonſhire; and in Ireland on the mountains of Kerry, where they add greatly to the magnificence of the romantic ſcenery of the lake of Killarney. The ſtags of Ireland during its uncultivated ſtate, and while it remained an almoſt boundleſs tract of foreſt, had an exact agreement in habit with thoſe that range at preſent through the wilds of America. They were leſs in body, but very fat; and their horns of a ſize far ſuperior to thoſe of Europe, but in form agreed in all points.

The chaſe of the ſtag has been formed into an art, and requires a ſpecies of knowledge which can only be learned by experience: It implies a royal aſſemblage of men, horſes, and dogs, all ſo trained, practiſed, and diſciplined, that their movements, their reſearches, and their ſkill, muſt concur in producing one common end. The huntſman ſhould know the age and the ſex of the animal; he ſhould be able to diſtinguiſh with preciſion, whether the ſtag he has harboured with his hound be a knobber, a young ſtag, in his ſixth or ſeventh year, or an old ſtag. The chief marks which convey this intelligence is derived from the foot, and the excrement. The foot of the ſtag is better formed than that of the hind, or female. Her leg is more groſs and nearer the heel. The impreſſions of his feet are rounder, and farther removed from each other. He moves more regularly, and brings the hind-foot into the impreſſion made by the fore-foot. But the diſtance between the ſteps of the hind are ſhorter, and her hind-feet ſtrike not ſo regularly the track of the fore-feet. As ſoon as the ſtag acquires his fourth horns, he is eaſily diſtinguiſhed; but to know the foot of a young ſtag from that of a hind, requires repeated experience. Stags of ſix, ſeven, &c. years, are ſtill more eaſily known; for their fore-foot is much larger than the hind-foot; the older they are, the ſides of their feet are the more worn; the diſtance of their ſteps are more regular than thoſe of young ſtags; they always place their hind-foot exactly in the track of the fore-foot, excepting when they ſhed their horns, the old ſtags miſplace at this ſeaſon, nearly as often as the young ones, but in this they are more regular than the hind or young ſtag, placing the hind-foot always at the ſide of the fore-foot, and never beyond or within it. When the huntſman, from the dryneſs of the ſeaſon, or other circumſtances, cannot judge by the foot, he is obliged to trace the animal backwards, and endeavour to find his dung. This mark requires, perhaps, greater experience than the knowledge of the foot; but without it the huntſman would be unable to give a proper report to the company. After the report of the huntſman, and the dogs are led to the refuge of the ſtag, he ought to encourage his hound, and make him reſt upon the track of the ſtag, till the animal be unharboured. Inſtantly the alarm is given to uncouple the dogs, which ought to be enlivened by the voice and the horn of the huntſman. He ſhould alſo diligently obſerve the foot of the ſtag, in order to diſcover whether the animal has ſtarted, and ſubſtituted another in his place. But it is then the buſineſs of the hunters to ſeparate alſo, and to recal the dogs which have gone aſtray after falſe game. The huntſman ſhould always accompany his dogs, and encourage, without preſſing them too hard. He ſhould aſſiſt them in detecting all the arts of eſcape uſed by the ſtag; for this animal has remarkable addreſs in deceiving the dogs. With this view he often returns twice or thrice upon his former ſteps; he endeavours to raiſe hinds or younger ſtags to accompany him, and draw off the dogs from the object of their purſuit: he then flies with redoubled ſpeed, or ſprings off at ſide, lies down on his belly, and conceals himſelf. In this caſe, when the dogs have loſt his foot, the huntſmen, by going backwards and forwards, aſſiſt them in recovering it. But if they cannot find it, they ſuppoſe that he is reſting within the circuit they have made, and go in queſt of him. But if they are ſtill unable to diſcover him, there is no other method left, but, from viewing the country, to conjecture where he may have taken refuge, and repair to the place. As ſoon as they have recovered his foot, and put the dogs upon the track, they purſue with more advantage, becauſe they perceive that the ſtag is fatigued. Their ardour augments in proportion to his feebleneſs; and their ſcent becomes more diſtinct as the animal grows warm. Hence they redouble their cries and their ſpeed; and though the ſtag practiſes ſtill more arts of eſcape than formerly, as his ſwiftneſs is diminiſhed, his arts and doublings become gradually leſs effectual. He has now no other reſource but to fly from the earth which he treads, and get into the waters, in order to cut off the ſcent from the dogs. The huntſmen go round theſe waters, and again put the dogs on the track of his foot. The ſtag, after taking to the water is incapable of running far, and is ſoon at bay. But he ſtill attempts to defend his life, and often wounds the dogs, and even the huntſmen when too forward, by blows with his horns, till one of them cuts his hams to make him fall, and then puts an end to his life, by a blow of a hanger. They now celebrate the death of the ſtag by a flouriſh of their horns: the dogs are allowed to trample upon him, and at laſt partake richly of the victory by devouring his fleſh.

4. The Tarandus, or Rein-deer, is a native of Lapland, and the northern parts of Europe, Aſia, and America. The horns are large, cylindrical, branched, and palmated at the tops. Two of the branches hang over the face. He is about the ſize of a buck, of a dirty whitiſh colour; the hairs of his ſkin are thick and ſtrong. To the Laplanders this animal is the ſubſtitute of the horſe, the cow, the goat, and the ſheep; and is their only wealth: the milk affords them cheeſe; the fleſh, food; the ſkin, cloathing; the tendons, bow-ſtrings; and when ſplit, thread; the horns, glue; the bones, ſpoons. During the winter it ſupplies the want of a horſe, and draws their ſledges with amazing ſwiftneſs, over the frozen lakes and rivers, or over the ſnow, which at that time covers the whole country. A rich Laplander is poſſeſſed of a herd of 1000 rein deer. In autumn they ſeek the higheſt hills, to avoid the Lapland gad-fly, which at that time depoſits its eggs in their ſkin; it is the peſt of theſe animals, and numbers die that are thus viſited. The moment a ſingle fly appears, the whole herd inſtantly perceives it; they fling up their heads, toſs about their horns, and at once attempt to fly for ſhelter amidſt the ſnows of the loftieſt Alps. In ſummer they feed on ſeveral plants; but during winter on the rein-liverwort, which lies far beneath the ſnow, which they remove with their feet and palmated brow antlers, in order to get at their beloved food.

The Samoieds, leſs intelligent than the Laplanders, conſider them in no other view than as animals of draught, to convey them to the chaſe of the wild reins; which they kill for the ſake of the ſkins, either to clothe themſelves, or to cover their tents. They know not the cleanly delicacy of the milk or cheeſe; but prefer for their repaſt the inteſtines of beaſts, or the half-putrid fleſh of a horſe, ox, or ſheep, which they find dead on the high road.—The Koreki, a nation of Kamtſchatka, may be placed on a level with the Samoieds. They keep immenſe herds of reins; ſome of the richeſt to the amount of 10 or 20 thouſand; yet ſo ſordid are they as to eat none except ſuch as they kill for the ſake of the ſkins; an article of commerce with their neighbours the Kamtſchatkans; otherwiſe they content themſelves with the fleſh of thoſe which die by diſeaſe or chance. They train them in the ſledge, but neglect them for every domeſtic purpoſe. Their hiſtorian ſays, they couple two to each carriage; and that the deer will travel 150 verſts in a day, that is 112 Engliſh miles. They caſtrate the males by piercing the ſpermatic arteries, and tying the ſcrotum tight with a thong.—The ſavage and uninformed Eſkimaux and Greenlanders, who poſſeſs, amidſt their ſnows, theſe beautiful animals, neglect not only the domeſtic uſes, but even are ignorant of their advantage in the ſledge. Their element is properly the water; their game the ſeals. They ſeem to want powers to domeſticate any animals except dogs. They are at enmity with all; conſider them as an object of chaſe, and of no utility till deprived of life. The fleſh of the rein is the moſt coveted part of their food; they eat it raw, dreſſed, and dried and ſmoked with the ſnow lichen. The wearied hunters will drink the raw blood; but it is uſually dreſſed with the berries of the heath: they eagerly devour the contents of the ſtomach, but uſe the inteſtines boiled. They are very fond of the fat, and will not loſe the leaſt bit. The ſkin, ſometimes a part of their cloathing, dreſſed with the hair on, is ſoft and pliant; it forms alſo the inner lining of their tents, and moſt excellent blankets. The tendons are their bow-ſtrings, and when ſplit are the threads with which they ſew their jackets.

The Greenlanders, before they acquired the knowledge of the gun, caught them by what was called the *clapper-hunt*. The women and children ſurrounded a large ſpace, and, where people were wanting, ſet up poles capped with a turf in certain intervals, to terrify the animals; they then with great noiſe drove the reins into the narrow defiles, where the men lay in wait and killed them with harpoons or darts. But they are now become very ſcarce.

The rein-deers are found in the neighbourhood of Hudſon's Bay, in moſt amazing numbers, columns of eight or ten thouſand are ſeen annually paſſing from north to ſouth in the months of March and April, driven out of the woods by the muſketoes, ſeeking refreſhment on the ſhore, and a quiet place to drop their young. They go to rut in September, and the males ſoon after ſhed their horns; they are at that ſeaſon very fat, but ſo rank and muſky as not to be eatable. The females drop their young in June, in the moſt ſequeſtered ſpots they can find; and then they likewiſe loſe their horns. Beaſts of prey follow the herds: firſt, the wolves, who ſingle out the ſtragglers (for they fear to attack the drove), detach and hunt them down: the foxes attend at a diſtance, to pick up the offals left by the former. In autumn the deer with the fawns remigrate northward. The Indians are very attentive to their motions; for the rein forms the chief part not only of their dreſs but of their food. They often kill multitudes for the ſake of their tongues only; but generally they ſeparate the fleſh from the bones, and preſerve it by drying it in the ſmoke; they alſo ſave the fat, and ſell it to the Engliſh in bladders, who uſe it in frying inſtead of butter. The ſkins are alſo an article of commerce, and uſed in London by the breeches-makers. The Indians ſhoot them in the winter. The Engliſh make hedges with ſtakes and boughs of trees along the woods for five miles in length, leaving openings at proper intervals beſet with ſnares, in which multitudes are taken. The Indians alſo kill great numbers during the ſeaſons of migration, watching in their canoes, and ſpearing them while paſſing over the rivers of the country, or from iſland to iſland; for they ſwim moſt admirably well.

5. The Dama or Fallow-deer, Buck and Doe; with horns branched, compreſſed, and palmated at the top. The colour is various; reddiſh, deep brown, white or ſpotted. This ſpecies is not ſo univerſal as the ſtag: rare in France and Germany. It is fonnd in Greece, the Holy Land, and the north of China. They are very numerous in England; but, except on a few chaſes, confined in parks. None originally in America. They are eaſily tamed; and their fleſh, which goes by the name of veniſon, is in high eſteem among the luxurious. During rutting-time they will contend

with each other for their miſtreſs, but are leſs fierce than the ſtag; during that ſeaſon, the male will form a hole in the ground, make the female lie down in it, and then often walk round and ſmell at her. Moore ſpeaks of a ſpecies found on the banks of the Gambia, in the interior parts of Africa, near Barracunda, called *Toncong,* which he ſays differed not in form from the Engliſh fallow-deer; only that its ſize was equal to that of a ſmall horſe, and weighed 300lb. It had alſo on its neck an erect black mane, four or five inches long.—Mr White, in his Natural Hiſtory of Pelborn, mentions as a piece of information to naturaliſts, that if ſome curious gentleman would procure the head of a fallow-deer, and have it diſſected, he would find it furniſhed with two *ſpiracula,* or breathing places, beſides the noſtrils; probably analogous to the *puncta lachrymalia* in the human head. When deer are thirſty they plunge their noſes, like ſome horſes, very deep under water, while in the act of drinking, and continue them in that ſituation for a conſiderable time; but, to obviate any inconveniency, they can open two vents, one at the inner corner of each eye, having a communication with the noſe. This ſeems, as our author obſerves, to be an extraordinary proviſion of nature; for it looks as if theſe creatures could not be ſuffocated, though their mouths and noſtrils were both ſtopped. This curious formation of the head, he farther remarks, may be of ſingular ſervice to beaſts of chaſe, by affording them free reſpiration; and no doubt theſe additional noſtrils are thrown open when they are hard run. Mr Pennant has obſerved the ſame curious organization in the antelope. See CAPRA.

6. The Capreolus, or Roe-buck, has erect cylindrical, branched horns, and forked at the top. His ſize is only three feet nine inches long, two feet three inches high before, and two feet ſeven inches high behind: weight from 50 to 60lb. Though the leaſt of the deer-kind, his figure is moſt elegant and handſome. His eyes are more brilliant and animated than thoſe of the ſtag. His limbs are more nimble, his movements quicker, and he bounds, ſeemingly without effort, with equal vigour and agility. His coat, or hair, is always clean, ſmooth, and gloſſy. He never wallows in the mire like the ſtag. He delights in dry and elevated ſituations, where the air is pureſt. He is likewiſe more crafty, conceals himſelf with greater addreſs, is more difficult to trace, and derives ſuperior reſources from inſtinct; for though he has the misfortune to leave behind him a ſtronger ſcent than the ſtag, which redoubles the ardour and appetite of the dogs, he knows how to withdraw himſelf from their purſuit, by the rapidity with which he begins his flight, and by his numerous doublings. He delays not his arts of defence till his ſtrength fails him; but, as ſoon as he finds that the firſt efforts of a rapid chaſe have been unſucceſsful, he repeatedly returns on his former ſteps; and after confounding by theſe oppoſite movements, the direction he has taken, after intermixing the preſent with the paſt emanations from his body, he riſes from the earth with a great bound, and retiring to a ſide, he lies down flat on his belly; and in this immoveable ſituation, he allows the whole troop of his deceived enemies to paſs very near him.

The roe-deer differs from the ſtag and fallow-deer in diſpoſition, temperament, manners, and almoſt every natural habit. Inſtead of aſſociating in herds, they live in ſeparate families. The father, mother, and young, go together, and never mix with ſtrangers. They are conſtant in their amours, and never unfaithful like the ſtag. As the females generally produce two fawns, the one male and the other female, theſe young animals, brought up and nouriſhed together, acquire ſo ſtrong a mutual affection, that they never quit each other, unleſs one of them meets with a misfortune, which never ought to ſeparate lovers. This attachment is more than love; for though always together, they feel the ardour of the rut but once a year, and it continues only fifteen days, commencing at the end of October, and ending before the fifteenth day of November. They are not then, like the ſtag, overloaded with fat: they have no ſtrong ſmell, no fury, in a word, nothing that can change the ſtate of their bodies. During this period, they indeed ſuffer not their fawns to remain with them. The father drives them off, as if he meant to oblige them to yield their place to thoſe which are to ſucceed, and to form new families for themſelves. However, after the rutting ſeaſon is paſt, the fawns return to their mother, and remain with her ſome time; after which they ſeparate for ever, and remove to a diſtance from the place which gave them birth.

The female goes with young five months and a half, and brings forth about the end of April or beginning of May. She produces two at a time, which ſhe is obliged to conceal from the buck while very young. In 10 or 12 days they acquire ſtrength ſufficient to enable them to follow her. When threatened with danger, ſhe hides them in a cloſe thicket, and, to preſerve them preſents herſelf to be chaſed. But notwithſtanding all her care and anxiety, the young are ſometimes carried off by men, dogs, or wolves.

Roe-bucks prefer a mountainous woody country to a plain one. They were formerly very common in Wales, in the north of England, and in Scotland; but at preſent the ſpecies nowhere exiſts in Great-Britain, except in the Scottiſh highlands. In France they are more frequent; they are alſo found in Italy, Sweden, and Norway; and in Aſia they are met with in Siberia. The firſt that are met with in Great-Britain, are in the woods on the ſouth ſide of Loch-Rannoch, in Perthſhire: the laſt in thoſe of Longwal, on the ſouthern borders of Caithneſs; but they are moſt numerous in the beautiful foreſts of Invercauld, in the midſt of the Grampian hills. They are unknown in Ireland. Wild roes, during ſummer, feed on graſs; and are very fond of the *rubus ſaxatilis,* called in the Highlands the roe-buck berry; but in the winter time, when the ground is covered with ſnow, they brouſe on the tender branches of the fir and birch.

7. The Guineenſis, about the ſize of a cat, is of a greyiſh colour, and black underneath. It is a native of Guinea, and the ſize and figure of its horns have not been hitherto deſcribed with any preciſion.

8. The Axis, or Speckled Deer, has ſlender trifurcated horns; the firſt branch near the baſe, the ſecond near the top, each pointing upwards. This ſpecies is about the ſize of the fallow-deer; of a light red colour; the body beautifully marked with white ſpots; along

along the lower part of the ſides, next the belly, is a line of white; the tail long, as that of a fallow-deer; red above, white beneath.—They are common on the banks of the Ganges, and in the iſle of Ceylon. Pliny deſcribes them well among the animals of India, and adds that they were ſacred to Bacchus. They will bear other climates; and have bred in the prince of Orange's menagery near the Hague. They are very tame, and have the ſenſe of ſmelling in an exquiſite degree. They readily eat bread, but will refuſe a piece that has been breathed on: many other animals of this, the antelope and goat kind, will do the ſame.

9. The Porcine or Hog-Deer, has ſlender trifurcated horns, 13 inches long: His body is thick and clumſy; his legs are fine and ſlender: The upper part of the neck, body, and ſides, are brown; belly and rump of a lighter colour.—They are found in Bengal; and called, from the thickneſs of their body, *hog-deer*. The ſame ſpecies is alſo found in Borneo. They are taken in ſquare pit-falls, about four feet deep, covered with ſome ſlight materials. Of their feet, as well as thoſe of the leſſer ſpecies of muſks and antelopes, are made tobacco-ſtoppers.

10. The Virginiana, or Virginian Deer, has ſlender horns bending very much forward; numerous branches on the interior ſides; no brow antlers. It is about the ſize of the Engliſh fallow-deer; of a light colour, cinereous brown. A quite diſtinct ſpecies, and peculiar to America. It inhabits all the provinces ſouth of Canada, but in the greateſt abundance in the ſouthern; but eſpecially the vaſt ſavannas contiguous to the Miſſiſippi, and the great rivers which flow into it. They graze in herds innumerable, along with the ſtags and buffaloes. This ſpecies probably extends to Guiana, and is the *baieu* of that country, which is ſaid to be about the ſize of a European buck, with ſhort horns, bending at their ends. They are capable of being made tame; and when properly trained, are uſed by the Indians to decoy the wild deer (eſpecially in the rutting ſeaſon) within ſhot. Both bucks and does herd from September to March; after that they ſeparate, and the does ſecret themſelves to bring forth, and are found with difficulty. The bucks from this time keep ſeparate till the amorous ſeaſon of September revolves. The deer begin to feed as ſoon as night begins; and ſometimes in the rainy ſeaſon, in the day; otherwiſe they ſeldom or never quit their haunts. An old American ſportſman has remarked that the bucks will keep in the thickets for a year, or even two.

Theſe animals are very reſtleſs, and always in motion, coming and going continually. Thoſe which live near the ſhore are lean and bad, ſubject to worms in their heads and throats, generated from the eggs depoſited in thoſe parts. Thoſe that frequent the hills and ſavannas are in better caſe, but the veniſon is dry. In hard winters they will feed on the long moſs which hangs from the trees in the northern parts.

Theſe and other cloven-footed quadrupeds of America are very fond of ſalt, and reſort eagerly to the places impregnated with it. They are always ſeen in great numbers in the ſpots where the ground has been torn by torrents or other accidents, where they are ſeen licking the earth. Such ſpots are called *licking-places*. The huntſmen are ſure of finding the game there; for notwithſtanding they are often diſturbed, the buffaloes and deer are ſo paſſionately fond of the ſavoury regale, as to bid defiance to all danger, and return in droves to theſe favourite haunts.

The deer are of the firſt importance to the ſavages. The ſkins form the greateſt branch of their traffic, by which they procure from the coloniſts, by way of exchange, many of the articles of life. To all of them the fleſh is the principal food throughout the year; for drying it over a gentle but clear fire, after cutting it into ſmall pieces, it is not only capable of long preſervation, but is very portable in their ſudden excurſions, eſpecially when reduced to powder, which is frequently done.

Hunting is more than an amuſement to theſe people. They give themſelves up to it not only for the ſake of ſubſiſtence, but to fit themſelves for war, by habituating themſelves to fatigue. A good huntſman is an able warrior. Thoſe who fail in the ſports of the field are never ſuppoſed to be capable of ſupporting the hardſhips of a campaign; they are degraded to ignoble offices, ſuch as dreſſing the ſkins of deer, and other employs allotted only to ſlaves and women. When a large party meditates a hunting-match, which is uſually at the beginning of winter, they agree on a place of rendezvous, often 500 miles diſtant from their homes, and a place perhaps that many of them had never been at. They have no other method of fixing on the ſpot than by pointing with their finger. The preference is given to the eldeſt, as the moſt experienced. When this matter is ſettled, they ſeparate into ſmall parties, travel and hunt for ſubſiſtence all the day, and reſt at night; but the women have no certain reſting-places. The ſavages have their particular hunting countries; but if they invade the limits of thoſe belonging to other nations, feuds enſue, fatal as thoſe between Percy and Douglas in the famed Chevy Chace. As ſoon as they arrive on the borders of the hunting country (which they never fail doing to a man, be their reſpective routes every ſo diſtant or ſo various), the captain of the band delineates on the bark of a tree his own figure with a rattleſnake twined round him with diſtended mouth; and in his hand a bloody tomahawk. By this he implies a deſtructive menace to any who are bold enough to invade their territories, or to interrupt their diverſion.—The chaſe is carried on in different ways. Some ſurpriſe the deer by uſing the ſtale of the head, horns, and hide; but the general method is performed by the whole body. Several hundreds diſperſe in a line, encompaſſing a vaſt ſpace of country, fire the woods, and drive the animals into ſome ſtrait or peninſula, where they become an eaſy prey. The deer alone are not the object; foxes, raccoons, bears, and all beaſts of fur, are thought worthy of attention, and form articles of commerce with the Europeans.

The number of deer deſtroyed in ſome parts of America is incredible; as is pretended, from an abſurd idea which the ſavages have, that the more they deſtoy, the more they ſhall find in ſucceeding years. Certain it is that multitudes are deſtroyed; the tongues only preſerved, and the carcaſes left a prey to wild beaſts. But the motive is much more political. The ſavages well diſcern, that ſhould they overſtock the market, they would certainly be over-reached by the European dealers, who take care never to produce more goods than are barely ſufficient for the demand of the ſeaſon, eſtabliſhing their prices according to the quantity of furs brought by the natives.

Cervus Volans, in natural hiſtory, a name given by authors to the ſtag-fly, or horned beetle, a very large ſpecies of beetle with horns ſloped, and ſomething like thoſe of the ſtag.

CERYX, in antiquity. The ceryces were a ſort of public criers appointed to proclaim or publiſh things aloud in aſſemblies. The *ceryx* among the Greeks anſwered to the *præco* among the Romans. Our criers have only a ſmall part of their office and authority.

There were two kinds of ceryces, *civil* and *ſacred*. The former were thoſe appointed to call aſſemblies and make ſilence therein; alſo to go on meſſages, and do the office of our heralds, &c. The ſacred ceryces were a ſort of prieſts, whoſe office was to proclaim ſilence in the public games and ſacrifices, publiſh the names of the conquerors, proclaim feaſts, and the like. The prieſthood of the ceryces was annexed to a particular family, the deſcendants of Ceryx, ſon of Eumolphus. To them it alſo belonged to lead ſolemn victime to ſlaughter. Before the ceremonies began, they called ſilence in the aſſembly, by the formula, Ευφημειτε σιγη ϖας εσω λεως; anſwering to the *favete linguis* of the Romans. When the ſervice was over, they diſmiſſed the people with this formula, Δαων αφεσις, *Ite miſſa eſt.*

CESARE, among logicians, one of the modes of the ſecond figure of ſyllogiſms; the minor propoſition of which is an univerſal affirmative, and the other two univerſal negatives: thus,

Ce No immoral books ought to be read;
Sa But every obſcene book is immoral;
Re Therefore no obſcene books ought to be read.

CECENA, a town of Romagna in Italy, with a biſhop's ſee, ſubject to the pope, and ſeated on the river Savio, in E. Long. 12. 46. N. Lat. 44. 8.

CESPITOSÆ plantæ (from *ceſpes*, turf or ſod) are thoſe plants which produce many ſtems from one root, and thence form a cloſe thick carpet on the ſurface of the earth.

Cespitosæ Paludes, turf-bogs.

CESSATION, the act of intermitting, diſcontinuing or interrupting the courſe of any thing, work, action or the like.

Cessation of Arms, an armiſtice or occaſional truce. See Truce.

When the commander of a place finds things reduced to an extremity, ſo that he muſt either ſurrender, or ſacrifice the garriſon and inhabitants to the mercy of the enemy, he plants a white flag on the breach, or beats the chamade; on which a ceſſation of arms and hoſtilities commences, to give room for a capitulation.

CESSIO bonorum, in Scots law, the name of that action by which an inſolvent debtor may apply for liberation from priſon, upon making over his whole real and perſonal eſtate to his creditors.

CESSION, in law, an act by which a perſon ſurrenders and tranſmits to another perſon a right which belonged to himſelf. Ceſſion is more particularly uſed in the civil law for a voluntary ſurrender of a perſon's effects to his creditors, to avoid impriſonment. See the article Bankrupt.

In ſeveral places the ceſſion carried with it a mark of infamy, and obliged the perſon to wear a green cap or bonnet; at Lucca, an orange one: to neglect this was to forfeit the privileges of the *ceſſion*. This was originally intended to ſignify that the ceſſionary was become poor through his own folly. The Italian lawyers deſcribe the ceremony of ceſſion to conſiſt in ſtriking the bare breech three times againſt a ſtone, called *Lapis Vituperii*, in preſence of the judge. Formerly it conſiſted in giving up the girdles and keys in court: the ancients uſing to carry at their girdles the chief utenſils wherewith they got their living; as the ſcrivener his eſcritoire, the merchant his bag, &c. The form of ceſſion among the ancient Gauls and Romans was as follows: The ceſſionary gathered up duſt in his left hand from the four corners of the houſe, and ſtanding on the threſhold, holding the door poſt in his right hand, threw the duſt back over his ſhoulders; then ſtripping to his ſhirt, and quitting his girdle and bags, he jumped with a pole over the hedge; hereby letting the world know, that he had nothing left, and that when he jumped all he was worth was in the air with him. This was the ceſſion in criminal matters. In civil caſes, it was ſufficient to lay a broom, a ſwitch or a broken ſtraw, on the threſhold: this was called *chrenecruda per durpillum et feſtucam*.

Cession, in the eccleſiaſtical law, is when an eccleſiaſtical perſon is created a biſhop, or when a parſon of a pariſh takes another benefice, without diſpenſation, or being otherwiſe qualified. In both theſe caſes their firſt benefices became void by ceſſion, without any reſignation; and to thoſe livings that the perſon had, who was created biſhop, the king may preſent for that time, whoſoever is patron of them; and in the other caſe the patron may preſent: but by diſpenſation of retainder, a biſhop may retain ſome or all the preferments he was intitled to before he was made biſhop.

CESTRUM, bastard jasmine: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The corolla is funnel-ſhaped; the ſtamina each ſending out a little tooth about the middle of the inſide. There are ſix ſpecies, all of them natives of the warmeſt parts of America; ſo cannot be preſerved in Britain without artificial heat. They are flowering ſhrubs, riſing in height from five to twelve feet, with flowers of a white, herbaceous, or pale yellow colour. The flowers of one ſpecies commonly called *Badmington Jaſmine*, have the property of ſending out a ſtrong ſcent after ſunſet. They may be propagated either by ſeeds or cuttings.

CESTUI, a French word, ſignifying *he* or *him*, frequently uſed in the Engliſh law writings. Thus, *Ceſtui qui truſt*, a perſon who has lands, &c. committed to him for the benefit of another; and if ſuch perſon does not perform his truſt, he is compellable to it in chancery. *Ceſtui qui vie*, one for whoſe life any lands, &c. are granted. *Ceſtui qui uſe*, a perſon to whoſe uſe any one is infeoffed of lands or tenements. Formerly the feoffees to uſes were deemed owners of the

the land, but now the poſſeſſion is adjudged in *ceſtui qui uſe*.

CESTUS, among ancient poets, a fine embroidered girdle ſaid to be worn by Venus, to which Homer aſcribes the power of charming and conciliating love. The word is alſo written *ceſtum* and *ceſton*: it comes from κεϛος, *a girdle*, or other thing embroidered or wrought with a needle; derived, according to Servius, from κεντειν, *pungere*; whence alſo *inceſtus*, a term uſed at firſt for any indecency by undoing the girdle, &c. but now reſtrained to that between perſons near akin. See INCEST.

CETACEOUS, an appellation given to the fiſhes of the whale kind; the characters of which are: they have no gills; there is an orifice on the top of the head, through which they breathe and eject water; and they have a flat or horizontal tail.

Nature on this tribe hath beſtowed an internal ſtructure in all reſpects agreeing with that of quadrupeds; and in a few others the external parts in both are ſimilar. Cetaceous fiſh, like land animals, breathe by means of lungs, being deſtitute of gills. This obliges them to riſe frequently on the ſurface of the water to reſpire, to ſleep on the ſurface, as well as to perform ſeveral other functions. They have the power of uttering ſounds, ſuch as bellowing and making other noiſes denied to genuine fiſh. Like land animals they have warm blood, are furniſhed with organs of generation, copulate, bring forth, and ſuckle their young, ſhowing a ſtrong attachment to them. Their bodies beneath the ſkin are entirely ſurrounded with a thick layer of fat (blubber), analogous to the lard on hogs. The number of their fins never exceed three, *viz.* two pectoral fins, and one back fin; but in ſome ſpecies the laſt is wanting. Their tails are placed horizontally, or flat in reſpect to their bodies; contrary to the direction of thoſe of all other fiſh, which have them in a perpendicular ſite. This ſituation of the tail enables them to force themſelves ſuddenly to the ſurface of the water to breathe, which they are ſo frequently conſtrained to do. Many of theſe circumſtances induced Linnæus to place this tribe among his *mammalia*, or what other writers call *quadrupeds**. To have preſerved the chain of beings entire, he ſhould in this caſe have made the genus of *phocæ* or *ſeals*, and that of the *tricheus* or *manati*, immediately precede the whale, thoſe being the links that connect the mammalia or quadrupeds with the fiſh: for the ſeal is, in reſpect to its legs, the moſt imperfect of the former claſs; and in the manati the hind feet coaleſce, aſſuming the form of a broad horizontal tail.

* See Zoology.

Notwithſtanding the many parts and properties which cetaceous fiſh have in common with land animals, yet there ſtill remain others which render it more natural to place them, with Ray, in the rank of fiſh: the form of their bodies agrees with that of fiſh; they are entirely naked, or covered only with a ſmooth ſkin; they live conſtantly in the water, and have all the actions of fiſh.

CETE, the name of Linnæus's ſeventh order of mammalia, comprehending the MONODON, BALÆNA, PHYSETER, and DELPHINUS.

CETERACH, in botany, the trivial name of a ſpecies of ASPLENIUM.

CETTE, a maritime town of France, in Languedoc, ſeated at the place where the canal of Languedoc begins, between Montpellier and Agde, on the bay of Magnelona in the Mediterranean ſea. E. Long. 3. 15. N. Lat. 43. 25.

CETUS, in aſtronomy, the whale; a large conſtellation of the ſouthern hemiſphere, under Piſces, and next the water of Aquarius. The ſtars in the conſtellation Cetus, in Ptolemy's catalogue, are twenty-two; in Tycho's twenty-one; in Hevelius's forty-five; in the Britannic catalogue ninety-ſeven.

Cetus is repreſented by the poets, as the ſea-monſter which Neptune, at the ſuit of the nymphs, ſent to devour Andromeda for the pride of her mother, and which was killed by Perſeus. In the mandible of cetus is a variable ſtar which appears and diſappears periodically, paſſing through the ſeveral degrees of magnitude both increaſing and diminiſhing, in about 333 days. See ASTRONOMY, n° 45.

CEVA, a ſtrong town of Piedmont in Italy, ſeated on the river Tanero, with a ſtrong fort, in E. Long. 8. 8. N. Lat. 44. 20.

CEVENNES, mountains of Languedoc in France, remarkable for the frequent meetings of the Proteſtants there as a place of ſecurity againſt the tyranny of their governors. In queen Anne's reign there was an attempt made to aſſiſt them by an Engliſh fleet in the Mediterranean; but to no purpoſe, for the French had occupied the paſſages.

CEUTA, a maritime town of Barbary in Africa, and in the kingdom of Fez, ſeated on the ſtraits of Gibraltar, oppoſite that place, in W. Long. 6. 25. N. Lat. 36. 35. John king of Portugal took it from the Moors in 1415, but it now belongs to Spain. In 1697, it ſuſtained a vigorous ſiege by the Moors.

CEYLON, a large iſland in the Eaſt Indies, about 250 miles in length and 200 in breadth. It abounds in trees and ſhrubs, valuable both on account of their timber and the gums or ſpices they produce. Among theſe Mr Ives enumerates the euphorbium, tulip-tree, ebony, red-wood, caſſia, cocoa-nut, cotton, lime, mangoe, citron, coffee; the trees producing balſam of capivi, gum gamboge, lac, and *cenquenomale*. This laſt is as yet unknown in Europe; but, according to the information of a Dutch ſurgeon, an oil or balſam is produced from it by diſtillation, which is of great uſe in paralytic complaints. There is alſo another gum named *badule*, which has been but lately diſcovered, and of which the uſe is as yet unknown. Here is alſo the black and yellow *teak*, the wood of which is of a moſt beautiful grain, but ſo hard that the cutting of it proves very duſtructive to the carpenters tools. But the moſt remarkable, as well as the moſt uſeful, of the vegetable productions of Ceylon, is the cinnamon-tree, which grows wild in every wood on the ſouth-weſt part of the iſland. The very young trees are not fit for rinding, and the old ones are cut down for firewood. The common flowering ſhrubs, of which the whole iſland is full, ſend forth a moſt agreeable fragrance every morning and evening. It abounds with high hills, between which the ſoil is a fat red earth; and the valleys are extremely pleaſant, having a clear rivulet running thro' almoſt every one of them. Thus the fineſt fruits grow in vaſt plenty, and may be had at the moſt trifling rates; a pine-apple being bought for leſs than a penny, and ſo of the reſt. Other proviſions are almoſt equally cheap ; a dozen of fowls or five ducks being ſold for a rupee, not quite half-a-crown of Engliſh money. Here the Dutch ſhow a poiſonous fruit called by them *Adam's apple.* In ſhape it reſembles the quarter of an apple cut out, with the two inſides a little convex, and a continued ridge along the outer edges ; and is of a beautiful orange colour. Pepper, ginger, and cardamoms, are alſo produced here ; as well as five kinds of rice, which ripen one after another.

Ceylon produces alſo topazes, garnets, rubies, and other precious ſtones, which are diſcovered by waſhing the ſoil wherein they grow. It has likewiſe ores of copper, iron, and probably of tin, with veins of black cryſtal.

Common deer are found in this iſland in great abundance, as well as Guinea-deer ; but the horned cattle are both very ſmall and ſcarce, ſix of them weighed all together, but 714 pounds, and one of theſe weighed, only 70 pounds. They have, however, the largeſt and beſt elephants in the world ; and their woods are infeſted by tygers, the moſt terrible of all ravenous beaſts. They abound alſo with ſnakes of a monſtrous ſize, one of which has been known to deſtroy a tyger and devour him at one meal. Mr Ives ſaw one 15 feet long and 30 inches in circumference. Spiders, centipedes, and ſcorpions, alſo grow here to an enormous ſize. Our author ſaw a ſpider here as large as a toad, with brown hair upon it, and legs as thick as the ſhank of a large tobacco-pipe. A ſcorpion, taken out of a piece of wood, was eight inches long, from head to tail, excluſive of the claws ; the ſhell was as hard as that of a crab : and our author killed a centipede more than ſeven inches long. Here the *mantis* or creeping leaf is met with ; which our author ſuppopoſes to be a ſpecies of graſshoppers, having every member we ſee in common inſects, though in ſhape and appearance it greatly reſembles a leaf. It is of a green colour. The ſea-coaſts abound with fiſh, which are to be had very cheap. Neither harp-ſhells nor ventletraps are to be met with here : but there are abundance of painted cockles, and others commonly called *panama ſhells.*

“ The natives of this iſland (ſays our author) are the ſtouteſt Indians I ever ſaw. Mr Knox in his hiſtory reports many ſtrange things of their religion and cuſtoms, none of which I had any opportunity of ſeeing. He ſays ‘ that they have various ways of treating their dead. Some burn them, which is not uncommon in India ; while others throw their limbs up into the forks of trees.’ This may be true, becauſe when our wood-cutters were once hewing down a ſtick of timber, there fell from it the ſkull and many bones of a human body ; and I alſo ſaw here a human body hanging on a tree. Other hiſtorians relate, that the natives of Ceylon feed on human fleſh ; nay, that they eat the bodies of their deceaſed parents, imagining that no other ſepulchre is ſo fit for them as their own bowels, ſince thereby they think they are changed into their own ſubſtance, and live again in themſelves. This ſhocking cuſtom is reported of the ancient Scythians, and poſſibly might have been uſed by the inhabitants of Ceylon, but is now in both countries entirely aboliſhed ; and yet even at this day theſe iſlanders are ſaid to make cups of their parents ſkulls, with a view, that in midſt of their mirth and jollity they may be ſure to preſerve a reſpectful remembrance of them.”

The Ceyloneſe make uſe of boats hollowed out of the trunks of trees, which are about 12 or 14 feet long, but only as many inches broad within. The tree part in the bottom is much larger ; but when the boat, on account of the ſize of the tree, is too ſmall, they make a trough on the top of it ſquare at both ends. Some boats, however, are much larger, being built between two trees ; and with theſe they coaſt along ſhore ; the others are for fiſhermen. It lies from E. Long. 78° to 82°, and from N. Lat. 6° to 10.

The conqueſt of this iſland was the firſt attempt of Albuquerque the celebrated Portugueſe admiral. He found it well peopled, and inhabited by two different nations, the *Bedas* inhabiting the northern, and the *Cinglaſſes* who dwelt in the ſouthern parts. The former were very barbarous, but the latter a good deal more poliſhed. Beſides the advantages already mentioned, which theſe nations derived from their mines of precious ſtones, they carried on the greateſt pearl-fiſhery in the Eaſt. Theſe nations the Portugueſe conquered, and tyrannized over in ſuch a manner, that they aſſiſted the Dutch in expelling them from the iſland ; and by their united efforts this was accompliſhed in 1658, after a bloody and obſtinate war. All the Portugueſe ſettlements fell into the hands of the Dutch Eaſt India company, who ſtill keep poſſeſſion of them, excepting a ſmall diſtrict on the eaſtern coaſt without any port, from whence the ſovereign of the country had his ſalt. Theſe ſettlements formed a regular track, extending from two to twelve leagues into the inland parts of the iſland. The company have appropriated all the productions of the iſland. The ſeveral articles of trade are, 1. Amethyſts, ſapphires, topazes, and rubies ; the laſt are very ſmall, and very indifferent. The Moors who come from the coaſt of Coromandel buy them, paying a moderate tax : and when they are cut, ſell them at a low price in the different countries of India. 2. Pepper, which the company buy for about 4d. *per* pound ; coffee, for which they only pay 2d. and cardamom, which has no fixed price. Theſe articles are all of an inferior quality, and through the indolence of the inhabitants will never turn to any account. 3. An hundred bales of handkerchiefs, pagnes, and ginghams, of a fine red colour, which are fabricated by the Malabars of Jafranapatan. 4. A ſmall quantity of ivory, and about 50 elephants, which are carried to the coaſt of Coromandel. 5. Areca, which the company buys at about 8s. 9d. the ammonan, and ſells on the ſpot at L. 1, 13s. to the merchants of Bengal, Coromandel, and the Maldives ; who give in return rice, coarſe linen, and cowries. 6. The pearl fiſhery, which was formerly of great conſequence ; but is now ſo much exhauſted as not to bring in more than L. 8,750 *per annum.* 7. After all, the great object of the company is cinnamon. They purchaſe the greateſt part of their cinnamon of the Indians who are ſubject to them, and, all expences deducted, it does not coſt them above 6d. *per* pound. The annual expences of the colony may amount to about L. 96,250 ; their revenues and ſmall branches of commerce produce only about L. 87,500. —This deficiency muſt be ſupplied out of the profits

fits ariſing from the cinnamon trade; and they are obliged to provide for the expences of the wars in which they are frequently engaged with the king of Candy, who is at preſent the ſole ſovereign of the iſland. Theſe are very detrimental to the intereſts of the Hollanders; for which reaſon they endeavoured to engage the good will of this monarch by ſhowing him all imaginable civilities. The harmony, however, has been often interrupted. In a bloody war which terminated on the 14th of February 1766, the Ceyloneſe monarch was driven from his capital, ſo that the Dutch made a very advantageous treaty. Their ſovereignty was acknowledged over all that part of the country they poſſeſſed before the troubles broke out; and that part of the coaſts held by the natives was ceded to them. They were allowed to gather cinnamon in all the plains; and the court was to ſell them the beſt ſort, which is produced in the mountains, at the rate of L. 1 : 16 : 8, for 18 *lb*. The government engaged to have no connection with any foreign power; and even to deliver up any Europeans who might happen to ſtray into the iſland. In return for ſo many conceſſions, the king was to receive annually the value of the produce of the ceded coaſts; and from thence his ſubjects were to be furniſhed gratis with as much ſalt as they had occaſion for. The Ceyloneſe are in the moſt miſerable ſituation: they are in a ſtate of total inactivity; live in huts without any furniture; and ſubſiſt upon fruits: thoſe who are the moſt affluent have no other covering than a piece of coarſe linen wrapt about their waiſt.

CHACE. See CHASE.

CHACO, a large country of South America ſituated between 19° and 37° S. Lat. It belongs to the Spaniards, by whom it was conquered in 1536. It is not naturally fruitful; but abounds in gold mines, which are ſo much the more valuable that they are eaſily worked. The works are carried on by about 8000 blacks, who deliver every day to their maſters a certain quantity of gold; and what they can collect above this, belongs to themſelves; as well as what they find on thoſe days that are conſecrated to religion and reſt, upon condition that during the feſtival they maintain themſelves. This enables many of them to purchaſe their liberty; after which they intermarry with the Spaniards.

CHADCHOD, in Jewiſh antiquity. Ezekiel mentions *chadchod* among the ſeveral merchandizes which were brought to Tyre. The old interpreters, not very well knowing the meaning of this term, continued it in their tranſlation. St Jerom acknowledges that he could not diſcover the interpretation of it. The Chaldee interprets it pearls; others think that the onyx, ruby, carbuncle, cryſtal or diamond is meant by it.

CHÆRONEA, (anc. geog.) the laſt town, or rather the laſt village, of Bœotia, towards Phocis; the birth-place of Plutarch: famous for the fatal defeat of the confederate Greeks by Philip of Macedon. This place was conſidered by Philip as well adapted to the operations of the Macedonian phalanx; and the ground for his encampment, and afterwards the field of battle, were choſen with equal ſagacity: having in view on one ſide a temple of Hercules, whom the Macedonians regarded as the author of their royal houſe, and the high protector of their fortune; and on the other the banks of the Thermodon, a ſmall river flowing into the Cephiſſus, announced by the oracles of Greece as the deſtined ſcene of deſolation and woe to their unhappy country. The generals of the confederate Greeks had been much leſs careful to avail themſelves of the powerful ſanctions of ſuperſtition. Unreſtrained by inauſpicious ſacrifices, the Athenians had left their city at the exhortation of Demoſthenes, to wait no other omen but the cauſe of their country. Regardleſs of oracles, they afterwards advanced to the ill-fated Thermodon, accompanied by the Thebans, and the ſcanty reinforcements raiſed by the iſlands and ſtates of Peloponneſus which had joined their alliance. Their army amounted to 30,000 men, animated by the nobleſt cauſe for which men can fight, but commanded by the Athenians Lyſicles and Chares; the firſt but little, and the ſecond unfavourably, known; and by Theagenes the Theban, a perſon ſtrongly ſuſpected of treachery: all three creatures of cabal and tools of faction, ſlaves of intereſt or voluptuouſneſs, whoſe characters (eſpecially as they had been appointed to command the only ſtates whoſe ſhame, rather than virtue, yet oppoſed the public enemy) are alone ſufficient to prove that Greece was ripe for ruin.

When the day approached for aboliſhing the tottering independence of thoſe turbulent republics, which their own internal vices, and the arms and intrigues of Philip, had been gradually undermining for 22 years, both armies formed in battle array before the riſing of the ſun. The right wing of the Macedonians was headed by Philip, who judged proper to oppoſe in perſon the dangerous fury of the Athenians. His ſon Alexander, only 19 years of age, but ſurrounded by experienced officers, commanded the left wing, which faced the Sacred Band of the Thebans. The auxiliaries of either army were poſted in the centre. In the beginning of the action, the Athenians charged with impetuoſity, and repelled the oppoſing diviſions of the enemy; but the youthful ardour of Alexander obliged the Thebans to retire, the Sacred Band being cut down to a man. The activity of the young prince completed their diſorder, and purſued the ſcattered multitude with his Theſſalian cavalry.

Meantime the Athenian generals, too much elated by their firſt advantage, loſt the opportunity to improve it; for having repelled the centre and right wing of the Macedonians, except the phalanx, which was compoſed of choſen men, and immediately commanded by the king, they, inſtead of attempting to break this formidable body by attacking it in flank, preſſed forward againſt the fugitives, the inſolent Lyſicles exclaiming in vain triumph, "Purſue, my brave countrymen! let us drive the cowards to Macedon." Philip obſerved this raſh folly with contempt; and ſaying to thoſe around him, "Our enemies know not how to conquer," commanded his phalanx, by a rapid evolution, to gain an adjacent eminence, from which they poured down, firm and collected, on the advancing Athenians, whoſe confidence of ſucceſs had rendered them totally inſenſible to danger. But the irreſiſtible ſhock of the Macedonian ſpear converted their fury into deſpair. Above a thouſand fell, two thouſand were taken priſoners; the reſt eſcaped by a precipitate and ſhameful flight. Of the Thebans more were killed than taken. Few of the confederates periſhed, as they had little ſhare in the action, and as Philip, perceiving his victory to be complete, gave orders to ſpare the vanquiſhed, with a clemency unuſual in that age, and not leſs honourable to his underſtanding than his heart; ſince his humanity thus ſubdued the minds, and gained the affections, of his conquered enemies.

According to the Grecian cuſtom, the battle was followed by an entertainment, at which the king preſiding in perſon, received the congratulations of his friends, and the humble ſupplications of the Athenian deputies, who craved the bodies of their ſlain. Their requeſt, which ſerved as an acknowledgement of their defeat, was readily granted; but before they availed themſelves of the permiſſion to carry off their dead, Philip, who with his natural intemperance had protracted the entertainment till morning, iſſued forth with his licentious companions to viſit the field of battle; their heads crowned with feſtive garlands, their minds intoxicated with the inſolence of wine and victory; yet the ſight of the ſlaughtered Thebans, which firſt preſented itſelf to their eyes, and particularly the ſacred band of friends and lovers, who lay covered with honourable wounds on the ſpot where they had been drawn up to fight, brought back theſe inſolent ſpectators to the ſentiments of reaſon and humanity. Philip beheld the awful ſcene with a mixture of admiration and pity; and, after an affecting ſilence, denounced a ſolemn curſe againſt thoſe who baſely ſuſpected the friendſhip of ſuch brave men to be tainted with criminal and infamous paſſions.

But this ſerious temper of mind did not laſt long; for having proceeded to that quarter of the field where the Athenians had fought and fallen, the king abandoned himſelf to all the levity and littleneſs of the moſt petulent joy. Inſtead of being impreſſed with a deep ſenſe of his recent danger, and with dutiful gratitude to Heaven for the happineſs of his eſcape and the importance of his victory, Philip only compared the boaſtful pretenſions with the mean performances of his Athenian enemies; and, ſtruck by this contraſt, rehearſed, with the inſolent mockery of a buffoon, the pompous declaration of war lately drawn up by the ardent patriotiſm and too ſanguine hopes of Demoſthenes. It was on this occaſion that the orator Demades at once rebuked the folly, and flattered the ambition of Philip, by aſking him, Why he aſſumed the character of Therſites when fortune aſſigned him the part of Agamemnon?

Whatever might be the effect of this ſharp reprimand, it is certain that the king of Macedon indulged not, on any future occaſion, a vain triumph over vanquiſhed. When adviſed by his generals to advance into Attica, and to render himſelf maſter of Athens, he only replied, "Have I done ſo much for glory, and ſhall I deſtroy the theatre of that glory?" His ſubſequent conduct correſponded with the moderation of this ſentiment. He reſtored without ranſom the Athenian priſoners; who, at departing, having demanded their baggage, were alſo gratified in this particular; the king pleaſantly obſerving, that the Athenians ſeemed to think he had not conquered them in earneſt. Soon afterwards he diſpatched his ſon Alexander, and Antipater, the moſt truſted of his miniſters, to offer them peace on ſuch favourable terms as they had little reaſon to expect. They were required to ſend deputies to the Iſthmus of Corinth, where, to adjuſt their reſpective contingents of troops for the Perſian expedition, Philip propoſed aſſembling early in the ſpring a general convention of all the Grecian ſtates: they were ordered to ſurrender the iſle of Samos, which actually formed the principal ſtation of their fleet, and the main bulwark and defence of all their maritime or inſular poſſeſſions; but they were allowed to enjoy, unmoleſted, the Attic territory, with their hereditary form of government.

CHÆROPHYLLUM, Chervil: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The involucrum is reflexed-concave; the petals inflexed-cordate; the fruit oblong and ſmooth. There are ſeven ſpecies, two of which, called cow-weed and wild chervil, are weeds common in many places of Britain. The roots of the firſt have been found poiſonous when uſed as parſnips: the rundles afford an indifferent yellow dye; the leaves and ſtalks a beautiful green. Its preſence indicates a fertile and grateful ſoil. It ought to be rooted out from all paſtures early in the ſpring, as no animal but the aſs will eat it. It is one of the moſt early plants in ſhooting, ſo that by the beginning of April the leaves are near two feet high. The leaves are recommended by Geoffroy as aperient and diuretic, and at the ſame time grateful to the palate and ſtomach. He even aſſerts, that dropſies which do not yield to this medicine can ſcarcely be cured by any other. He directs the juice to be given in the doſe of three or four ounces every fourth hour, and continued for ſome time either alone, or in conjunction with nitre and ſyrup of the five opening roots.—The other ſpecies of chærophyllum are not poſſeſſed of any remarkable property.

CHÆTODON, in ichthyology, a genus of fiſhes belonging to the order of thoraci. The teeth are very numerous; thick, ſetaceous, and flexile; the rays of the gills are ſix. The back-fin and the fin at the anus are fleſhy and ſquamous. There are 23 ſpecies, diſtinguiſhed from each other principally by the figure of the tail, and the number of ſpines in the back-fin. The moſt remarkable is the roſtratus, or ſhooting-fiſh, having a hollow, cylindrical beak. It is a native of the Eaſt Indies, where it frequents the ſides of the ſea and rivers in ſearch of food, from its ſingular manner of obtaining which it receives its name. When it ſpies a fly ſitting on the plants that grow in ſhallow water, it ſwims on to the diſtance of four, five, or ſix feet; and then, with a ſurpriſing dexterity, it ejects out of its tubular mouth a ſingle drop of water, which never fails ſtriking the fly into the water, where it ſoon becomes its prey.

CHAFF, in huſbandry, the huſks of the corn, ſeparated by ſcreening or winnowing it. It ſignifies alſo the rind of corn, and ſtraw cut ſmall for the uſe of cattle.

Chaff-*Cutter*, a machine for making chaff to feed horſes.—The advantages of an eaſy and expeditious method of cutting ſtraw into chaff by an engine which could be uſed by common labourers have been long acknowledged, and various attempts have been made to bring ſuch an engine to perfection. But the objections to moſt of them have been their complicated ſtructure, their great price, and the noiſe they make in working; all which inconveniences ſeem to have been lately removed by an invention of Mr James Pike watchmaker of Newton Abbot in Devonſhire. Of his engine, which is of a ſimple and cheap conſtruction, the following deſcription, and figure referred to, are extracted from the Tranſactions of the Society of Arts for 1787.

The engine is fixed on a wood frame, which is ſupported with four legs, and on this frame is a box for containing the ſtraw, four feet ſix inches long, and about ten inches broad; at one end is fixed acroſs the box two rollers inlaid with iron, in a diagonal line about an eighth of an inch above the ſurface; on the ends of theſe rollers are fixed two ſtrong braſs wheels, which takes one into the other. On one of theſe wheels is a contrect wheel, whoſe teeth take in a worm on a large arbour; on the end of this arbour is fixed a wooden wheel, two feet five inches diameter and three inches thick; on the inſide-part of this wheel is fixed a knife, and every revolution of the wheel the knife paſſes before the end of the box and cuts the chaff, which is brought forward between the rollers, which are about two inches and a half aſunder; the ſtraw is brought on by the worm taking one tooth of the wheel every round of the knife; the ſtraw being ſo hard preſſed between the rollers, the knife cuts off the chaff with ſo great eaſe, that twenty-two buſhels can be cut within the hour, and makes no more noiſe than is cauſed by the knife paſſing through the chaff.

Plate CXXXVI. *A* is the box into which the ſtraw is put. *B*, the upper roller, with its diagonal projecting ribs of iron, the whole moving by the revolution of the braſs wheel *C* on the axis of which it is fixed. *D*, a braſs wheel, having upon it a face wheel, whoſe teeth take into the endleſs ſcrew on the arbour *E*, while the teeth on the edge of this wheel enter between thoſe on the edge of the wheel *C*. On the axis of the wheel *D* is a roller, with iron ribs ſimilar to *B*, but hid within the box. *E*, the arbour, one of the ends of which being made ſquare and paſſing through a mortiſe in the centre of the wooden wheel *F*, is faſtened by a ſtrong ſcrew and nut; the other end of this arbour moves round in a hole within the wooden block *G*. *H*, the knife, made faſt by ſcrews to the wooden wheel *F*, and kept at the diſtance of nearly three quarters of an inch from it by means of a ſtrip of wood of that thickneſs, of the form of the blade, and reaching to within an inch of the edge. *I*, the handle mortiſed into the outſide of the wooden wheel *F*.

CHAFFER, in zoology, a ſpecies of beetle. See Scarabæus.

CHAFFERCONNERS, in commerce, printed linens manufactured in the Great Mogul's dominions. They are imported by the way of Surat; and are of the number of thoſe linens prohibited in France.

CHAFFERY, in the iron-works, the name of one of the two principal forges. The other is called the *finery*. When the iron has been brought at the finery into what is called an ancony, or ſquare maſs, hammered into a bar in its middle, but with its two ends rough, the buſineſs to be done at the chaffery is the reducing the whole to the ſame ſhape, by hammering down theſe rough ends to the ſhape of the middle part.

CHAFFINCH, in ornithology, the Engliſh name of a ſpecies of Fringilla.

CHAGRE, a fort of America in the province of Darien at the mouth of a river of the ſame name. It has been taken ſeveral times by the buccaneers, and laſt of all by Admiral Vernon in 1740. W. Long. 82. 7. N. Lat. 9. 50.

CHAIN, (*Catena*) a ſeries of ſeveral rings, or links, fitted into one another.

There are chains of divers matters, ſizes, forms, and for divers uſes.—Ports, rivers, ſtreets, &c. are cloſed with iron chains: rebellious cities are puniſhed by taking away their chains and barriers.

The arms of the kingdom of Navarre are, *Chains, Or, in a field Gules*. The occaſion hereof is referred to the kings of Spain leagued againſt the Moors; who having gained a celebrated victory againſt them in 1212, in the diſtribution of the ſpoils the magnificent tent of Miralmumin fell to the king of Navarre, as being the firſt that broke and forced the chains thereof.

A gold Chain, is one of the ornaments or badges of the dignity of the chief magiſtrates of a city, as the mayor of London, the provoſt and bailies of Edinburgh, &c.—Something like this obtained among the ancient Gauls: the principal ornament of their perſons in power and authority was a gold chain, which they wore on all occaſions; and even in battle, to diſtinguiſh them from the common ſoldiers.

Chain alſo denotes a kind of ſtring, of twiſted wire; ſerving to hang watches, tweezer-caſes, and other valuable toys upon. The invention of this piece of curious work is owing to the Engliſh; whence, in foreign countries, it is denominated the *Engliſh chain*. Theſe chains are uſually either of ſilver or gold, ſome of gilt copper; the thread or wire of each kind to be very fine.—For the fabric, or making of theſe chains: a part of the wire is folded into little links of an oval form; the longeſt diameter about three lines; the ſhorteſt one. Theſe, after they have been exactly ſoldered, are again folded into two; and then bound together or interwove, by means of ſeveral other little threads of the ſame thickneſs; ſome whereof, which paſs from one end to the other, imitate the warp of a ſtuff; and the others, which paſs tranſverſe, the woof. There are at leaſt four thouſand little links in a chain of four pendants; which are by this means bound ſo equally, and withal ſo firmly together, that the eye is deceived, and takes the whole to conſiſt of one entire piece.

Chain is alſo a kind of meaſure in France, in the trade of wood for fuel. There are chains for wood by tale, for wood by the rope, for faggots, for cleft wood, and for round ſticks. There are alſo chains for meaſuring the ſheaves of all ſorts of corn, particularly with regard to the payment of tithes; for meaſuring pottles of hay, and for meaſuring horſes. All theſe are divided into feet, inches, hands, &c. according to the uſe they are deſigned for.

Chain, in ſurveying, is a meaſure, conſiſting of a certain number of links of iron wire, uſually a hundred; ſerving to take the dimenſions of fields, &c.

This is what Merſenne takes to be the arvipendium of the ancients.

The chain is of various dimenſions, as the length or number of links varies: that commonly uſed in meaſuring land, called Gunter's chain, is in length four poles or perches: or ſixty-ſix feet, or a hundred links; each link being ſeven inches $\frac{92}{100}$. Whence it is eaſy to reduce any number of thoſe links to feet, or any number of feet to links.

This chain is entirely adapted to Engliſh meaſures; and its chief convenience is in finding readily the numbers contained in a given field. Where the proportions of ſquare feet and acres differ, the chain, to have the ſame advantages as Gunter's chain, muſt alſo be varied. Thus in Scotland, the chain ought to be of 74 feet, or 24 Scotch ells, if no regard be had to the difference between the Scotch and Engliſh foot; but if regard be had to this difference, the Scotch chain ought to conſiſt of $74\frac{2}{5}$ Engliſh feet, or 74 feet 4 inches and $\frac{4}{5}$ of an inch. This chain being divided into an hundred links, each of theſe will be $8\frac{928}{1000}$ inches.

That ordinarily uſed for large diſtances, is in length a hundred feet; each link one foot. For ſmall parcels, as gardens, &c. is ſometimes uſed a ſmall chain of one pole, or ſixteen feet and a half length; each link one inch $\frac{98}{100}$.

Some in lieu of chains uſe ropes; but theſe are liable to ſeveral irregularities; both from the different degrees of moiſture, and of the force which ſtretches them. Schwenterus, in his Practical Geometry, tells us, he has obſerved a rope ſixteen feet long, reduced to fifteen in an hour's time, by the mere falling of a hoar froſt. To obviate theſe inconveniences, Wolfius directs, that the little ſtrands whereof the rope conſiſts be twiſted contrary ways, and the rope dipped in boiling hot oil; and when dry, drawn through melted wax. A rope thus prepared, will not get or loſe any thing in length, even though kept under water all day.

Chain-Pump. See Pump.

Chain-Shot, two bullets with a chain between them. They are uſed at ſea to ſhoot down yards or maſts, and to cut the ſhrouds or rigging of a ſhip.

Top-Chain, on board a ſhip, a chain to ſling the ſail-yards in time of battle, in order to prevent them from falling down when the ropes by which they are hung happen to be ſhot away or rendered incapable of ſervice.

Plate CXXXVI. *Chain-Wales*, or *Channels*, of a ſhip, *porteboiſſoirs*, are broad and thick planks projecting horizontally from the ſhip's outſide, abreaſt of and ſomewhat behind the maſts. They are formed to extend the ſhrouds from each other, and from the axis or middle line of the ſhip, ſo as to give a greater ſecurity and ſupport to the maſts, as well as to prevent the ſhrouds from damaging the gunwale, or being hurt by rubbing againſt it. Every maſt has its chain-wales, which are either built above or below the ſecond deck-ports in a ſhip of the line: they are ſtrongly connected to the ſide by knees, bolts, and ſtandards, beſides being confined thereto by the chains whoſe upper ends paſs through notches on the outer edge of the chain-wales, ſo as to unite with the ſhrouds above.

Chains, in ſhip-building, are ſtrong links or plates of iron, the lower ends of which are bolted through the ſhip-ſide to the timbers.

Hanging in Chains, a kind of puniſhment inflicted on murderers. By ſtat. 25. Geo. II. c. 37. the judge ſhall direct ſuch to be executed on the next day but one, unleſs Sunday intervene; and their bodies to be delivered to the ſurgeons to be diſſected and anatomized: and he may direct them afterwards to be hung in chains. During the interval between ſentence and execution, the priſoner ſhall be kept alone, and ſuſtained only with bread and water. The judge, however, hath power to reſpite the execution, and relax the other reſtraints of the act.

Chain-Iſland, an iſland lately diſcovered by captain Wallis in the South-ſea. It ſeemed to be about five miles long and as much broad, lying in the direction of north-weſt and ſouth-eaſt. It appeared to be a double range of woody iſlands joined together by reefs, ſo as to compoſe one iſland of an oval figure, with a lake in the middle. The trees are large; and from the ſmoke that iſſued from the woods, it appeared to be inhabited. W. Long. 145. 54. S. Lat. 17. 23.

CHAJOTLI, or Chayoti, a Mexican fruit of a round ſhape, and ſimilar in the huſk with which it is covered to the cheſnut, but four or five times larger, and of a much deeper green colour. Its kernel is of a greeniſh white, and has a large ſtone in the middle, which is white, and like it in ſubſtance. It is boiled, and the ſtone eat with it. This fruit is produced by a twining perennial plant, the root of which is alſo good to eat. See Plate CXXXVIII.

CHAIR, (*Cathedra*) was anciently uſed for the pulpit, or ſuggeſtum, whence the prieſt ſpoke to the people.

It is ſtill applied to the place whence profeſſors and regents in univerſities deliver their lectures, and teach the ſciences to their pupils: thus, we ſay, the profeſſor's chair, the doctor's chair, &c.

Curule Chair. was an ivory ſeat placed on a car, wherein were ſeated the prime magiſtrates of Rome, and thoſe to whom the honour of a triumph had been granted.

Sedan Chair, a vehicle ſupported by poles, wherein perſons are carried; borne by two men. There are two hundred chairs allowed by act of parliament in London; and no perſon is obliged to pay for a hackney-chair more than the rate allowed by the act for a hackney-coach driven two-third parts of the ſaid diſtance. 9 Ann. c. 23. § 8. Their number is ſince increaſed, by 10 Ann. c. 19. and 12 Geo. I. c. 12. to four hundred. See *Hackney-Coaches*.

Chair is alſo applied by the Romaniſts to certain feaſts, held anciently in commemoration of the tranſlation of the ſee, or ſeat of the vicarage of Chriſt, by St Peter.

The perforated chair, wherein the new-elected pope is placed, F. Mabillon obſerves, is to be ſeen at Rome: but the origin thereof he does not attribute, as is commonly done, to the adventure of Pope Joan; but ſays there is a myſtery in it; and it is intended, to explain to the pope thoſe words of ſcripture, that *God draws the poor from out of the duſt and mire*.

CHAIRMAN, the president, or ſpeaker of an aſſembly,

aſſembly, company, &c. We ſay, the chairman of a committee, &c.

CHAISE, a ſort of light open chariot, or calaſh. Aurelius Victor relates, that Trajan firſt introduced the uſe of poſt-chaſes: but the invention is generally aſcribed to Auguſtus; and was probably only improved by Trajan, and ſucceeding emperors.

CHALAZA, among naturaliſts, a white knotty ſort of ſtring at each end of an egg, formed of a plexus of the fibres of the membranes, whereby the yolk and white are connected together. See EGG.

CHALCAS, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants. The calyx is quinquepartite; the corolla campanulated, with the petals heeled; the ſtigma round-headed and warty.

CHALCEDON, or CALCEDON, anciently known by the names of *Proceraſtis* and *Colbuſa;* a city of Bithynia, ſituated at the mouth of the Euxine, on the north extremity of the Thracian Boſphorus, over againſt Byzantium. Pliny, Strabo, and Tacitus, call it *The City of the Blind;* alluding to the anſwer which the Pythian Apollo gave to the founders of Byzantium, who, conſulting the oracle relative to a place where to build a city, were directed to chooſe that ſpot which lay oppoſite "to the habitation of the blind;" that is, as was then underſtood, to Chalcedon: the Chalcedonians well deſerving that epithet for having built their city in a barren and ſandy ſoil, without ſeeing that advantageous and pleaſant ſpot on the oppoſite ſhore, which the Byzantines afterwards choſe.—Chalcedon, in the Chriſtian times, become famous on account of the council which was held there againſt Eutyches. The emperor Valens cauſed the walls of this city to be levelled with the ground for ſiding with Procopius, and the materials to be conveyed to Conſtantinople, where they were employed in building the famous Valentinian aqueduct. Chalcedon is at preſent a poor place, known to the Greeks by its ancient name, and to the Turks by that of *Cadiaci*, or "the judges town."

CHALCEDONY, in natural hiſtory, a genus of the ſemipellucid gems. They are of an even and regular, not tabulated ſtructure; of a ſemi-opaque cryſtalline baſis; and variegated with different colours, but thoſe ever diſpoſed in form of miſts or clouds, and, if nicely examined, found to be owing to an admixture of various coloured earths, but imperfectly blended in the maſs, and often viſible in diſtinct moleculæ.—It has been doubted by ſome whether the ancients were at all acquainted with the ſtone we call *chalcedony;* they having deſcribed a Chalcedonian carbuncle and emerald, neither of which can at all agree with the characters of our ſtone; but we are to conſider that they have alſo deſcribed a Chalcedonian jaſper which ſeems to have been the very ſame ſtone as they deſcribe by the word *turbida*, which extremely well agrees with our chalcedony.

There are four known ſpecies of the chalcedony. 1. A bluiſh white one. This is the moſt common of all, and is found in the ſhape of flints and pebbles, in maſſes of two or three inches or more in diameter. It is of a whitiſh colour, with a faint cloud of blue diffuſed all over it, but always in the greateſt degree near the ſurface. This is a little leſs hard than the oriental onyx. The oriental chalcedonies are the only ones of any value; they are found in vaſt abundance on the ſhores of rivers in all parts of the Eaſt-Indies, and frequently come over among the ballaſt of the Eaſt-India ſhips. They are common in Sileſia and Bohemia, and other parts of Europe alſo; but with us are leſs hard, more opaque, and of very little value. 2. The dull milky-veined chalcedony. This is a ſtone of little value, and is ſometimes met with among the lapidaries, who miſtake it for a kind of nephritic ſtone. It is of a ſomewhat yellowiſh white or cream colour, with a few milk-white veins. This is principally found in New-Spain. 3. The third is a browniſh, black, dull, and cloudy one, known to the ancients by the name of ſmoky jaſper, or jaſpis capnitis. This is the leaſt beautiful ſtone of all the claſs: it is of a pale browniſh white, clouded all over with a blackiſh miſt, as the common chalcedony is with a blue. It is common both in the Eaſt and Weſt-Indies, and in Germany; but is very little valued, and is ſeldom worked into any thing better than the handles of knives. 4. The yellow and red chalcedony is greatly ſuperior to all the reſt in beauty; and is in great repute in Italy, though very little known among us. It is naturally compoſed of an admixture of red and yellow only, on a clouded cryſtalline baſis; but is ſometimes found blended with the matter of common chalcedony, and then is mixed with blue. It is all over of the miſty hue of the common chalcedony. This is found only in the Eaſt-Indies, and there not plentifully. The Italians make it into beads, and call theſe *caſſidonies;* but they are not determinate in the uſe of the word, but call beads of ſeveral of the agates by the ſame name.—All the chalcedonies readily give fire with ſteel, and make no efferveſcence with aquafortis.

CHALCIDENE, or CHALCIDICE, (anc. geog.) an inland country of Syria, having Antiochis or Seleucia to the weſt, Cyrrheſtica to the north, to the ſouth Apamene and Cœleſyria, and to the eaſt Chalybonitis; being ſo called from its principal city Chalcis. This province, one of the moſt fruitful in Syria, was ſeized by Ptolemy the ſon of Mennæus during the troubles of Syria, and by him made a ſeparate kingdom. Ptolemy himſelf is ſtyled by Joſephus and Hegeſippus only Prince of Chalcis, but his ſon Lyſanias is honoured both by Joſephus and Dio with the title of King. Upon the death of Antiochus Dionyſius king of Syria, Ptolemy attempted to make himſelf maſter of Damaſcus and all Cœleſyria; but the inhabitants, having an utter averſion to him on account of his cruelty and wickedneſs, choſe rather to ſubmit to Aretas king of Arabia, by whom Antiochus and his whole army had been cut off. He oppoſed Pompey on his entering Syria; but was by him defeated, taken priſoner, and ſentenced to death; which, however, he eſcaped by paying a thouſand talents, and was left alſo in the poſſeſſion of his kingdom. After Ariſtobulus king of Judæa had been poiſoned by the friends of Pompey, and Alexander his ſon beheaded at Antioch, he ſent Philippion his ſon to Aſcalon, whither the widow of Ariſtobulus had retired with her other children, to bring them all to Chalcis; propoſing, as he was in love with one of the daughters named Alexandria, to maintain them in his own kingdom in a manner ſuitable to their rank: but Philippion likewiſe being in love with Alexandria, married her on the way; for which preſumption Ptolemy put him to death on his return, and then took her to wife. On account of this affinity, he ſupported to the utmoſt of his power Antigonus the younger ſon of Ariſtobulus who took the field at the head of a conſiderable army, but on his entering Judæa was entirely defeated by Herod. Ptolemy ſoon after died, and was ſucceeded by his ſon Lyſanias; who, eſpouſing the cauſe of the Aſmonæan family with great warmth, promiſed to Barzapharnes who command the Parthian troops in Syria, and to Pacorus the king's ſon, a thouſand talents and five hundered women, provided they ſhould put Antigonus in poſſeſſion of the kingdom of Judæa, and depoſe Hyrcanus. He was not long after put to death by Marc Antony, at the inſtigation of Cleopatra; who, in order to have his dominions, accuſed him falſely of having entered into an alliance with the Parthians.

CHALCIDIC, CHALCIDICUM, or CHALCEDONIUM, in the ancient architecture, a large magnificent hall belonging to a tribunal or court of juſtice.—Feſtus ſays, it took its name from the city of Chalcis; but he does not give the reaſon. Philander will have it to be the court or tribunal where affairs of money and coinage were regulated; ſo called from χαλκος *braſs*, and δικη *juſtice*. Others ſay the money was ſtruck in it; and derive the word from χαλκος, and οικος, *houſe*. In Vitruvius, it is uſed for the auditory of a baſilica; in other of the ancient writers for a hall or apartment where the heathen imagined their gods to eat.

CHALCIDICE, (anc. geog.) an eaſtern diſtrict of Macedonia, ſtretching northwards between the Sinus Toronæus and Singiticus. Formerly a part of Thrace, but invaded by Philip of Macedon. Named from the city Chalcis near Olynthus.

CHALCIDIUS, a famous platonic philoſopher in the third century, who wrote a commentary, which is eſteemed, on the Timæus of Plato. This work has been tranſlated from the Greek into Latin.

CHALCIS, a city of Chalcidice. See CHALCIDICE. (anc. geog.)—Another of Ætolia, near the mouth of the river Evenus, on the Ionian Sea, at the foot of a cognominal mountain; and therefore called by ſome *Hypochalcis*.—Another of Eubœa (Strabo), on the Euripus, the country of Lycophron the poet, one of the ſeven which formed the conſtellation Pleiades. Now *Negroponte*. E. Long. 24. 30. Lat. 38. 30.—A fourth, the capital of Chalcidene in Syria; diſtinguiſhed by the ſurnames *ad Belum*, a mountain or a river; and *ad Libanum*, from its ſituation (Pliny).

CHALCITIS, one of the diviſions or diſtricts of Meſopotamia, to the ſouth of Anthemuſia, the moſt northern diſtrict, next to Armenia, and ſituated between Edeſſa and Carræ. *Chalcitis* (Pliny), an iſland oppoſite to Chalcedon.

CHALCONDYLAS, (Demetrius) a learned Greek, born at Conſtantinople, left that city after its being taken by the Turks, and afterwards taught Greek in ſeveral cities in Italy. He compoſed a Greek grammar; and died at Milan in 1513.

CHALCONDYLAS, (Laonicus) a famous Greek hiſtorian of the 15th century, was born at Athens; and wrote an excellent hiſtory of the Turks, from Ottoman, who reigned about the year 1300, to Mahomet II. in 1463.

CHALDEA, (anc. geog) taken in a larger ſenſe, included Babylonia; as in the prophecies of Jeremiah and Ezekiel. In a reſtricted ſenſe, it denoted a province of Babylonia, towards Arabia Deſerta; called in Scripture *The land of the Chaldeans*. Named from Chaſed the fourth ſon of Nahor. See BABYLONIA.

CHALDEE LANGUAGE, that ſpoken by the Chaldeans or people of Chaldea. It is a dialect of the HEBREW.

CHALDEE Paraphraſe, in the rabbinical ſtyle, is called TARGUM. There are three Chaldee paraphraſes in Walton's Polyglot; *viz.* that of Onkelos, that of Jonathan ſon of Uziel, and that of Jeruſalem.

CHALDRON, a dry Engliſh meaſure, conſiſting of thirty ſix buſhels, heaped up according to the ſealed buſhel kept at Guildhall, London; but on ſhipboard, twenty-one chaldrons of coals are allowed to the ſcore. The chaldron ſhould weigh two thouſand pounds.

CHALICE, the cup or veſſel uſed to adminiſter the wine in the ſacrament, and by the Roman Catholics in the maſs.

The uſe of the chalice, or communicating in both kinds, is by the church of Rome denied to the laity, who communicate only in one kind, the clergy alone being allowed the privilege of communicating in both kinds.

CHALK, *Creta*, is a white earth found plentifully in Britain, France, Norway, and other parts of Europe, ſaid to have been anciently dug chiefly in the iſland of Crete, and thence to have received its name of *Creta*. They have a very eaſy way of digging chalk in the county of Kent in England. It is there found on the ſides of hills; and the workmen undermine it ſo far as appears proper; then digging a trench at the top as far diſtant from the edge as the undermining goes at bottom, they fill this with water, which ſoaks through in the ſpace of a night, upon which the whole flake falls down at once. In other parts of the kingdom, chalk generally lies deeper, and they are forced to dig for it at conſiderable depths, and draw it up in buckets.

Chalk is of two kinds; hard, dry, and firm, or ſoft and unctuous; both of which are adapted to various purpoſes. The hard and dry kind is much the propereſt for burning into lime; but the ſoft and unctuous chalk is beſt for uſing as a manure for lands. Chalk whether burnt into lime or not, is in ſome caſes an excellent manure. Its mode of operating on the ſoil is explained under the article AGRICULTURE, n° 20, 25, &c.

Pure chalk melts eaſily with alkali and flint into a tranſparent colourleſs glaſs. With alkaline ſalts it melts ſomewhat more difficultly, and with borax ſomewhat more eaſily, than with flint or ſand. It requires about half its weight of borax, and its whole weight of alkali, to fuſe it. Sal mirabile, and ſandiver, which do not vitrify at all with the cyrſtalline earths, form with half their weight of chalk, the firſt a yellowiſh black, the latter a greeniſh, glaſs. Nitre, on the other hand, one of the moſt active fluxes for flint, does not perfectly vitrify with chalk. This earth notably promotes the vitrification of flint; a mixture of the two requiring leſs alkali than either of them ſeparately. If glaſs made from flint and alkali is further

ther ſaturated with the flint, ſo as to be incapable of bearing any further addition of that earth without becoming opaque and milky, it will ſtill in a ſtrong fire take up a conſiderable proportion, one-third or one-fourth of its weight, of chalk, without injury to its tranſparency; hence chalk is ſometimes made uſe of in compoſitions for glaſs, as a part of the ſalt may then be ſpared. Chalk likewiſe has a great effect in melting the ſtony matters intermixed with metallic ores, and hence might be of uſe in ſmelting ores; as indeed limeſtone is uſed for that purpoſe. But it is remarkable, that chalk, when deprived of its fixed air, and converted into limeſtone, loſes much of its diſpoſition to vitrify. It is then found to melt very difficultly and imperfectly, and to render the glaſs opaque and milky.

Chalk readily imbibes water; and hence maſſes of it are employed for drying precipitates, lakes, earthy powders that have been levigated with water, and other moiſt preparations. Its œconomical uſes in cleaning and poliſhing metalline or glaſs utenſils are well known. In this caſe it is powdered and waſhed from any gritty matter it may contain, and is then called *whiting*.—In medicine it is one of the moſt uſeful abſorbents, and is to be looked upon ſimply as ſuch. The aſtringent virtues which ſome have attributed to it have no foundation, unleſs in as far as the earth is ſaturated with an acid, with which it compoſes a ſaline concrete manifeſtly ſub-aſtringent. For the further properties of chalk, ſee CHEMISTRY, *Index*.

Black-CHALK, a name given by painters to a ſpecies of earth with which they draw on blue paper, &c. It is found in pieces from two to ten feet long, and from four inches to twenty in breadth, generally flat, but ſomewhat riſing in the middle, and thinner towards the edges, commonly lying in large quantities together. While in the earth, it is moiſt and flaky: but being dried, it becomes conſiderably hard and very light; but always breaks in ſome particular direction; and if attentively examined when freſh broken, appears of a ſtriated texture. To the touch it is ſoft and ſmooth, ſtains very freely, and by virtue of its ſmoothneſs makes very neat marks. It is eaſily reduced into an impalpable ſoft powder without any diminution of its blackneſs. In this ſtate it mixes eaſily with oil into a ſmooth paſte: and being diffuſed through water, it ſlowly ſettles into a black ſlimy or muddy form; properties which make its uſe very convenient to the painters both in oil and water colours. It appears to be an earth quite different from common chalk, and rather of the ſlaty bituminous kind. In the fire it becomes white with a reddiſh caſt, and very friable, retaining its flaky ſtructure, and looking much like the white flaky maſſes which ſome ſorts of pit-coal leave in burning. Neither the chalk nor theſe aſhes are at all affected by acids.

The colour-ſhops are ſupplied with this earth from Italy or Germany; though ſome parts of England afford ſubſtances nearly, if not entirely, of the ſame quality, and which are found to be equally ſerviceable both for marking and as black paints. Such particularly is the black earth called *killow*, ſaid by Dr Merret in his *Pinax Rerum Britannicarum* to be found in Lancaſhire; and by Mr Da Coſta, in his hiſtory of foſſils, to be plentiful near the top of Cay-Avon, an high hill in Merionethſhire.

Red-CHALK, an earth much uſed by painters and artificers, and common in the colour-ſhops. It is properly an indurated clayey ochre; and is dug in Germany, Italy, Spain, and France, but in greateſt quantity in Flanders. It is of a fine, even, and firm texture; very heavy, and very hard; of a pale red on the outſide, but of a deep duſky chocolate colour within. It adheres firmly to the tongue, is perfectly inſipid to the taſte, and makes no efferveſcence with acids.

CHALK-*Land*. Barley and wheat will ſucceed very well on the better ſort of chalky land, and oats generally do well on any kind of it. The natural produce of this ſort of land in weeds, is that ſort of ſmall vetch called the *tine-tare*, with poppies, may-weed, &c. Sainfoin and hop-clover will generally ſucceed tolerably well on theſe lands; and where they are of the better ſort, the great clover will do. The beſt manure is dung, old rags, and the ſheep-dung left after folding them.

CHALK-*Stones*, in medicine, ſignify the concretions of calcareous matter in the hands and feet of people violently afflicted with the gout. Leeuwenhoek has been at the pains of examining theſe by the microſcope. He divides them into three parts. The firſt is compoſed of various ſmall parcels of matter looking like white grains of ſand; this is harder and drier, and alſo whiter than the reſt. When examined with large magnifiers, theſe are found to be compoſed of oblong particles laid cloſely and evenly together: though the whole ſmall ſtones are opapue, theſe component parts of them are pellucid, and reſemble pieces of horſe-hair cut ſhort, only that they are ſomewhat pointed at both ends. Theſe are ſo extremely thin, that Mr Leeuwenhoek computes that 1000 of them placed together would not amount to the ſize of one hair of our heads. The whole ſtones in this harder part of the chalk are not compoſed of theſe particles, but there are confuſedly thrown in among them ſome broken parts of other ſubſtances, and in a few places ſome globules of blood and ſmall remains of other juices. The ſecond kind of chalky matter is leſs hard and leſs white than the former, and is compoſed of fragments or irregular parts of thoſe oblong bodies which compoſe the firſt or hardeſt kind, and theſe are mixed among tough and clear matter, interſperſed with the ſmall broken globules of blood diſcoverable in the former, but in much greater quantity. The third kind appears red to the naked eye; and, when examined with glaſſes, is found to be a more tough and clammy white matter, in which a great number of globules of blood are interſperſed; theſe give it the red appearance it has.

CHALLENGE, a cartel or invitation to a duel or other combat*. A challenge either by word or letter, or to be the bearer of ſuch a challenge, is puniſhable by fine and impriſonment on indictment or information.

CHALLENGE, among hunters. When hounds or beagles, at firſt finding the ſcent of their game, preſently open and cry, they are ſaid to challenge.

CHALLENGE, in the law of England, is an exception made to jurors†; and is either in civil or criminal caſes.

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* See *Duel*.

† See the art. *Trial*.

I. In *civil* caſes challenges are of two ſorts; challenges to the *array*, and challenges to the *poll*.

1. Challenges to the array are at once an exception to the whole panel, in which the jury are arrayed, or ſet in order by the ſheriff in his return; and they may be made upon account of partiality or ſome default in the ſheriff or his under officer who arrayed the panel. Alſo, though there be no perſonal objection againſt the ſheriff, yet if he arrays the panel at the nomination, or under the direction of either party, this is good cauſe of challenge to the array. Formerly, if a lord of parliament had a cauſe to be tried, and no knight was returned upon the jury, it was a cauſe of challenge to the array: alſo by the policy of the ancient law, the jury was to come *de vicineto*, from the neighbourhood of the vill or place where the cauſe of action was laid in the declaration: and therefore ſome of the jury were obliged to be returned from the hundred in which ſuch vill lay, and, if none were returned, the array might be challenged from defect of hundreders. For, living in the neighbourhood, theſe were ſuppoſed to know beforehand the characters of the parties and witneſſes; and therefore they better knew what credit to give to the facts alleged in evidence. But this convenience was overbalanced by another very natural and almoſt unavoidable inconvenience; that jurors coming out of the immediate neighbourhood, would be apt to intermix their prejudices and partialities in the trial of right. And this the law was ſo ſenſible of, that it for a long time has been gradually relinquiſhing this practice; the number of neceſſary hundreders in the whole panel, which in the reign of Edward III. were conſtantly ſix, being in the time of Forteſcue reduced to four; afterwards by ſtatute 27 Eliz. c. 6. to two; and at length, by ſtatute 4 and 5 Anne, c. 16. it was entirely aboliſhed upon all civil actions, except upon penal ſtatutes; and upon thoſe alſo by the 24 Geo. II. c. 18. the jury being now only to come *de corpore comitatus*, from the body of the county at large, and not *de vicineto*, or from the particular neighbourhood. The array by the ancient law may alſo be challenged, if an alien be party to the ſuit, and, upon a rule obtained by his motion to the court for a jury *de medietate linguæ*, ſuch a one be not returned by the ſheriff purſuant to the ſtatute 28 Edward III. c. 13. enforced by 18 Hen. VI. c. 29. which enacts, that where either party is an alien born, the jury ſhall be one-half denizens and the other aliens (if ſo many be forthcoming in the place), for the more impartial trial: A privilege indulged to ſtrangers in no other country in the world; but which is as ancient in England as the time of King Ethelred, in whoſe ſtatute *de monticolis. Walliæ* (then aliens to the crown of England), c. 3. it is ordained, that "duodeni legales homines, quorum ſex Walli et ſex Angli erunt, Anglis et Wallis jus dicunto."

2. Challenges to the polls, *in capita*, are exceptions to particular jurors; and ſeem to anſwer the *recuſatio judicis* in the civil and canon laws; by the conſtitutions of which, a judge might be refuſed upon any ſuſpicion of partiality. By the laws of England alſo, in the times of Bracton and Fleta, a judge might be refuſed for good cauſe; but now the law is otherwiſe, and it is held that judges or juſtices cannot be challenged. For the law will not ſuppoſe a poſſibility of bias or favour in a judge who is already ſworn to adminiſter impartial juſtice, and whoſe authority greatly depends on that preſumption and idea. And, ſhould the fact at any time prove flagrantly ſuch, as the delicacy of the law will not preſume beforehand, there is no doubt but that ſuch miſbehaviour would draw down a heavy cenſure from thoſe to whom the judge is accountable for his conduct. But challenges to the polls of the jury (who are judges of fact) are reduced to four heads by Sir Edward Coke: *propter honoris reſpectum*; *propter defectum*; *propter affectum*; and *propter delictum*. 1. *Propter honoris reſpectum*; as, if a lord of parliament be impanelled on a jury, he may be challenged by either party, or he may challenge himſelf. 2. *Propter defectum*; as, if a juryman be an alien born, this is defect of birth; if he be a ſlave or bondman, this is defect of liberty, and he cannot be a *liber et legalis homo*. Under the word *homo* alſo, though a name common to both ſexes, the female is however excluded, *propter defectum ſexus*; except when a widow feigns herſelf with child in order to exclude the next heir, and a ſuppoſititious birth is ſuſpected to be intended; then, upon the writ *de ventre inſpiciendo*, a jury of women is to be impanelled to try the queſtion whether with child or not. But the principal deficiency is defect of eſtate ſufficient to qualify him to be a juror, which depends upon a variety of ſtatutes*. 3. Jurors may be challenged *propter affectum*, for ſuſpicion of bias or partiality. This may be either a principal challenge, or to the favour. A *principal* challenge is ſuch, where the cauſe aſſigned carries with it, *prima facie*, evident marks of ſuſpicion either of malice or favour: as, that a juror is of kin to either party within the ninth degree; that he has an intereſt in the cauſe; that there is an action depending between him and the party; that he has taken money for his verdict, &c. which, if true, cannot be over-ruled, for jurors muſt be *omne exceptione majores*. Challenges *to the favour*, are where the party hath no principal challenge; but objects only ſome probable circumſtances of ſuſpicion, as acquaintance, and the like; the validity of which muſt be left to the determination of *triors*, whoſe office is to decide whether the juror be favourable or unfavourable. 4. Challenges *propter delictum*, are for ſome crime or miſdemeanour that affects the juror's credit, and renders him infamous: As for a conviction of treaſon, felony, perjury, or conſpiracy: or if, for ſome infamous offence, he hath received judgment of the pillory or the like.

II. In *criminal* caſes, challenges may be made either on the part of the king, or on that of the priſoner; and either to the whole array, or to the ſeparate polls, for the very ſame reaſons that they may be in civil cauſes. For it is here at leaſt as neceſſary as there, that the ſheriff or returning officer be totally indifferent; that, where an alien is indicted, the jury ſhould be *de midietate*, or half foreigners, if ſo many are found in the place (which does not indeed hold in treaſons, aliens being very improper judges of the breach of allegiance; nor yet in the caſe of Egyptians under the ſtatute 22 Hen. VIII. c. 10.); that on every panel there ſhould be a competent number of hundreders; and that the particular jurors ſhould be *omne exceptione majores*, not liable to objections either *propter honoris reſpectum*,

*See *Blackſtone's Com.* III. 362.

ſpectum, propter defectum, propter affectum, or *propter delictum.*

Challenges on any of the foregoing accounts are ſtyled challenges *for cauſe*; which may be without ſtint in both civil and criminal trials. But in criminal caſes, or at leaſt in capital ones, there is, *in favorem vitæ*, allowed to the priſoner an arbitrary and capricious ſpecies of challenge to a certain number of jurors, without ſhowing any cauſe at all; which is called a peremptory challenge: a proviſion full of that tenderneſs and humanity to priſoners for which our laws are famous. This is grounded on two reaſons: 1. As every one muſt be ſenſible what ſudden impreſſions and unaccountable prejudices we are apt to conceive upon the bare looks and geſtures of another; and how neceſſary it is, that a priſoner, when put to defend his life, ſhould have a good opinion of his jury, the want of which might totally diſconcert him; the law wills not that he ſhould be tried by any one man againſt whom he has conceived a prejudice even without being able to aſſign a reaſon for ſuch his diſlike. 2. Becauſe upon challenges for cauſe ſhown, if the reaſon aſſigned prove inſufficient to ſet aſide the juror, perhaps the bare queſtioning his indifference may ſometimes provoke a reſentment; to prevent all ill conſequences from which, the priſoner is ſtill at liberty, if he pleaſes, peremptorily to ſet him aſide.

This privilege of peremptory challenges, though granted to the priſoner, is denied to the king by the ſtatute 33 Edward I. ſtat. 4. which enacts, that the king ſhall challenge no jurors without aſſigning a cauſe certain to be tried and approved by the court. However, it is held that the king need not aſſign his cauſe of challenge till all the panel is gone through, and unleſs there cannot be a full jury without the perſons ſo challenged. And then, and not ſooner the king's counſel muſt ſhow the cauſe: otherwiſe the juror ſhall be ſworn.

The peremptory challenges of the priſoner muſt, however, have ſome reaſonable boundary; otherwiſe he might never be tried. This reaſonable boundary is ſettled by the common law to the number of 35; that is, one under the number of three full juries. For the law judges, that 35 are fully ſufficient to allow the moſt timorous man to challenge through mere caprice; and that he who peremptorily challenges a greater number, or three full juries, has no intention to be tried at all. And therefore it deals with one who peremptorily challenges above 35, and will not retract his challenge, as with one who ſtands mute or refuſes his trial; by ſentencing him to the *peine forte et dure* in felony, and by attainting him in treaſon. And ſo the law ſtands at this day with regard to treaſon of any kind. But by ſtatute 22 Hen. VIII. c. 14. (which, with regard to felonies, ſtands unrepealed), no perſon arraigned for felony can be admitted to make more than 20 peremptory challenges.

CHALLON-SUR-SAONE, an ancient town of France, in Burgundy, and capital of the Challonnois, with a citadel and biſhop's ſee. It is ſeated on the river Saone, in E. Long. 5. 7. N. Lat. 46. 47.

CHALLONS-Sur-Marne, a large epiſcopal town of France, in Champagne. It carries on a conſiderable trade in ſhalloons, and other woollen ſtuffs. It is ſeated between two fine meadows on the rivers Marne, Mau, and Nau, in E. Long. 4. 37. N. Lat 48. 57.

CHALONER, (Sir Thomas) a ſtateſman, ſoldier, and poet, deſcended from a good family in Denbigh in Wales, was born at London about the year 1515. Having been educated in both univerſities, but chiefly at Cambridge, he was introduced at the court of Henry VIII, who ſent him abroad in the retinue of Sir Henry Knevet ambaſſador to Charles V. and he had the honour to attend that monarch on his fatal expedition againſt Algiers in 1541. Soon after the fleet left that place, he was ſhipwrecked on the coaſt of Barbary in a very dark night: and having exhauſted his ſtrength by ſwimming, he chanced to ſtrike his head againſt a cable, which he had the preſence of mind to catch hold of with his teeth; and, with the loſs of ſeveral of them, was drawn up by it into the ſhip to which he belonged. Mr Chaloner returned ſoon after to England, and was appointed firſt clerk of the council, which office he held during the reſt of that reign. On the acceſſion of Edward VI. he became a favourite of the Duke of Somerſet, whom he attended to Scotland, and was knighted by that nobleman after the battle of Muſſelburgh, in 1547. The protector's fall put a ſtop to Sir Thomas Chaloner's expectations, and involved him in difficulties. During the reign of queen Mary, being a determined proteſtant, he was in ſome danger; but having many powerful friends, he had the good fortune to eſcape. On the acceſſion of queen Elizabeth, he appeared again at court; and was ſo immediately diſtinguiſhed by her Majeſty, that ſhe appointed him ambaſſador to the emperor Ferdinand I. being the firſt ambaſſador ſhe nominated. His commiſſion was of great importance; and the queen was ſo well ſatisfied with his conduct, that, ſoon after his return, ſhe ſent him in the ſame capacity to Spain: but Sir Thomas was by no means ſatisfied with this inſtance of her majeſty's confidence: the courts of England and Spain being at this time extremely diſſatisfied with each other, he foreſaw that his ſituation would be very diſagreeable; and ſo it proved; but Elizabeth muſt be obeyed. He embarked for Spain in 1561, and returned to London in 1564, in conſequence of a requeſt to his ſovereign, in an elegy written in imitation of Ovid. After his return, he reſided in a houſe built by himſelf in Clerkenwell-cloſe, where he died in the year 1565, and was buried in St Paul's. Sir William Cecil aſſiſted as chief mourner at his funeral.

So various were the talents of Sir Thomas Chaloner, that he excelled in every thing to which he applied himſelf. He made a conſiderable figure as a poet. His poetical works were publiſhed by William Malim, maſter of St Paul's ſchool, in 1579. His capital work was that "Of reſtoring the Engliſh republic, in ten books," which he wrote when he was ambaſſador in Spain. It is remarkable, that this great man, who knew how to tranſact as well as to write upon the moſt important affairs of ſtates and kingdoms, could deſcend to compoſe a *dictionary for children*, and to tranſlate from the Latin a book *Of the office of Servants*, merely for the utility of the ſubjects.

CHALONER, (Sir Thomas) the younger, though inconſiderable as an author, deſerves to be recorded as a ſkilful naturaliſt, in an age wherein natural hiſtory was very

very little underſtood in this or any other country; and particularly as the founder of the alum-works in Yorkſhire, which have ſince proved ſo exceedingly advantageous to the commerce of Britain. He was the only ſon of Sir Thomas Chaloner mentioned in the laſt article, and was born in the year 1559. Being very young at the time of his father's death, the lord treaſurer Burleigh taking charge of his education, ſent him to St Paul's ſchool, and afterwards to Magdalen college in Oxford, where, like his father, he diſcovered extraordinary talents for Latin and Engliſh poetry. About the year 1580, he made the tour of Europe, and returned to England before 1584; for, in that year, we find him a frequent attendant in the court of queen Elizabeth. About this time he married the daughter of Sir William Fleetwood, recorder of London. In 1591 he was knighted; and, ſome time after, diſcovered the alum-mines on his eſtate at Giſborough, near the river Tees in Yorkſhire (A).

Towards the latter end of the queen's reign, Sir Thomas viſited Scotland; and returning to England in the retinue of king James I. found ſuch favour in the ſight of his majeſty, that he was immediately appointed governor to prince Henry, whom he conſtantly attended, and, when his royal pupil viſited Oxford, was honoured with the degree of maſter of arts. How he was employed after the death of the prince is not known. Some years before that event, he married a ſecond wife, the daughter of Mr William Blount of London, by whom he had ſome children. He died in the year 1615, and was buried at Chiſwick in Middleſex. His eldeſt ſon William was created a baronet in the 18th of James *anno* 1620. The title was extinct in 1681. He wrote, 1. Dedication to Lord Burleigh of his father's poetical works, dated 1579. 2. The virtue of nitre, wherein is declared the ſundry cures by the ſame effected. Lond. 1584, 4to.

CHALYBEAT, in medicine, an appellation given to any liquid, as wine or water, impregnated with particles of iron or ſteel. See MINERAL WATERS.

CHALYBES, (anc. geog.) an ancient people of the Hither Aſia. Their ſituation is differently aſſigned; Strabo placing them in Paphlagonia, to the eaſt of Synope; Apollonius Rhodus and Stephanus, on the eaſt of the Thermodon, in Pontus; called *Halizones* by Homer. They either gave their name to, or took it from, their iron manufactures, (Xenophon, Val. Flaccus), their only ſupport, their ſoil being barren and ungrateful, (Dionyſius Periegetes).

CHAM, or KHAN, the title given to the ſovereign princes of Tartary.

The word, in the Perſian, ſignifies *mighty lord*; in the Scalvonic, *emperor*. Sperlingius, in his Diſſertation on the Daniſh term of *Majeſty, koning, king*, thinks the Tartarian *cham* may be well derived from it; adding, that in the north they ſay *kan, konnen, konge, konning*, &c. The term *cham* is alſo applied, among the Perſians, to the great lords of the court, and the governors of provinces.

CHAM, in geography, a town of the Bavarian palatinate, ſituated on a river of the ſame name, about 25 miles north-eaſt of Ratiſbon; E. Long. 13. N. Lat. 49. 15.

CHAMA, in zoology, a genus of ſhell-fiſh belonging to the order of vermes teſtaceæ. The ſhell is thick, and has two valves; it is an animal of the oyſter kind. Linnæus enumerates 14 ſpecies, principally diſtinguiſhed by the figure of their ſhells.

CHAMADE, in war, a certain beat of a drum, or ſound of a trumpet, which is given the enemy as a ſignal to inform them of ſome propoſition to be made to the commander, either to capitulate, to have leave to bury their dead, make a truce, or the like.—Menage derives the word from the Italian *chiamata*, of *clamare* to "cry."

CHAMÆDRYS, in botany. See VERONICA.

CHAMÆLEON, in zoology, the trivial name of a ſpecies of LACERTA.

CHAMÆPITYS, in botany. See TEUCRIUM.

CHAMÆROPS, in botany: a genus of the natural order of palmæ. The hermaphrodite calyx is tripartite; the corolla tripetalous; there are ſix ſtamina, three piſtils, and three monoſpermous plums. The male, in a diſtinct plant, the ſame as the hermaphrodite. There are two ſpecies, the moſt remarkable of which is the glabra, a native of the Weſt-Indies, and warm parts of America, alſo of the correſponding latitudes of Aſia and Africa. It never riſes with a tall ſtem; but when the plants are old, their leaves are five or ſix feet long, and upwards of two feet broad; theſe ſpread open like a fan, having many foldings, and at the top are deeply divided like the fingers of a hand. This plant the Americans call *thatch*, from the uſe to which the leaves are applied.—Under the name of palmetto, however, Mr Adanſon deſcribes a ſpecies of palm which grows naturally at Senegal, whoſe trunk riſes from 50 to 60 feet in height: from the upper end of the trunk iſſues a bundle of leaves, which, in turning off, form a round head; each leaf repreſents a fan of five or ſix feet in expanſion, ſupported by a tail of the ſame length. Of theſe trees, ſome produce male flowers, which are conſequently barren; other are female, and loaded with fruit, which ſucceed each other uninterruptedly almoſt the whole year round. The fruit of the large palmettos, Mr Adanſon affirms to be of the bigneſs of an ordinary melon, but rounder: it is inveloped in two ſkins as tough as leather, and as thick as ſtrong parchment; within the fruit is yellowiſh, and full of filaments faſtened to three large kernels in the middle. The negroes are very fond of this fruit, which,

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(A) Sir Thomas, during his reſidence in Italy, being particularly fond of natural hiſtory, ſpent ſome time at Puzzoli, where he was very attentive to the art of producing alum. This attention proved infinitely ſerviceable to his country, though of no great benefit to himſelf or his family, his attempt being attended with much difficulty and expence. It was begun about the year 1600, in the reign of queen Elizabeth; but was not brought to any degree of perfection till ſome time in the reign of Charles I. by the aſſiſtance of one Ruſſel a Walloon, and two other workmen brought from the alum-works at Rochelle. By one of the arbitrary acts of Charles, it was then deemed a mine-royal, and granted to Sir Paul Pindar. The long parliament adjudged it a monopoly, and juſtly reſtored it to the original proprietors.

which, when baked under the aſhes, is ſaid to taſte like a quince.

The little palmetto may be eaſily raiſed in Britain from ſeeds brought from America; but, as the plants are tender, they muſt be conſtantly kept in a bark-ſtove.

CHAMANIM, in the Jewiſh antiquities, is the Hebrew name for that which the Greeks call *Pyreia* or *Pyrateria*; and St Jerom in Leviticus has tranſlated *Simulachra*, in Iſaiah, *delubra*. Theſe chamanim were, according to Rabbi Solomon, idols expoſed to the ſun upon the tops of houſes. Abenezra ſays they were portable chapels or temples made in the form of chariots, in honour of the Sun. What the Greeks call Pyreia, were temples conſecrated to the ſun and fire, wherein a perpetual fire was kept up. They were built upon eminences; and were large incloſures without covering, where the ſun was worſhipped. The Gaebres, or worſhippers of fire, in Perſia and the Eaſt-Indies, have ſtill theſe Pyreia. The word *chamanim* is derived from *Chaman*, which ſignifies to warm, or burn.

CHAMARIM, a word which occurs in ſeveral places of the Hebrew bible, and is generally tranſlated the *the prieſts of the idols*, or the *prieſts clothed in black*, becauſe *chamar* ſignifies "black," or "blackneſs." St Jerom, in the ſecond book of Kings, renders it *aruſpices*. In Hoſea and Zephania, he tranſlates it *æditui* or church-wardens. But the beſt commentators are of opinion, that by this word we are to underſtand the prieſts of the falſe gods, and in particular the worſhippers of fire; becauſe they were, as they ſay, dreſſed in black; or perhaps the Hebrews gave them this name in deriſion, becauſe, as they were continually employed in taking care about the fuel, and keeping up the fire, they were always as black as ſmiths or colliers. We find prieſts, among thoſe of Iſis, called *melanephori*, that is to ſay, that wear black; but whether this may be by reaſon of their dreſſing in black, or whether it were becauſe they wore a certain ſhining black veil in the proceſſions of this goddeſs, is not certain. *Camar*, in Arabic, ſignifies the "moon." Iſis is the ſame deity. Grotius thinks the Roman prieſts, called *camilli*, came from the Hebrew *chamarim*. Thoſe among the heathens who ſacrificed to the infernal gods were dreſſed in black.

CHAMBER, in building, a member of a lodging, or piece of an apartment, ordinarily intended for ſleeping in; and called by the Latins *cubiculum*. The word comes from the Latin *camera*; and that, according to *Nicod*, from the Greek καμαρα, *vault* or *curve*; the term *chamber* being originally confined to places arched over.

A complete apartment is to conſiſt of a hall, antichamber, *chamber*, and cabinet.

Privy-CHAMBER, in England. Gentlemen of the privy-chamber are ſervants of the king, who are to wait and attend on him and the queen at court, in their diverſions, &c. Their number is forty-eight, under the lord-chamberlain, twelve of whom are in quarterly waiting, and two of theſe lie in the privy-chamber.

In the abſence of the lord-chamberlain, or vice-chamberlain, they execute the king's orders: at coronations, two of them perſonate the dukes of Aquitain and Normandy; and ſix of them, appointed by the lord-chamberlain, attend ambaſſadors from crowned heads to their audiences, and in public entries. The gentlemen of the privy chamber were inſtituted by Henry VII.

CHAMBER, in policy, the place where certain aſſemblies are held, alſo the aſſemblies themſelves. Of theſe ſome are eſtabliſhed for the adminiſtration of juſtice, others for commercial affairs.

Of the firſt kind are, 1. Star-chamber, ſo called, becauſe the roof was painted with ſtars; the authority, power, and juriſdiction of which, are abſolutely aboliſhed by the ſtatute 17 Car. I. 2. Imperial chamber of Spire, the ſupreme court of judicatory in the empire, erected by Maximilian I. This chamber has a right of judging by appeal; and is the laſt reſort of all civil affairs of the ſtates and ſubjects of the empire, in the ſame manner as the aulic council of Vienna. Nevertheleſs it is reſtrained in ſeveral caſes: it takes no notice of matrimonial cauſes, theſe being left to the pope; nor of criminal cauſes, which either belong to particular princes or towns in their reſpective territories, or are cognizable by all the ſtates of the empire in a diet. By the treaty of Oſnaburg, in 1648, fifty aſſeſſors were appointed for this chamber, whereof 24 were to be Proteſtants, and 26 Catholics; beſides five preſidents, two of them Proteſtants, and the reſt Catholics. 3. Chamber of accounts, a ſovereign court in France, where accounts are rendered of all the king's revenues, inventories, and avowals thereof regiſtered; oaths of fidelity taken, and other things relating to the finances tranſacted. There are nine in France, that of Paris is the chief; it regiſters proclamations, treaties of peace, naturalizations, titles of nobility, &c. All the members wear long black gowns of velvet, of ſattin, or damaſk, according to their places. 4. Eccleſiaſtical chambers in France, which judge by appeal of differences about collecting the tythes. 5. Chamber of audience, or grand chamber, a juriſdiction in each parliament of France, the counſellors of which are called *jugeurs*, or judges, as thoſe of the chamber of inqueſts are called *raporteurs*, reporters of proceſſes by writing. 6. Chamber of the edict, or miparty, a court eſtabliſhed by virtue of the edict of pacification in favour of thoſe of the reformed religion. This chamber is now ſuppreſſed. 7. Apoſtolical chamber of Rome, that wherein affairs relating to the revenues of the church and the pope are tranſacted. This council conſiſts of the cardinal-camerlingo, the governor of the rota, a treaſurer, an auditor, a preſident, one advocate-general, a ſolicitor-general, a commiſſary, and 12 clerks. 8. Chamber of London, an apartment in Guildhall, where the city money is depoſited.

Of the laſt ſort are, the chambers of commerce; the chambers of aſſurance; and the royal or ſyndical chamber of bookſellers in France.

1. The chamber of commerce is an aſſembly of merchants and traders, where the affairs relating to trade are treated of. There are ſeveral eſtabliſhed in moſt of the chief cities of France; and in Britain there have lately been chambers of this kind erected, particularly in London, Edinburgh, and Glaſgow.—2. Chamber of aſſurance in France, denotes a ſociety of merchants and others for carrying on the buſineſs of inſuring: but in Holland, it ſignifies a court of juſtice, where cauſes relating to inſurance are tried.

3. Chamber of bookſellers in Paris, an aſſembly conſiſting of a ſyndic and aſſiſtants, elected by four delegates from the printers, and twelve from the bookſellers, to viſit the books imported from abroad, and to ſearch the houſes and ſellers of marble paper, printſellers, and dealers in printed paper for hangings, who are prohibited from keeping any letters proper for printing books. In the viſitation of books, which ought to be performed by three perſons at leaſt from among the ſyndic and aſſiſtants, all libels againſt the honour of God and the welfare of the ſtate, and all books printed either within or without the kingdom in breach of their regulations and privileges, are ſtopt, even with the merchandiſes that may happen to be in the bales with ſuch libels or other prohibited books. The days appointed for this chamber to meet, are Tueſdays and Fridays, at two o'clock in the afternoon.

CHAMBER, in military affairs. 1. Powder-chamber, or bomb-chamber; a place ſunk under ground for holding the powder, or bombs, where they may be out of danger, and ſecured from the rain. 2. Chamber of a mine; the place, moſt commonly of a cubical form, where the powder is confined. 3. Chamber of a mortar; that part of the chaſe, much narrower than the reſt of the cylinder, where the powder lies. It is of different forms; ſometimes like a reverſed cone; ſometimes globular, with a neck for its communication with the cylinder, whence it is called a bottled chamber; but moſt commonly cylindrical, that being the form which is found by experience to carry the ball to the greateſt diſtance.

CHAMBERLAIN, an officer charged with the management and direction of a chamber. See CHAMBER, *in policy*.

There are almoſt as many kinds of chamberlains as chambers, the principal whereof are as follows.

Lord CHAMBERLAIN of Great-Britain, the ſixth great officer of the crown; to whom belongs livery and lodging in the king's court; and there are certain fees due to him from each archbiſhop or biſhop when they perform their homage to the king, and from all peers at their creation, or doing their homage. At the coronation of every king, he is to have forty ells of crimſon velvet for his own robes. This officer on the coronation-day, is to bring the king his ſhirt, coif, and wearing clothes; and after the king is dreſſed, he claims his bed, and all the furniture of his chamber, for his fees: he alſo carries, at the coronation, the coif, gloves, and linen, to be uſed by the king on that occaſion, alſo the ſword and ſcabbard, the gold to be offered by the king, and the robes-royal and crown: he dreſſes and undreſſes the king on that day, waits on him before and after dinner, &c. To this officer belongs the care of providing all things in the houſe of lords, in the time of parliament; to him alſo belongs the government of the palace of Weſtminſter: he diſpoſes likewiſe of the ſword of ſtate, to be carried before the king, to what lord he pleaſes.

The great chamberlain of Scotland was ranked by King Malcom as the third great officer of the crown, and was called *Camerarius Domini Regis*. Before there was a treaſurer appointed, it was his duty to collect the revenue of the crown, and he diſburſed the money neceſſary for the king's expences, and the maintenance of the king's houſehold. From the time that a treaſurer was appointed, his province was limited to the boroughs throughout the kingdom, where he was a ſort of juſtice-general, as he had a power for judging of all crimes committed within the borough, and of the crime of foreſtalling. He was to hold chamberlain-ayres every year. He was ſupreme judge; nor could any of his decrees be queſtioned by any inferior judicatory. His ſentences were put in execution by the magiſtrates of the boroughs. He alſo regulated the prices of proviſions within the borough, and the fees of the workmen in the mint-houſe. His ſalary was only L. 200 a-year. The ſmallneſs of his ſalary, and his great powers, had no doubt been the cauſes of much oppreſſion in this officer, and the chamberlain-ayre was called rather a legal robbery than a court of juſtice; and when the combined lords ſeized King James VI. Auguſt 24, 1582, and carried him to Ruthven Caſtle, they iſſued a proclamation in the king's name, diſcharging the chamberlain-ayres to be kept. The chamberlain had great fees ariſing from the profits of eſcheats, fines, tolls, and cuſtoms. This office was granted heritably to the family of Stuart, duke of Lenox; and when their male line failed, king Charles II. conferred it in like manner upon his natural ſon, whom he created duke of Monmouth, and on his forfeiture it went to the duke of Lenox; but that family ſurrendered the office to the crown in 1703.

Lord CHAMBERLAIN of the Houſehold, an officer who has the overſight and direction of all officers belonging to the king's chambers, except the precinct of the king's bed-chamber.

He has the overſight of the officers of the wardrobe at all his majeſty's houſes, and of the removing wardrobes, or of beds, tents, revels, muſic, comedians, hunting, meſſengers, &c. retained in the king's ſervice. He moreover has the overſight and direction of the ſerjeant at arms, of all phyſicians, apothecaries, ſurgeons, barbers, the king's chaplains, &c. and adminiſters the oath to all officers above ſtairs.

Other chamberlains are thoſe of the king's court of exchequer, of North-Wales, of Cheſter, of the city of London, &c. in which caſes this officer is generally the receiver of all rents and revenues belonging to the place whereof he is chamberlain.

In the exchequer there are two chamberlains, who keep a controlment of the pells of receipts and exitus, and have certain keys of the treaſury, records, &c.

CHAMBERLAIN of London keeps the city money, which is laid up in the chamber of London: He alſo preſides over the affairs of maſters and apprentices, and makes free of the city, &c.

His office laſts only a year; but the cuſtom uſually obtains to re-chuſe the ſame perſon, unleſs charged with any miſdemeanour in his office.

CHAMBERLAYNE, (Edward) deſcended from an ancient family, was born in Glouceſterſhire 1616, and made the tour of Europe during the diſtractions of the civil war. After the reſtoration he went as ſecretary with the earl of Carliſle, who carried the order of the Garter to the king of Sweden; was appointed tutor to the duke of Grafton, natural ſon of Charles II. and was afterwards pitched on to inſtruct prince George of Denmark in the Engliſh tongue. He died in 1703, and was buried in a vault in Chelſea church.

church-yard: his monumental inſcription mentions ſix books of his writing; and that he was deſirous of doing ſervice to poſterity, that he ordered ſome copies of his books to be covered with wax, and buried with him. That work by which he is beſt known, is his *Angliæ Notitiæ*, or *the preſent ſtate of England*, which has been often ſince printed.

CHAMBERLAYNE, (John) ſon to the author of “*The Preſent State of England*,” and continuator of that uſeful work, was admitted into Trinity College, Oxford, 1685; but it doth not appear that he took any degree. Beſide the *Continuation* juſt mentioned, he was author of “Diſſertations hiſtorical, critical, theological, and moral, on the moſt memorable events of the Old and New Teſtaments, with Chronological Tables;” one vol. folio; and tranſlated a variety of works from the French, Dutch, and other languages. He likewiſe was F. R. S. and communicated ſome pieces, inſerted in the Philoſophical Tranſactions. It was ſaid of him that he underſtood ſixteen languages; but it is certain that he was maſter of the Greek, Latin, French, High and Low Dutch, Portugueſe, and Italian. Though he was qualified for employment, he had none but that of Gentleman-Uſher to George Prince of Denmark. After a uſeful and well-ſpent life, he died in the year 1724. He was a very pious and good man, and earneſt in promoting the advancement of religion, and the intereſt of true Chriſtianity; for which purpoſe he kept a large correſpondence abroad.

CHAMBERRY, a conſiderable and populous town of Italy, in Savoy, with a caſtle. It is capital of the duchy, and well built, but has no fortifications. It is watered by ſeven ſtreams, which have their ſources in St Martin's-hill, and run through ſeveral of the ſtreets. There are piazzas under moſt part of the houſes, where people may walk dry in the worſt weather. It hath large and handſome ſuburbs; and in the centre of the town is the royal palace. The parliament meet here, which is compoſed of four preſidents, and a pretty large number of ſenators, being the ſupreme tribunal of the whole duchy. The principal church is St Leger, and the Jeſuits college is the moſt magnificent of all the monaſteries. E. Long. 5. 50. N. Lat. 45. 35.

CHAMBERS, (David) a Scots hiſtorian, prieſt, and lawyer, was born in the ſhire of Roſs, about the year 1530, and educated in the univerſity of Aberdeen. From thence he went to France and Italy, where he continued ſome time, particularly at Boulogne, where, in 1556, he was a pupil of Marianus Sozenus.

After his return to Scotland, he was appointed, by queen Mary, parſon of Suddy and chancellor of Roſs. He was ſoon after employed in digeſting the laws of Scotland, and was principally concerned in publiſhing the acts of parliament of that kingdom by authority in 1566. He was alſo appointed one of the lords of ſeſſion, and continued her majeſty's faithful ſervant till her declining fortune obliged her adherents to ſeek for refuge in other kingdoms. Chambers went firſt to Spain, where he was graciouſly received by king Philip; and thence travelled to Paris, where he was no leſs kindly received by Charles IX. of that kingdom, to whom, in 1572, he preſented his hiſtory of Scotland, *&c.* He died at Paris in the year 1592, much regretted (ſays Mackenzie) by all who knew him. His writings were chiefly calculated to aſſiſt his royal miſtreſs, and to extol the wiſdom of the Scots nation.

CHAMBERS, (Ephraim) author of the ſcientific Dictionary which goes under his name, was born at Milton, in the county of Weſtmoreland. His parents were diſſenters of the Preſbyterian perſuaſion; and his education no other than that common one which is intended to qualify a youth for trade and commerce. When he became of a proper age, he was put apprentice to Mr Senex the globe-maker, a buſineſs which is connected with literature, and eſpecially with aſtronomy and geography. It was during Mr Chambers's reſidence with this ſkilful mechanic, that he contracted that taſte for ſcience and learning which accompanied him through life, and directed all his purſuits. It was even at this time that he formed the deſign of his grand work, the “Cyclopædia;” and ſome of the firſt articles of it were written behind the counter. Having conceived the idea of ſo great an undertaking, he juſtly concluded that the execution of it would not conſiſt with the avocations of trade; and therefore he quitted Mr Senex, and took chambers at Gray's-Inn, where he chiefly reſided during the reſt of his days. The firſt edition of the *Cyclopædia*, which was the reſult of many years intenſe application, appeared in 1728, in two vols. fol. It was publiſhed by ſubſcription, the price being 4l. 4s. and the liſt of ſubſcribers was very reſpectable. The dedication, which was to the king, is dated October 15, 1727. The reputation that Mr Chambers acquired by his execution of this undertaking, procured him the honour of being elected F. R. S. Nov. 6, 1729. In leſs than ten years time a ſecond edition became neceſſary; which accordingly was printed, with corrections and additions, in 1738; and was followed by a third the very next year.

Although the Cyclopædia was the grand buſineſs of Mr Chambers's life, and may be regarded as almoſt the ſole foundation of his fame, his attention was not wholly confined to this undertaking. He was concerned in a periodical publication intitled, “The Literary Magazine,” which was begun in 1735. In this work he wrote a variety of articles, and particularly a review of Morgan's “Moral Philoſopher.” He was engaged, likewiſe, in conjunction with Mr John Martyn, F. R. S. and profeſſor of botany at Cambridge, in preparing for the preſs a tranſlation and abridgement of the “Philoſophical Hiſtory and Memoirs of the Royal Academy of Sciences at Paris, or an Abridgment of all the Papers relating to Natural Philoſophy which have been publiſhed by the Members of that illuſtrious Society.” This undertaking, when completed was compriſed in five volumes 8vo. which did not appear till 1742, ſome time after our author's deceaſe, when they were publiſhed in the joint names of Mr Martyn and Mr Chambers. Mr Martyn, in a ſubſequent publication, hath paſſed a ſevere cenſure, upon the ſhare which his fellow-labourer had in the abridgement of the Pariſian papers. The only work beſides, that we find aſcribed to Mr Chambers, is a tranſlation of the *Jeſuit's Perſpective*, from the French; which was printed in 4to, and hath gone through ſeveral editions. Mr Chambers's cloſe and unremitting attention to his ſtudies at length impaired his health, and obliged him occaſionally to take a lodging at Canonbury-houſe, Iſlington. This not having greatly contributed to his recovery, he made an excurſion to the ſouth of France, but did not reap that benefit from it which he had himſelf hoped, and his friends wiſhed. Returning to England, he died at Canonbury-houſe, and was buried at Weſtminſter; where the following inſcription, written by himſelf, is placed on the north ſide of the cloyſters of the Abbey:

Multis pervulgatus,
Paucis notus;
Qui vitam, inter lucem & umbram,
Nec eruditus, nec idiota,
Literis deditus, tranſegit; ſed ut homo
Qui humani nihil a ſe alienum putat.
Vita ſimul, & laboribus functus,
Hic requieſcere voluit,
Ephraim Chambers, R. S. S.
Obiit XV Maii, MDCCXL.

After the author's death, two more editions of his Cyclopædia were publiſhed. The proprietors afterwards procured a ſupplement to be compiled, which extended to two volumes more: And in the year 1778 began to be publiſhed in weekly numbers, an edition of both, improved, and incorporated into one alphabet, by Dr Rees, which has been lately completed in four volumes folio, and forms a very valuable work.

CHAMBRE, (Martin Cureau de la) phyſician in ordinary to the French king, was diſtinguiſhed by his knowledge in medicine, philoſophy, and polite learning. He was born at Mons; and was received into the French academy in 1635, and afterwards into the academy of ſciences. He wrote a great number of works, the principal of which are, 1. The characters of the paſſions. 2. The art of knowing men. 3. On the knowledge of beaſts, &c. He died at Paris in 1669.

CHAMELEON. See Lacerta.

CHAMFERING, in architecture, a phraſe uſed for cutting any thing aſlope on the under ſide.

CHAMIER, (Daniel) an eminent proteſtant divine born in Dauphine. He was many years preacher at Montellimart; from whence he went in 1612 to Montaubon, to be profeſſor of divinity in that city, and was killed by a cannon-ball during the ſiege in 1621. The moſt conſiderable of his works is his *Panſtratia Catholica*, or "Wars of the Lord," in four volumes folio; in which he treats very learnedly of the controverſies between the Proteſtants and Roman Catholics.

CHAMOIS, or Chamois-goat, in zoology. See Capra.

CHAMOMILE. See Anthemis.

CHAMOS, or Chemosh, the idol or god of the Moabites.

The name of *chamos* comes from a root which, in Arabic, ſignifies to *make haſte*; for which reaſon many believe chamos to be the ſun, whoſe precipitate courſe might well procure it the name of ſwift or ſpeedy. Others have confounded chamos with the god *Hammon*, adored not only in Libya and Egypt, but alſo in Arabia, Ethiophia, and the Indies. Macrobius ſhows that Hammon was the ſun; and the horns, with which he was repreſented, denoted his rays. Calmet is of opinion, that the god Hamonus, and Apollo Chomeus, mentioned by Strabo and Ammianus Marcellinus, was the very ſame as chamos or the ſun. Theſe deities were worſhipped in many of the eaſtern provinces. Some who go upon the reſemblance of the Hebrew term *chamos*, to that of the Greek *comos*, have believed chamos to ſignify the god Bacchus the god of drunkenneſs, according to the ſignification of the Greek *comos*. St Jerom, and with him moſt other interpreters, take Chamos and Peor for the ſame deity. But it ſeems that Baal-Peor was the ſame as Tammuz or Adonis; ſo that Chamos muſt be the god whom the heathens call the Sun.

CHAMOUNI, one of the elevated valleys of the Alps ſituated at the foot of Mount Blanc. See Alps and Blanc.

The firſt ſtrangers whom a curioſity to viſit the glaciers drew to Chamouni (M. Saſſure obſerves), certainly conſidered this valley as a den of robbers; for they came armed cap-a-pee, attended with a troop of domeſtics armed in the ſame manner: they would not venture into any houſe; they lived in tents which they had brought along with them; fires were kept burning, and centinels on guard the whole night over. It was in the year 1741 that the celebrated traveller Pocock, and another Engliſh gentleman called Wyndham, undertook this intereſting journey. It is remembered by the old men of Chamouni, and they ſtill laugh at the fears of the travellers, and at their unneceſſary precautions. For 20 or 25 years after this period, the journey was made but ſeldom, and then chiefly by Engliſhmen, who lodged with the curate: for when I was there in 1760, and even for four or five year afterwards, there was no habitable houſe except one or two miſerable inns, like thoſe in villages that are little frequented. But now that this expedition has gradually become ſo faſhionable, three large and good inns, which have been ſucceſſively built, are hardly ſufficient to contain the travellers that come during the ſummer from all quarters.

This concourſe of ſtrangers, and the money they leave behind them at Chamouni, have ſomewhat affected the ancient ſimplicity of the inhabitants, and even the purity of their manners. Nobody, however, has any thing to fear from them: the moſt inviolable fidelity is obſerved with reſpect to travellers; they are only expoſed to a few importunate ſolicitations, and ſome ſmall artifices, dictated by the extreme eagerneſs with which the inhabitants offer their ſervices as guides.

The hope of obtaining this employment brings together round a traveller, almoſt all the men in every village through which he paſſes, and makes him believe that there are a great many in the valley; but there are very few at Chamouni in ſummer. Curioſity, or the hope of making money, draws many to Paris and into Germany: beſides, as the ſhepherds of Chamouni have the reputation of excelling in the making of cheeſe, they are in great requeſt in the Tarentaiſe, in the valley of Aoſte, and even at greater diſtances; and they receive there, for four or five months in ſummer, very conſiderable wages. Thus the labours of the field devolve almoſt entirely on the women, even ſuch as in other countries fall ſolely on the men; as mowing, cutting of wood and threſhing: even the animals of the ſame ſex are not ſpared, for the cows there are yoked in the plough.

The only labours that belong excluſively to the men are the ſeeking for rock cryſtal, and the chaſe. Happily they are now leſs employed than formerly in the firſt of theſe occupations. I ſay happily, for many of them periſhed in this purſuit. The hope of enriching themſelves quickly by the diſcovery of a cavern filled with fine cryſtals, was ſo powerful a motive, that they expoſed themſelves in the ſearch to the moſt alarming dangers; and hardly a year paſſed without ſome of them periſhing in the ſnows, or among the precipices.

The principal indication of the grottos, or cryſtal ovens, as they are here called, are veins of quartz, which appear on the outſide of the rocks of granite, or of the laminated rock. Theſe white veins are ſeen at a diſtance, and often at great heights, on vertical and inacceſſible places. The adventurers endeavour to arrive at theſe, either by fabricating a road acroſs the rocks, or by letting themſelves down from above ſuſpended by ropes. When they reach the place, they gently ſtrike the rock; and if the ſtone returns a hollow ſound, they endeavour to open it with a hammer, or to blow it up with powder. This is the principal method of ſearching: but young people, and even children, often go in queſt of theſe cryſtals over the glaciers, where the rocks have lately fallen down. But whether they conſider theſe mountains as nearly exhauſted, or that the quantity of cryſtal found at Madagaſcar has too much lowered the price of this foſſil, there are now but few people that go in ſearch of it, and perhaps there is not a ſingle perſon at Chamouni that makes it his only occupation. They go however occaſionally, as to a party of pleaſure.

But the chaſe of the Chamois goat, as dangerous, and perhaps more ſo than the ſeeking for cryſtal, ſtill occupies many inhabitants of the mountains, and carries off, in the flower of their age, many men whoſe lives are moſt valuable to their families. And when we are informed how this chaſe is carried on, we will be aſtoniſhed that a courſe of life, at once ſo laborious and perilous, ſhould have irreſiſtible attractions for thoſe who have been accuſtomed to it.

The Chamois hunter generally ſets out in the night, that he may reach by break of day the moſt elevated paſtures where the goats come to feed, before they arrive. As ſoon as he diſcovers the place where he hopes to find them, he ſurveys it with his glaſs. If he finds none of them there, he proceeds always aſcending: whenever he deſcries any, he endeavours to get above them, either by ſtealing along ſome gully, or getting behind ſome rock or eminence. When he is near enough to diſtinguiſh their horns, which is the mark by which he judges of the diſtance, he reſts his piece on a rock, takes his aim with great compoſure, and rarely miſſes. This piece is a rifle-barrelled carabine, into which the ball is thruſt, and theſe carabines often contain two charges, though they have but one barrel; the charges are put one above another, and are fired in ſucceſſion. If he has wounded the chamois, he runs to his prey, and for ſecurity he hamſtrings it; then he conſiders his way home: if the road is difficult, he ſkins the chamois, and leaves the carcaſe; but, if it is practicable, he throws the animal on his ſhoulders, and bears him to his village, though at a great diſtance, and often over frightful precipices: he feeds his family with the fleſh, which is excellent, eſpecially when the creature is young, and he dries the ſkins for ſale.

But if, as is the moſt common caſe, the vigilant chamois perceives the approach of the hunter, he immediately takes flight among the glaciers, through the ſnows, and over the moſt precipitous rocks. It is particularly difficult to get near theſe animals when there are ſeveral together; for then one of them, while the reſt are feeding, ſtands as a centinel on the point of ſome rock that commands a view of the avenues leading to the paſture; and as ſoon as he perceives any object of alarm, he utters a ſort of hiſs, at which the others inſtantly gather round him to judge for themſelves of the nature of the danger: if it is a wild beaſt, or a hunter, the moſt experienced puts himſelf at the head of the flock; and away they fly, ranged in a line, to the moſt inacceſſible retreats.

It is here that the fatigues of the hunter begin; inſtigated by his paſſion for the chaſe, he is inſenſible to danger; he paſſes over ſnows, without thinking of the horrid precipices they conceal; he intangles himſelf among the moſt dangerous paths, and bounds from rock to rock, without knowing how he is to return. Night often ſurpriſes him in the midſt of his purſuit; but he does not for that reaſon abandon it; he hopes that the ſame cauſe will arreſt the flight of the chamois, and that he will next morning overtake them. Thus he paſſes the night, not at the foot of a tree, like the hunter of the plain; not in a grotto, ſoftly reclined on a bed of moſs, but at the foot of a rock, and often on the bare points of ſhattered fragments, without the ſmalleſt ſhelter. There, all alone, without fire, without light, he draws from his bag a bit of cheeſe, with a morſel of oaten bread, which make his common food: bread ſo dry, that he is ſometimes obliged to break it between two ſtones, or with the hatchet he carries with him to cut out ſteps in the ice. Having thus made his ſolitary and frugal repaſt, he puts a ſtone below his head for a pillow, and goes to ſleep, dreaming on the rout which the chamois may have taken. But ſoon he is awakened by the freſhneſs of the morning; he gets up, benumbed with cold; ſurveys the precipices which he muſt traverſe in order to overtake his game; drinks a little brandy, of which he is always provided with a ſmall portion, and ſets out to encounter new dangers. Hunters ſometimes remain in theſe ſolitudes for ſeveral days together, during which time their families, their unhappy wives in particular, experience a ſtate of the moſt dreadful anxiety: they dare not go to reſt for fear of ſeeing their huſbands appear to them in a dream; for it is a received opinion in the country, that when a man has periſhed, either in the ſnow, or on ſome unknown rock, he appears by night to the perſon he held moſt dear, deſcribes the place that proved fatal to him, and requeſts the performance of the laſt duties to his corpſe.

Voyage dans les Alpes, par M. Saſſure, tem. iii.

“ After this picture of the life which the chamois hunters lead, could one imagine that this chaſe would be the object of a paſſion abſolutely unſurmountable? I knew a well-made, handſome man, who had juſt married a beautiful woman:—‘ My grandfather, ſaid he to me, loſt his life in the chaſe; ſo did my father; and I am perſuaded, that I too ſhall die in the ſame manner: this bag which I carry with me when I hunt I call my grave-cloaths, for I am ſure I will have no other; yet if you ſhould offer to make my fortune on condition of abandoning the chaſe of the chamois, I could not conſent. I made ſome excurſions on the Alps with this man: his ſtrength and addreſs were aſtoniſhing: but his temerity was greater than his ſtrength; and I have heard, that, two years afterwards, he miſſed a ſtep on the brink of a precipice, and met with the fate he had expected.

“ The few who have grown old in this employment bear upon their faces the marks of the life they have led. A ſavage look, ſomething in it haggard and wild, makes them be known in the midſt of a crowd, even when they are not in their hunting dreſs. And undoubtedly it is this ill look which makes ſome ſuperſtitious peaſants believe that they are ſorcerers, that they have dealings with the devil in their ſolitudes, and that it is he who throws them down the rocks. What then can be the paſſionate inducement to this courſe of life? It is not avarice, at leaſt it is not an avarice conſiſtent with reaſon: the moſt beautiful chamois is never worth more to the perſon that kills it than a dozen of francs, even including the value of its fleſh; and now that the number is ſo much diminiſhed, the time loſt before one can be taken is much more than its value. But it is the very dangers that attend the purſuit, thoſe alternations of hope and fear, the continual agitation and exerciſe which theſe emotions produce in the mind, that inſtigate the hunter: they animate him as they do the gamſter, the warrior, the ſailor, and even to a certain degree, the naturaliſt of the Alps; whoſe life, in ſome meaſure, pretty much reſembles that of the hunter whoſe manners we have deſcribed.”

But there is another kind of hunting, which is neither dangerous nor laborious, nor fatal to any one but to the poor animals that are the objects of it.—Theſe are the marmots, animals that inhabit the high mountains; where in ſummer they ſcoop out holes, which they line with hay, and retire to at the beginning of autumn: here they grow torpid with the cold, and remain in a ſort of lethargy, till the warmth of the ſpring returns to quicken their languid blood, and to recal them to life. When it is ſuppoſed that they have retired to their winter abode, and before the ſnow has covered the high paſtures where their holes are made, people go to unharbour them. They are found from 10 to 12 in the ſame hole, heaped upon one another, and buried in the hay. Their ſleep is ſo profound, that the hunter often puts them into his bag, and carries them home without their awaking. The fleſh of the young is good, though it taſtes of oil, and ſmells ſomewhat of muſk; the fat is uſed in the cure of rheumatiſms and pains, being rubbed on the parts affected; but the ſkin is of little value, and is ſold for no more than five or ſix ſols. Notwithſtanding the little benefit they reap from it, the people of Chamouni go in queſt of this animal with great eagerneſs, and its numbers accordingly diminiſh very ſenſibly.

It has been ſaid, that marmots, in order to tranſport the hay into their holes, uſe one of their number laid on his back as a cart; but this is fabulous, for they are ſeen carrying the hay in their mouths. Nor is it for food that they gather it, but for a bed, and in order to ſhut out the cold, and to guard the avenues of their retreat from enemies. When they are taken in autumn, their bowels are quite empty, and even as clean as if they had been waſhed with water; which proves that their torpidity is preceded by a faſt, and even by an evacuation: a wiſe contrivance of Nature for preventing their accumulated fæces from growing putrid, or too dry, in the long lethargy they are expoſed to. They alſo continue a few days after their revival without eating, probably to allow the circulation and digeſtive power to recover their activity. At firſt, leaving their holes, they appear ſtupid and dazzled with the light: they are at this time killed with ſticks, as they do not endeavour to fly, and their bowels are then alſo quite empty. They are not very lean when they awake, but grow more ſo for a few days after they firſt come abroad. Their blood is never congealed, however profound their ſleep may be; for at the time that it is deepeſt, if they are bled, the blood flows as if they were awake.

In theſe countries the period is ſo ſhort between the diſſolution of the ſnow and its return, that grain has hardly time to come to maturity. Mr Saſſure mentions a very uſeful and ingenious practice, invented by mountaineers of the Argentiere, for enlarging this period. “I obſerved (ſays he), in the middle of the valley, ſeveral large ſpaces where the ſurface of the ſnow exhibited a ſingular appearance, ſomewhat reſembling a piece of white cloth ſpotted with black. While I was endeavouring to divine the cauſe of this phenomenon, I diſcovered ſeveral women walking with meaſured pace, and ſowing ſomething in handfuls that was black; and which being ſcattered, regularly diverging, on the ſurface of the ſnow, formed that ſpotted appearance that I had been admiring. I could not conceive what ſeed ſhould be ſown on ſnow ſix feet deep; but my guide, aſtoniſhed at my ignorance, informed me, that it was black earth ſpread upon the ſnow to accelerate its melting; and thus to anticipate, by a fortnight or three weeks, the time of labouring the fields and ſowing. I was ſtruck with the elegant ſimplicity of a practice ſo uſeful, the effects of which I already ſaw very evidently in places which had not been thus treated above three days.

“ As to the inhabitants of Chamouni, the men, like thoſe of moſt high valleys, are neither well-made nor tall: but they are nervous and ſtrong, as are alſo the women. They do not attain to a great age; men of 80 are very rare. Inflammatory diſeaſes are the moſt fatal to them; proceeding, no doubt, from obſtructed perſpiration, to which the inconſtant temperature of the climate expoſes them.

“ They are in general honeſt, faithful, and diligent in the practice of religious duties. It would, for inſtance, be in vain to perſuade them to go any where on a holiday before hearing maſs. They are economical, but charitable. There are among them neither hoſpitals nor foundations for the poor; but orphans and old people, who have no means of ſubſiſtence, are entertained by every inhabitant of a pariſh in his turn. If a man is prevented by age or infirmities from taking charge of his affairs, his neighbours join among themſelves and do it for him.

“ Their mind is active and lively, their temper gay, with an inclination to raillery: they obſerve, with ſingular acuteneſs, the ridiculous in ſtrangers, and turn it into a fund of very facetious merriment among themſelves; yet they are capable of ſerious thinking: many of them have attacked me on religious and metaphyſical ſubjects; not as profeſſing a different faith from theirs, but on general queſtions, which ſhowed they had ideas independent of thoſe they were taught."

CHAMPAGNE, a conſiderable province of France, about 162 miles in length, and 112 in breadth, bounded on the north by Hainhalt and Luxemburg, on the eaſt by Lorrain and the Franche-Comté, on the ſouth by Burgundy, and on the weſt by the iſle of France and Soiſſonnois. It has a great number of rivers, the principal of which are the Meuſe, the Seine, the Marne, the Aube, and the Aine. Its principal trade conſiſts in excellent wine, all ſorts of corn, linen cloth, woollen ſtuffs, cattle, and ſheep. It is alſo divided into the higher and lower, and Troys is the capital town. Its ſub-diviſions are Champagne Proper, and Rhemois, the Retelois, the Pertois, the Vallage, Baſigni, the Senonois, and the Brie Champenois.

Champagne Proper, is one of the eight parts of Champagne, which comprehends the towns of Troys, Chalons, St Menehold, Eperney, and Vertus.

CHAMPAIN, or *Point Champain*, in heraldry, a mark of diſhonour in the coat of arms of him who kills a priſoner of war after he has cried quarter.

CHAMPERTRY, in law, a ſpecies of MAINTENANCE, and puniſhed in the ſame manner; being a bargain with the plaintiff or defendant *campum partire*, "to divide the land," or other matter ſued for between them, if they prevail at law; whereupon the champertror is to carry on the party's ſuit at his own expence. Thus *Champart*, in the French law, ſignifies a ſimilar diviſion of profits, being a part of the crop annually due to the landlord by bargain or cuſtom. In our ſenſe of the word, it ſignifies the purchaſing of a ſuit, or right of ſuing; a practice ſo much abhorred by our law, that it is one main reaſon why a *choſe* in action, or thing of which one hath the right but not the poſſeſſion, is not aſſignable in common law; becauſe no man ſhould purchaſe any pretence to ſue in another's right. Theſe peſts of civil ſociety, that are perpetually endeavouring to diſturb the repoſe of their neighbours, and officiouſly interfering in other mens quarrels, even at the hazard of their own fortunes, were ſeverely animadverted on by the Roman law; and were puniſhed by the forfeiture of a third part of their goods and perpetual infamy. Hitherto alſo muſt be referred the proviſion of the ſtatue 32 Henry VIII. c. 9. that no one ſhall ſell or purchaſe any pretended right or title to land, unleſs the vender hath received the profits thereof for one whole year before ſuch grant, or hath been in actual poſſeſſion of the land, or of the reverſion or remainder; on pain that both purchaſer and vender ſhall each forfeit the value of ſuch land to the king and the proſecutor.

CHAMPION, a perſon who undertakes a combat in the place or quarrel of another; and ſometimes the word is uſed for him who fights in his own cauſe.

It appears that champions, in the juſt ſenſe of the word, were perſons who fought inſtead of thoſe that, by cuſtom, were obliged to accept the duel, but had a juſt excuſe for diſpenſing with it, as being too old, infirm, or being eccleſiaſtics, and the like. Such cauſes as could not be decided by the courſe of common law, were often tried by ſingle combat; and he who had the good fortune to conquer, was always reputed to have juſtice on his ſide. See the article BATTEL.

Champion of the King, (campio regis), is an ancient officer, whoſe office is, at the coronation of Britiſh kings, when the king is at dinner, to ride armed *cap-a-pee*, into Weſtminſter-Hall, and by the proclamation of an herald make a challenge, "That if any man ſhall deny the king's title to the crown, he is there ready to defend it in ſingle combat, *&c.*" which being done, the king drinks to him, and ſends him a gilt cup with a cover full of wine, which the champion drinks, and hath the cup for his fee. This office, at the coronation of king Richard II. when Baldwin Freville exhibited his petition for it, was adjudged from him to his competitor Sir John Dymocke (both claiming from Marmion), and hath continued ever ſince in the family of the Dymockes; who hold the manor of Sinvelſby in Lincolnſhire, hereditary from the Marmions by grand ſerjeantry, *viz.* that the lord thereof ſhall be the king's champion as aforeſaid. Accordingly Sir Edward Dymocke performed this office at the coronation of king Charles II. a perſon of the name of Dymocke performed at the coronation of his preſent majeſty George the third.

CHAMPLAIN, (Samuel de) a celebrated French navigator, the founder of the colony of New France, or Canada. He built Quebec; and was the firſt governor of the colony in 1603. Died after 1649. See QUEBEC.

CHANANAEI, (anc. geog.) the name of the ancient inhabitants of Canaan in general, deſcendants of Canaan; but peculiarly appropriated to ſome one branch; though uncertain which branch or ſon of Canaan it was, or how it happened that they preferred the common gentilitious name to one more appropriated as deſcendants of one of the ſons of Canaan: unleſs from their courſe of life, as being in the mercantile way, the import of the name *Canaan*; and for which their ſituation was greatly adapted, they living on the ſea and about Jordan, and thus occupying the greater part of the Land of Promiſe.

CHANCE, a term we apply to events, to denote that they happen without any neceſſary or foreknown cauſe. See CAUSE.

Our aim is, to aſcribe thoſe things to *chance*, which are not neceſſarily produced as the natural effects of any proper cauſe: but our ignorance and precipitancy lead us to attribute effects to *chance*, which have a neceſſary and determinate cauſe.

When we ſay a thing happens *by chance*, we really mean no more than that its cauſe is unknown to us: not, as ſome vainly imagine, that *chance* itſelf can be the cauſe of any thing.

The caſe of the painter, who, unable to expreſs the foam at the mouth of a horſe he had painted, threw his ſponge in deſpair at the piece, and, *by chance*, did that which he could not before do by deſign, is an eminent inſtance of the force of *chance*: yet, it is obvious, all we here mean by *chance*, is, that the painter was not aware of the effect; or that he did not throw the ſponge with ſuch a view: not but that he actually did every thing neceſſary to produce the effect; inſomuch, that, conſidering the direction wherein he threw his ſponge, together with its form, ſpecific gravity, the colours wherewith it was ſmeared, and the diſtance of the hand from the piece, it was impoſſible, on the preſent ſyſtem of things, the effect ſhould not follow.

Chance is frequently perſonified, and erected into a chimerical being, whom we conceive as acting arbitrarily, and producing all the effects whoſe real cauſes do not appear to us: in which ſenſe the word coincides with the *τυχη*, *fortuna*, of the ancients.

CHANCE is alſo uſed for the manner of deciding things, the conduct or direction whereof is left at large, and not reducible to any determinate rules or meaſures; or where there is no ground for preference: as at cards, dice, lotteries, &c.

For the Laws of CHANCE, *or the proportion of Hazard in Gaming*, ſee GAME.

The ancient *ſortilege*, or *chance*, M. Placette obſerves, was inſtituted by God himſelf; and in the Old Teſtament we find ſeveral ſtanding laws and expreſs commands which preſcribed its uſe on certain occaſions: hence the Scripture ſays, "The *lot*, or *chance*, fell on Matthias," when it was in queſtion who ſhould fill Judas's place in the apoſtolate.

Hence alſo aroſe the *ſortes ſanctorum*; or method of determining things, among the ancient Chriſtians, by opening ſome of the ſacred books, and pitching on the firſt verſe they caſt their eye on, as a ſure prognoſtic of what was to befal them. The *ſortes Homericæ, Virgilianæ, Præneſtinæ*, &c. uſed by the heathens, were with the ſame view, and in the ſame manner. See SORTES.

St Auguſtin ſeems to approve of this method of determining things future, and owns that he had practiſed it himſelf; grounded on this ſuppoſition, that God preſides over *chance*; and on Prov. xvi. 33.

Many among the modern divines hold *chance* to be conducted in a particular manner by Providence; and eſteem it an extraordinary way which God uſes to declare his will, and a kind of immediate revelation.

CHANCE-Medley, in law, is where one is doing a lawful act, and a perſon is killed by chance thereby; for if the act be unlawful, it is felony. If a perſon caſt, not intending harm, a ſtone, which happens to hit one, whereof he dies; or ſhoots an arrow in an highway, and another that paſſeth by is killed therewith; or if a workman, in throwing down rubbiſh from a houſe after warning to take care, kills a perſon; or a ſchoolmaſter in correcting his ſcholar, a maſter his ſervant, or an officer in whipping a criminal in a reaſonable manner, happens to occaſion his death; it is chance-medley and miſadventure. But if a man throw ſtones in a highway where perſons uſually paſs; or ſhoot an arrow, &c. in a market-place among a great many people; or if a workman caſt down rubbiſh from a houſe in cities and towns where people are continually paſſing; or a ſchoolmaſter, &c. correct his ſervant or ſcholar, &c. exceeding the bounds of moderation; it is manſlaughter: and if with an improper inſtrument of correction, as with a ſword or iron bar, or by kicking, ſtamping, &c. in a cruel manner, it is murder. If a man whips his horſe in a ſtreet to make him gallop, and the horſe runs over a child and kills it, it is manſlaughter: but if another whips the horſe, it is manſlaughter in him, and chance-medley in the rider. And if two are fighting, and a third perſon coming to part them is killed by one of them without any evil intent, yet this is murder in him, and not manſlaughter by chance-medley or miſadventure. In chance-medley, the offender forfeits his goods; but hath a pardon of courſe.

CHANCEL, is properly that part of the choir of a church, between the altar or communion-table and the baluſtrade or rail that incloſes it, where the miniſter is placed at the celebration of the communion. The word comes from the Latin *cancellus*, which in the lower Latin is uſed in the ſame ſenſe, from *cancelli*, "lattices or croſs bars," wherewith the chancels were anciently encompaſſed, as they now are with rails. The right of a ſeat and a ſepulchre in the chancels is one of the privileges of founders.

CHANCELLOR, was at firſt only a chief notary or ſcribe under the emperors; and was called *cancellarius*, becauſe he ſat behind a lattice (in Latin *cancellus*) to avoid being crowded by the people: though ſome derive the word from *cancellare*, "to cancel" (See CHANCERY). This office was afterwards inveſted with ſeveral judicial powers, and a general ſuperintendency over the reſt of the officers of the prince. From the Roman empire it paſſed to the Roman church, ever emulous of imperial ſtate: and hence every biſhop has to this day his chancellor, the principal judge of his conſiſtory. And when the modern kingdoms of Europe were eſtabliſhed upon the ruins of the empire, almoſt every ſtate preſerved its chancellor with different juriſdictions and dignities, according to their different conſtitutions. But in all of them he ſeems to have had the ſuperviſion of all charters, letters, and ſuch other public inſtruments of the crown as were authenticated in the moſt ſolemn manner: and therefore, when ſeals came in uſe, he had always the cuſtody of the king's great ſeal.

Lord High CHANCELLOR *of Great Britain*, or *Lord Keeper of the Great Seal*, is the higheſt honour of the long robe, being created by the mere delivery of the king's great ſeal into his cuſtody; whereby he becomes, without writ or patent, an officer of the greateſt weight and power of any now ſubſiſting in that kingdom. He is a privy counſellor by his office; and, according to Lord Chancellor Elleſmere, prolocutor of the houſe of lords by preſcription. To him belongs the appointment of all the juſtices of the peace throughout the kingdom. Being in former times commonly an eccleſiaſtic (for none elſe were then capable of an office ſo converſant in writing), and preſiding over the royal chapel, he became keeper of the king's conſcience; viſitor, in right of the king, of all hoſpitals and colleges of the king's foundation; and patron of all the king's livings under the value of L. 20 *per annum* in the king's books. He is the general guardian of all infants, ideots, and lunatics; and has the general ſuperintendance of all charitable uſes in the kingdom. And all this over and above the vaſt extenſive juriſdiction which he exerciſes in his judicial capacity in the court of chancery. He takes precedence of every temporal lord except the royal family, and of all others except the archbiſhop of Canterbury. See CHANCERY.

CHANCELLOR, in Scotland, was the chief in matters of juſtice. In the laws of King Malcolm II. he is placed before all other officers; and from theſe it appears that he had the principal direction of the chancery, or Chancellary as it is called, which is his proper office. He had the cuſtody of the king's ſeal; and he was the king's moſt intimate counſellor, as appears by an old law cited by Sir James Balfour: "The chancellar ſall at al tymes aſſiſt the king, in giving him counſall mair ſecretly nor the reſt of the nobility, to qhuais ordinances all officiaris, als well of the realme as the kingis hous, ſould anſwer and obey. The chancellar ſall be ludgit neir unto the kingis grace, for keiping of his bodie, and the ſeill; and that he may be readie baith day and nicht at the kingis command." By having the cuſtody of the great ſeal, he had an opportunity of examining the king's grants and other deeds which were to paſs under it, and to cancel them if they appeared againſt law, and were obtained ſurreptitiouſly or by falſe ſuggeſtions.

King James VI. ordained the chancellor to have the firſt place and rank in the nation, *ratione officii*; by virtue whereof he preſided in the parliament, and in all courts of judicature. After the reſtoration of King Charles II. by a particular declaratory law, parliament firſt, the lord chancellor was declared, by virtue and right of his office, preſident in all the meetings of parliament, or other public judicatures of the kingdom. Although this act was made to declare the chancellor preſident of the exchequer as well as other courts, yet in 1663 the king declared the treaſurer to be preſident of that court.

The office of lord chancellor of Scotland was aboliſhed by the Union, their being no farther uſe for the judicial part of this office; and, to anſwer all the other parts of the chancellor's office, a lord keeper of the great ſeal was erected, with a ſalary of L. 3000 a-year.

CHANCELLOR *of a Cathedral*, an officer that hears leſſons and lectures read in the church, either by himſelf or his vicar; to correct and ſet right the reader when he reads amiſs; to inſpect ſchools; to hear cauſes; apply the ſeal; write and diſpatch the letters of the chapter; keep the books; take care that there be frequent preachings, both in the church and out of it, and aſſign the office of preaching to whom he pleaſes.

CHANCELLOR *of the Duchy of Lancaſter*, an officer appointed chiefly to determine controverſies between the king and his tenants of the duchy-land, and otherwiſe to direct all the king's affairs belonging to that court. See *DUCHY-Court*.

CHANCELLOR *of the Exchequer*, an officer who preſides in that court, and takes care of the intereſt of the crown. He is always in commiſſion with the lord-treaſurer, for the letting of crown-lands, &c. and has power, with others, to compound for forfeitures of lands upon penal ſtatutes. He has alſo great authority in managing the royal revenues, and in matters relating to the firſt-fruits.

CHANCELLOR *of the Order of the Garter, and other Military Orders*, is an officer who ſeals the commiſſions and mandates of the chapter and aſſembly of the knights, keeps the regiſter of their proceedings, and delivers acts thereof under the ſeal of their order.

CHANCELLOR *of an Univerſity*, is he who ſeals the diplomas, or letters of degrees, proviſion, &c. given in the univerſity.

The chancellor of Oxford is uſually one of the prime nobility, choſen by the ſtudents themſelves in convocation. He is their chief magiſtrate; his office is, *durante vita*, to govern the univerſity, preſerve and defend its rights and privileges, convoke aſſemblies, and do juſtice among the members under his juriſdiction.

Under the chancellor is the vice-chancellor, who is choſen annually, being nominated by the chancellor, and elected by the univerſity in convocation. He is always the head of ſome college, and in holy orders. His proper office is to execute the chancellor's power, to govern the univerſity according to her ſtatutes, to ſee that officers and ſtudents do their duty, that courts be duly called, &c. When he enters upon his office, he chooſes four pro-vice-chancellors out of the heads of the colleges, to execute his power in his abſence.

The chancellor of Cambridge is alſo uſually one of the prime nobility, and in moſt reſpects the ſame as that in Oxford; only he does not hold his office *durante vita*, but may be elected every three years. Under the chancellor there is a commiſſary, who holds a court of record for all privileged perſons and ſcholars under the degree of maſter of arts, where all cauſes are tried and determined by the civil and ſtatute law, and by the cuſtom of the univerſity.

The vice-chancellor of Cambridge is choſen annually by the ſenate, out of two perſons nominated by the heads of the ſeveral colleges and halls.

CHANCELLOR's Court. See *UNIVERSITY Courts*.

CHANCERON, in natural hiſtory, a name given by the French writers to the ſmall caterpillar that eats the corn, and does vaſt miſchief in their granaries. See the article *CORN-Butterfly*.

CHANCERY, the higheſt court of juſtice in Britain next to the parliament, and of very ancient inſtitution. It has its name chancery (*cancellaria*) from the judge who preſides here, the lord chancellor, or *cancellarius*; who, according to Sir Edward Coke, is ſo termed *a cancellando*, from cancelling the king's letters patent when granted contrary to law, which is the higheſt point of his juriſdiction. In chancery there are two diſtinct tribunals: the one ordinary, being a court of common law; the other extraordinary, being a court of equity.

Blackſt. Comment.

1. The *ordinary* legal court holds pleas of recognizances acknowledged in the chancery, writs of *ſcire facias*, for repeal of letters patent, writs of partition, &c. and alſo of all perſonal actions by or againſt any officer of the court. Sometimes a *ſuperſedeas*, or writ of privilege, hath been here granted to diſcharge a perſon out of priſon; one from hence may have a *habeas corpus* prohibition, &c. in the vacation: and here a *ſubpœna* may be had to force witneſſes to appear in other courts, when they have no power to call them. But, in proſecuting cauſes, if the parties deſcend to iſſue, this court cannot try it by jury; but the lord chancellor delivers the record into the king's bench to be tried there; and after trial had, it is to be remanded into the chancery, and there judgment given: tho' if there be a demurrer in law, it ſhall be argued in this court.

In this court is alſo kept the *officina juſtitiæ*; out of which all original writs that paſs under the great ſeal, all commiſſions of charitable uſes, ſewers, bankruptcy, idiocy,

idiocy, lunacy, and the like, do iſſue; and for which it is always open to the ſubject, who may there at any time demand and have, *ex debito juſtitiæ*, any writ that his occaſions may call for. Theſe writs, relating to the buſineſs of the ſubject, and the returns of them, were, according to the ſimplicity of ancient times, originally kept in a hamper, *in hanaperio*; and the others (relating to ſuch matters wherein the crown is mediately or immediately concerned) where preſerved in a little ſack or bag, *in parva baga*: and hence hath ariſen the diſtinction of the *hanaper* office, and the *petty-bag* office, which both belong to the common law-court in chancery.

2. The *extraordinary* court, or court of equity, proceeds by the rules of equity and conſcience; and moderates the rigour of the common law, conſidering the *intention* rather than the *words* of the law. It gives relief for and againſt infants notwithſtanding their minority, and for and againſt married women notwithſtanding their coverture. All frauds and deceits for which there is no redreſs at common law; all breaches of truſt and confidence; and accidents, as to relieve obligors, mortgagers, &c. againſt penalties and forfeitures, where the intent was to pay the debt, are here remedied: for in chancery, a forfeiture, &c. ſhall not bind, where a thing may be done after or compenſation made for it. Alſo this court will give relief againſt the extremity of unreaſonable engagements entered into without conſideration; oblige creditors that are unreaſonable to compound with an unfortunate debtor; and make executors, &c. give ſecurity and pay intereſt for money that is to lie long in their hands. This court may confirm title to lands, though one hath loſt his writings; and render conveyances, defective through miſtake, &c. good and perfect. In chancery, copy-holders may be relieved againſt the ill uſage of their lords; incloſures of lands that are common be decreed; and this court may decree money or lands given to charitable uſes, oblige men to account with each other, &c. But in all caſes where the plaintiff can have his remedy at law, he ought not to be relieved in chancery; and a thing which may be tried by a jury is not triable in this court.

The proceedings in chancery are, firſt to file the bill of complaint, ſigned by ſome counſel, ſetting forth the fraud or injury done, or wrong ſuſtained, and praying relief: after the bill is filed, proceſs of *ſubpœna* iſſues to compel the defendant to appear; and when the defendant appears, he puts in his anſwer to the bill of complaint, if there be no cauſe for the plea to the juriſdiction of the court, in diſability of the perſon, or in bar, &c. Then the plaintiff brings his replication, unleſs he files exceptions againſt the anſwer as inſufficient, referring it to a maſter to report whether it be ſufficient or not; to which report exceptions may alſo be made. The anſwer, replication, rejoinder, &c. being ſettled, and the parties come to iſſue, witneſſes are to be examined upon interrogatories, either in court, or by commiſſion in the country, wherein the parties uſually join; and when the plaintiff and defendant have examined their witneſſes, publication is to be made of the depoſitions, and the cauſe is to be ſet down for hearing; after which follows the decree. But it is now uſual to appeal to the houſe of lords; which appeals are to be ſigned by two noted counſel, and exhibited by way of petition; the petition or appeal is lodged with the clerk of the houſe of lords, and read in the houſe, whereon the appellee is ordered to put in his anſwer, and a day fixed for hearing the cauſe; and after counſel heard, and evidence given on both ſides, the lords will affirm or reverſe the decree of the chancery, and finally determine the cauſe by a majority of votes, &c.

CHANDELIER, in fortification, a kind of moveable parapet, conſiſting of a wooden frame, made of two upright ſtakes, about ſix feet high, with croſs planks between them; ſerving to ſupport faſcines to cover the pioneers.

CHANDERNAGORE, a French ſettlement in the kingdom of Bengal in the Eaſt-Indies. It lies on the river Ganges, two leagues and a half above Calcutta. The diſtrict is hardly a league in circumference, and has the diſadvantage of being ſomewhat expoſed on the weſtern ſide; but its habour is excellent, and the air is as pure as it can be on the banks of the Ganges. Whenever any building is undertaken that requires ſtrength, it muſt here, as well as in all other parts of Bengal, be built upon piles; it being impoſſible to dig three or four feet without coming at water.

CHANDLER, (Mary) diſtinguiſhed by her talent for poetry, was the daughter of a diſſenting miniſter at Bath; and was born at Malmſbury in Wiltſhire, in 1687. She was bred a milliner; but from her childhood had a turn for poetry, and in her riper years applied herſelf to the ſtudy of the poets. Her poems, for which ſhe was complimented by Mr Pope, breathe the ſpirit of piety and philoſophy. She had the misfortune to be deformed, which determined her to live ſingle; though ſhe had great ſweetneſs of countenance, and was ſolicited to marry. She died in 1745, aged 58.

CHANDLER, (Dr Samuel) a learned and reſpectable diſſenting miniſter, deſcended from anceſtors heartily engaged in the cauſe of religious liberty, and ſufferers for the ſake of conſcience and nonconformity; was born at Hungerford in Berks, where his father was a miniſter of conſiderable worth and abilities. Being by his literary turn deſtined to the miniſtry, he was at firſt placed at an academy at Bridgewater, and from thence removed to Glouceſter under Mr Samuel Jones. Among the pupils of Mr Jones were Mr Joſeph Butler, afterwards biſhop of Durham, and Mr Thomas Secker, afterwards archbiſhop of Canterbury. With theſe eminent perſons he contracted a friendſhip that continued to the end of their lives, notwithſtanding the different views by which their conduct was afterwards directed, and the different ſituations in which they were placed.

Mr Chandler having finiſhed his academical ſtudies, began to preach about July 1714; and being ſoon diſtinguiſhed by his talents in the pulpit, he was choſen in 1716 miniſter of the Preſbyterian congregation at Peckham near London, in which ſtation he continued ſome years. Here he entered in the matrimonial ſtate, and began to have an increaſing family, when, by the fatal South-ſea ſcheme of 1720, he unfortunately loſt the whole fortune which he had received with his wife. His circumſtances being thereby embarraſſed, and his income as a miniſter being inadequate to his expences, he engaged in the trade of a bookſeller, and kept a ſhop in the Poultry, London, for about two or three

Chandler.

years, ſtill continuing to diſcharge the duties of the paſtoral office. He alſo officiated as joint preacher with the learned Dr Lardner of a winter weekly evening lecture at the meeting-houſe in the Old Jewry, London: in which meeting he was eſtabliſhed aſſiſtant preacher about the year 1725, and then as the paſtor. Here he miniſtered to the religious improvement of a very reſpectable congregation for 40 years with the greateſt applauſe; and with what diligence and application he improved the vacancies of time from his paſtoral duties, for improving himſelf and benefiting the world, will appear from his many writings on a variety of important ſubjects. While he was thus laudably employed, not only the univerſities of Edinburgh and Aberdeen gave him, without any application, teſtimonies of their eſteem in diplomas, conferring on him the degree of D. D. but he alſo received offers of preferment from ſome of the governors of the eſtabliſhed church, which he nobly declined. He had likewiſe the honour of being afterwards elected F. R. and A. SS.

On the death of George II. in 1760, Dr Chandler publiſhed a ſermon on that event, in which he compared that prince to King David. This gave riſe to a pamphlet, which was printed in the year 1761, intitled "The Hiſtory of the Man after God's own Heart;" wherein the author ventured to exhibit King David as an example of perfidy, luſt, and cruelty, fit only to be ranked with a Nero or a Caligula; and complained of the inſult that had been offered to the memory of the late Britiſh monarch by Dr Chandler's parallel between him and the king of Iſrael. This attack occaſioned Dr Chandler to publiſh in the following year "A Review of the Hiſtory of the Man after God's own Heart; in which the Falſehoods and Miſrepreſentations of the Hiſtorian are expoſed and corrected." He alſo prepared for the preſs a more elaborate work, which was afterwards publiſhed in two volumes 8vo, under the following title: "A Critical Hiſtory of the Life of David: in which the principal Events are ranged in Order of time; the chief Objections of Mr Bayle and others againſt the Character of this Prince, and the Scripture Account of him, and the Occurrences of his Reign, are examined and refuted; and the Pſalms which refer to him explained." As this was the laſt, it was likewiſe one of the beſt, of Dr Chandler's productions. The greateſt part of this work was printed off at the time of our author's death, which happened May 8th 1766, aged 73. During the laſt year of his life, he was viſited with frequent returns of a very painful diſorder, which he endured with great reſignation and Chriſtian fortitude. He was interred in the burying-ground at Bunhill-fields on the 16th of the month; and his funeral was very honourably attended by miniſters and other gentlemen. He expreſsly deſired, by his laſt will, that no delineation of his character might be given in his funeral ſermon, which was preached by Dr Amory. He had ſeveral children; two ſons and a daughter who died before him, and three daughters who ſurvived him; two of whom are yet living, and both married, one of them to the Rev. Dr Harwood.

Dr Chandler was a man of very extenſive learning and eminent abilities; his apprehenſion was quick and his judgment penetrating; he had a warm and vigorous imagination; he was a very inſtructive and animated preacher; and his talents in the pulpit and as a writer procured him very great and general eſteem, not only among the diſſenters, but among large numbers of the eſtabliſhed church. He was principally inſtrumental in the eſtabliſhment of the fund for relieving the widows and orphans of poor Proteſtant diſſenting miniſters: the plan of it was firſt formed by him; and it was by his intereſt and application to his friends that many of the ſubſcriptions for its ſupport were procured.

Chandler, Chang-tong.

In 1768, four volumes of our author's ſermons were publiſhed by Dr Amory, according to his own directions in his laſt will; to which was prefixed a neat engraving of him, from an excellent portrait by Mr Chamberlin. He alſo expreſſed a deſire to have ſome of his principal pieces reprinted in four volumes 8vo: propoſals were accordingly publiſhed for that purpoſe, but did not meet with ſufficient encouragement. But in 1777, another work of our author was publiſhed in one volume 4to, under the following title: "A Paraphraſe and Notes on the Epiſtles of St Paul to the Galatians and Epheſians, with doctrinal and practical Obſervations: together with a critical and practical Commentary on the two Epiſtles of St Paul to the Theſſalonians." Dr Chandler alſo left, in his interleaved Bible, a large number of critical notes, chiefly in Latin, which are now the property of Dr Hippis, Mr Farmer, Dr Price, and Dr Savage, and which have been intended to be publiſhed; but the deſign has not yet been executed. A complete liſt of Dr Chandler's works is given in the Biographia Britannica, vol. III. p. 435.

CHANG-TONG, a province of China, bounded on the eaſt by Petcheli and part of Honan, on the ſouth by Kiang-nan, on the eaſt by the ſea, and on the north by the ſea and part of Petcheli. The country is well watered by lakes, ſtreams, and rivers; but is nevertheleſs liable to ſuffer from drought, as rain falls here but ſeldom. The locuſts alſo ſometimes make great devaſtation. However, it abounds greatly in game; and there is perhaps no country where quails, partridges, and pheaſants, are ſold cheaper, the inhabitants of this province being reckoned the keeneſt ſportſmen in the empire. The province is greatly enriched by the river Yun, called the *Grand Imperial Canal*, through which all the barks bound to Pekin muſt paſs in their way thither. The duties on this canal alone amount to more than L. 450,000 annually. The canal itſelf is greatly admired by European travellers on account of its ſtrong and long dikes, the banks decorated with cut ſtone, the ingenious mechaniſm of its locks, and the great number of natural obſtacles which have been overcome in the execution of the work.—The province produces ſilk of the ordinary kind; and, beſides this, another from a ſort of inſect reſembling our caterpillar. It is coarſer than the ordinary ſilk, but much ſtronger and more durable; ſo that the ſtuffs made from it have a very extenſive ſale throughout the empire.

Chang-tong is remarkable for being the birth-place of the celebrated philoſopher and lawgiver Confucius. His native city is called *Kio-feou*, where there are ſeveral monuments erected in honour of this great man. The province is divided into ſix diſtricts, which contain ſix cities of the firſt claſs, and 114 of the ſecond and third. Along the coaſt, alſo, are 15 or 16 villages of cofiderable importance on account of their commerce; there are likewiſe a number of ſmall iſlands, moſt of which have harbours very convenient for the Chineſe junks which paſs from thence to Corea or Lea-tong. The moſt remarkable cities are, 1. Tſi-nan-fou, the capital, which ſtands ſouth of the river Tſingho or Tſi. It is large and populous; but chiefly celebrated for having been the reſidence of a long ſeries of kings, whoſe tombs, riſing on the neighbouring mountains, afford a beautiful proſpect. 2. Yen-tcheu-fou, the ſecond city of the province, ſituated between two rivers, and in a mild and temperate climate. Great quantities of gold are ſaid to have been formerly collected in its neighbourhood. 3. Lin-tcin-tcheu, ſituated on the great canal, is much frequented by ſhips, and may be called a general magazine for every kind of merchandiſe. Here is an octagonal tower, divided into eight ſtories, the walls of which are covered on the outſide with porcelain loaded with various figures neatly executed, and encruſted on the inſide with variouſly coloured marble. A ſtaircaſe, conſtructed in the wall, conducts to all the ſtories, from which there are paſſages that lead into magnificent galleries ornamented with gilt balluſtrades. All the cornices and projections of the tower are furniſhed with little bells; which, ſays Mr Groſier, when agitated by the wind, form a very agreeable harmony. In the higheſt ſtory is an idol of gilt copper, to which the tower is dedicated. In the neighbourhood are ſome other temples, the architecture of which is exceedingly beautiful.

CHANGER, in England, an officer belonging to the king's mint, who changes money for gold or ſilver bullion. See MINT.

Money-CHANGER, is a banker who deals in the exchange, receipt, and payment, of moneys. See BANKER.

CHANGES, in arithmetic, &c. the permutations or variations of any number of quantities; with regard to their poſition, order, &c. See COMBINATION.

To find all the poſſible CHANGES *of any Number of Quantities, or how oft their Order may be varied.*] Suppoſe two quantities *a* and *b*. Since they may be either wrote *a b* or *b a*, it is evident their *changes* are $2=2.1$. Suppoſe three quantities *a b c*: their *changes* will be as in the margin; as is evident by combining *c* firſt with *a b*, then with *b a*; and hence the number of *changes* ariſes $3.\ 2.\ 1=6$. If the quantities be 4, each may be combined four ways with each order of the other three; whence the number of changes ariſes $6.\ 4=4.\ 3.\ 2.\ 1.=24$. Whereof, if the number of quantities be ſuppoſed n, the number of *changes* will be $n.n-1.n-2.n-3.n-4.$&c. If the ſame quantity occur twice, the *changes* of two will be found *b b*; of three, *b a b*, *a b b*, *b b c*; of four, *c b a b*, *b c a b*, *b a b c*. And thus the number of *changes* in the firſt caſe will be $1=(2.\ 1):2.\ 1$; in the ſecond, $3=(3.\ 2.\ 1):2.\ 1$: in the third, $12=(4.\ 3.\ 2.\ 1):2.\ 1$.

c a b
a c b
a b c
——
c b a
b c a
b a c

If a fifth letter be added, in each ſeries of four quantities, it will beget five *changes*, whence the number of all the *changes* will be $60=(5.\ 4.\ 3.\ 2.)\ 1,:2.\ 1.$ Hence if the number of quantities be n, the number of *changes* will be $(n.n-1.n-2.n-3.n-4.\ \text{\&c.}):2.\ 1.$ From theſe ſpecial formulæ may be collected a general one, viz. if n be the number of quantities, and m the number which ſhows how oft the ſame quantity occurs; we ſhall have $(n.n-1.n-2.n-3.n-4.n-5.n-6.n-7.n-8.n-9.\ \text{\&c.}:m-1.m-2.m-3.m-4.\ \text{\&c.})$ the ſeries being to be continued, till the continual ſubtraction of unity from n and m leave 0. After the ſame manner we may proceed further, till putting n for the number of quantities, and l, m, r, &c. for the number that ſhows how oft any of them is repeated, we arrive at an univerſal form. $(n.n-1.n-2.n-3.n-4.n-5.n-6.n-7.n-8.\ \text{\&c.}):(l.l-1.l-2.l-3.l-4.l-5.\ \text{\&c.}\ m.m-1.m-2.m-3.\ \text{\&c.}\ r.r-1.r-2.r-3.r-4.r-5.\ \text{\&c.}$

Suppoſe, for inſtance, $n=6$, $l=3$, $r=0$. The number of *changes* will be $(6.\ 5.\ 4.\ 3.\ 2.\ 1.):(3.\ 2.\ 1.\ 3.\ 2.\ 1.)=(6.\ 5.\ 4.):(3.\ 2=2.\ 5.\ 2=20)$.

Hence, ſuppoſe thirteen perſons at a table, if it be required how oft they may *change* places; we ſhall find the number $13.\ 12.\ 11.\ 10.\ 9.\ 8.\ 7.\ 6.\ 5.\ 4.\ 3.\ 2.\ 1.=6227020800$.

In this manner may all the poſſible anagrams of any word be found in all languages, and that without any ſtudy: ſuppoſe *v. g.* it were required to find the anagrams of the word *amor*, the number of *changes* will be

a
——
m a
a m
——
o m a
m o a
m a o

o a m
a o m
a m o
——
r o m a
o r m a
o m r a
o m a r

r m o a
m r o a
m o r a
m o a r
——
r m a o
m r a o

m a r o
m a o r
——
r a o m
o r a m
o a r m
o a m r
——
r a o m

a r o m
a o r m
a o m r
——
r a m o
a r m o
a m r o
a m o r

The anagrams therefore of the word *amor*, in the Latin tongue, are *roma*, *mora*, *maro*, *ramo*, *armo*. See ANAGRAM.

Whether this new method of anagramatizing be like to prove of much ſervice to that art, is left to the poets.

CHANNA, in zoology, the name of a fiſh caught in great plenty in the Mediterranean, and brought to market in Italy and elſewhere, among the ſea-perch, which it ſo nearly reſembles, that it would not be diſtinguiſhable from it, but that the ſea-perch is bigger, and has only broad tranſverſe lines on its back, whereas the channa has them both tranſverſe and longitudinal. It has a very wide mouth, and its lower jaw is longer than its upper; ſo that its mouth naturally falls open. Its eyes are ſmall, and its teeth very ſharp: its back is of a blackiſh red: it has ſeveral longitudinal lines of a reddiſh hue, and its tail is marked with reddiſh ſpots. There is an obſervation, that in all the fiſh of this kind which have been examined by naturaliſts, there have been found none but females. This is as old as the days of Ariſtotle. Whether this be true in fact, would require many obſervations. If it ſhould prove ſo, the whole ſeems to end in this, that the channa is no diſtinct ſpecies, but only the female of ſome other fiſh. There is another fiſh not unlike this, called *cannadella*, or rather *channadella*, which at Marſeilles is known by the name of *charina*.

CHANNEL, in geography, an arm of the ſea, or a narrow ſea between two continents, or between a continent and an iſland. Such are the Britiſh channel, St George's channel, the channel of Conſtantinople, &c.

Channel of a Ship. See *Chain-Wales.*

CHAN-SI, a province of China, and one of the ſmalleſt in the empire, is bounded on the eaſt by Pet-cheli, on the ſouth by Honan, on the weſt by Chen-ſi, and on the north by the great wall. The climate is healthful and agreeable, and the ſoil generally fertile, though the country is full of mountains. Some of the laſt are rough, wild, and uninhabited; but others are cultivated with the greateſt care from top to bottom, and cut into terraces, forming a very agreeable proſpect; while ſome have on their tops vaſt plains no leſs fertile than the richeſt low-lands. Theſe mountains abound with coal, which the inhabitants pound and make into cakes with water; a kind of fuel which, though not very inflammable, affords a ſtrong and laſting fuel when once kindled. It is principally uſed for heating their ſtoves, which are conſtructed with brick as in Germany; but the inhabitants of this province give them the form of ſmall beds, and ſleep upon them. The beſt grapes to be met with in this part of Aſia grow in the province of Chan-ſi; ſo that good wine might be made, but the people chooſe rather to dry and ſell them to the neighbouring provinces. The country abounds with muſk, prophyry, marble, lapis lazuli, and jaſper of various colours; and iron mines as well as ſalt-pits and cryſtal are very common. Here are five cities of the firſt claſs, and eighty-five of the ſecond and third: the moſt remarkable are, 1. Tai-youen-fou the capital, an ancient city about three leagues in circumference, but much decayed in conſequence of being no longer the reſidence of the princes of the blood as it was formerly. Nothing now remains of the palaces of thoſe prince's but a few ruins: but their tombs are ſtill to be ſeen on a neighbouring mountain. The burying-place is magnificently ornamented; and all the tombs are of marble or cut ſtone, having near them triumphal arches, ſtatues of heroes, figures of lions and different animals, eſpecially horſes, and which are diſpoſed in very elegant order. An awful and melancholy gloom is preſerved around theſe tombs by groves of aged cypreſſes, which have never felt the ſtroke of an axe, placed chequer-wiſe. The principal articles of trade here are, hard-ware, ſtuffs of different kinds, particularly carpets in imitation of thoſe of Turkey. 2. Ngan-y is ſituated near a lake as ſalt as the ocean, from which a great quantity of ſalt is extracted. 3. Fuen-tcheou-fou, an ancient and commercial city, built on the banks of the river Fuenho: it has baths and ſprings almoſt boiling hot, which by drawing hither a great number of ſtrangers, add greatly to its opulence. 4. Tai-tong-fou; ſituated near the wall, is a place of great ſtrength, and important by reaſon of its ſituation, as being the only one expoſed to the incurſions of the Tartars. Its territories abound with lapis lazuli, medicinal herbs, and a particular kind of jaſper called *yieche*, which is as white and beautiful as agate; marble and prophyry are alſo common; and a great revenue is produced from the ſkins which are dreſſed here.

CHANT, *(cantus)*, is uſed for the vocal muſic of churches.

In church hiſtory we meet with divers kinds of *chant* or *ſong*. The firſt is the *Ambroſian*, eſtabliſhed by St Ambroſe. The ſecond, the *Gregorian chant*, introduced by Pope Gregory the great, who eſtabliſhed ſchools of chantors, and corrected the church-ſong. This is ſtill retained in the church under the name of *plain ſong*: at firſt it was called the *Roman ſong*. The *plain* or *Gregorian chant*, is where the choir and people ſing in uniſon, or all together in the ſame manner.

CHANTILLY, a village in France, about ſeven leagues from Paris, where there is a magnificent palace and fine foreſt belonging to the duke of Bourbon.

CHANTOR, a ſinger of a choir in a cathedral. The words is almoſt grown obſolete, *choriſter* or *ſinging-man* being commonly uſed inſtead of it. All great chaptors have chantors and chaplains to aſſiſt the canons, and officiate in their abſence.

Chantor is uſed by way excellence for the precentor maſter of the choir, which is one of the firſt dignities of the chapter. At St David's in Wales, where there is no dean, he is next in dignity to the biſhop. The ancients called the chantor *primicerius cantorum*. To him belonged the direction of the deacons and other inferior officers.

Chantors, in the temple of Jeruſalem, were a number of Levites employed in ſinging the praiſes of God, and playing upon inſtruments before his altar. They had no habits diſtinct from the reſt of the people; yet in the ceremony of removing the ark to Solomon's temple, the chantors appeared dreſſed in tunics of byſſus or fine linen. 2 Chron. v. 12.

CHANTRY, or Chauntry, was anciently a church or chapel endowed with lands, or other yearly revenue, for the maintenance of one or more prieſts, daily ſaying or ſinging maſs for the ſouls of the donors, and ſuch others as they appointed. Hence *chauntry-rents* are rents paid to the crown by the tenants or purchaſers of *chauntry lands*.

CHAOLOGY the hiſtory or deſcription of the choas. See Chaos.

Orpheus, in his chaology, ſets forth the different alterations, ſecretions, and divers forms which matter went through till it became inhabitable, which amounts to the ſame with what we otherwiſe call *coſmogony*. Dr Burnet, in his theory of the earth repreſents the chaos as it was at firſt, entire, undivided, and univerſally rude and deformed; or the *tohu bohu*: then ſhews how it came to be divided into its reſpective regions; how the homogeneous matter gathered itſelf apart from all of a contrary principle; and laſtly, how it hardened and became a ſolid habitable globe. See Earth.

CHAOS, that confuſion in which matter lay when newly produced out of nothing at the beginning of the world, before God, by his almighty word, had put it into the order and condition wherein it was after the ſix days creation. See Earth.

Chaos is repreſented by the ancients as the firſt principle, ovum, or ſeed of nature and the world. All the ſophiſts, ſages, naturaliſts, philoſophers, theologues, and poets, held that chaos was the eldeſt and firſt principle, το αρχαιον χαος. The Barbarians, Phœnicians, Egyptians, Perſians, &c. all refer the origin of the world to a rude, mixed, confuſed maſs of matter. The Greeks, Orpheus, Heſiod, Menander, Ariſtophanes, Euripides, and the writers of the Cyclic Poems, all ſpeak of the firſt chaos: the Ionic and Platonic Philoſophers build the world out of it. The Stoics hold, that as the world was firſt made of a chaos, it ſhall at laſt be reduced to a chaos; and that its periods and revolutions in the mean time are only tranſitions from one chaos to another. Laſtly, the Latins as Ennius, Varro, Ovid, Lucretius, Statius, &c. are all of the ſame opinion. Nor is there any ſect or nation whatever, that does not derive their *διακοσμησις*, *the ſtructure of the world*, from chaos.

The opinion firſt aroſe among the Barbarians, whence it ſpread to the Greeks, and from the Greeks to the Romans and other nations. Dr Burnet obſerves, that beſides Ariſtotle and a few other pſeudo-Pythagoreans, nobody ever aſſerted that our world was always from eternity of the ſame nature, form and ſtructure, as at preſent; but that it had been the ſtanding opinion of the wiſe men of all ages, that what we now call the *terreſtrial globe*, was originally an unformed, indigeſted maſs of heterogeneous matter, called *chaos*; and no more than the rudiments and materials of the preſent world.

It does not appear who firſt broached the notion of a chaos. Moſes, the eldeſt of all writers, drives the origin of this world from a confuſion of matter, dark, void, deep, without form, which he calls *tohu bohu*; which is preciſely the chaos of the Greek and Barbarian philoſophers. Moſes goes no further than the chaos; nor tells us whence it took its origin, or whence its confuſed ſtate; and where Moſes ſtops, there, preciſely, do all the reſt. Dr Burnet endeavours to ſhow, that as the ancient philoſophers, &c. who wrote of the coſmogony, acknowledged a chaos for the principle of their world; ſo the divines, or writers of the theogony, derive the origin or generation of their fabled gods from the ſame principle.

Mr Whiſton ſuppoſes the ancient chaos, the origin of our earth, to have been the atmoſphere of a comet; which, though new, yet, all things conſidered, is not the moſt improbable aſſertion. He endeavours to make it out by many arguments, drawn from the agreement which appears to be between them. So that, according to him, every planet is a comet, formed into a regular and laſting conſtitution, and placed at a proper diſtance from the ſun, revolving in a nearly circular orbit: and a comet is a planet either beginning to be deſtroyed or re-made; that is, a chaos or planet unformed or in its primæval ſtate, and placed as yet in an orbit very eccentrical.

Chaos, in the phraſe of Paracelſus, imports the air. It has alſo ſome other ſignifications amongſt the alchemiſts.

Chaos, in zoology, a genus of inſects belonging to the order of vermes zoophyta. The body has no ſhell or covering, and is capable of reviving after being dead to appearance for a long time: it has no joints or external organs of ſenſation. There are five ſpecies, moſtly obtained by infuſion of different vegetables in water, and only diſcoverable by the microſcope. See Animalcule.

CHAPEAU, in heraldry, an ancient cap of dignity worn by dukes, being ſcarlet-coloured velvet on the outſide, and lined with a fur. It is frequently borne above an helmet inſtead of a wreath, under gentlemens creſts.

CHAPEL, a place of divine worſhip, ſo called. The word is derived from the Latin *capella*. In former times when the kings of France were engaged in war they always carried St Martin's hat into the field, which was kept in a tent as a precious relic: from whence the place was called *capella*; and the prieſt, who had the cuſtody of the tent, *capellani*. Afterwards the word *capella* became applied to private oratories.

In Britain there are ſeveral ſorts of chapels. 1. Parochial chapels: theſe differ from pariſh-churches only in name; they are generally ſmall, and the inhabitants within the diſtrict few. If there be a preſentation *ad eccleſiam*, inſtead of *capellam*, and an admiſſion and inſtitution upon it, it is no longer a chapel, but a church. 2. Chapels, which adjoin to, and are part of the church; ſuch were formerly built by honourable perſons, as burying-places for themſelves and their families. 3. Chapels of eaſe; theſe are uſually built in very large pariſhes, where all the people cannot conveniently repair to the mother-church. 4. Free chapels; ſuch as were founded by kings of England. They are free from all epiſcopal juriſdiction, and only to be viſited by the founder and his ſucceſſors; which is done by the lord chancellor; yet the king may licenſe any ſubject to build and endow a chapel, and by letters patent exempt it from the viſitation of the ordinary. 5. Chapels in the univerſities, belonging to particular colleges. 6. Domeſtic chapels, built by noblemen or gentlemen for the private ſervice of God in their families. See Chaplain.

Chapel is alſo a name given to a printer's workhouſe; becauſe, according to ſome authors, printing was firſt actually performed in chapels or churches, or, according to others, becauſe Caxton, an early printer, exerciſed the art in one of the chapels in Weſtminſter Abby. In this ſenſe they ſay, *the orders* or *laws of the chapel*, *the ſecrets of the chapel*, &c.

Knights of the Chapel, called alſo *Poor knights of Windſor*, were inſtitued by Henry VIII. in his teſtament. Their number was at firſt thirteen, but has been ſince augmented to twenty-ſix. They aſſiſt in the funeral ſervices of the kings of England: they are ſubject to the office of the canons of Windſor, and live on penſions aſſigned them by the order of the garter. They bear a blue or red cloak, with the arms of St George on the left ſhoulder.

CHAPELAIN, (James) an eminent French poet born at Paris in 1595, and often mentioned in the works of Balzac, Menage, and other learned men. He wrote ſeveral works, and at length diſtinguiſhed himſelf by a heroic poem called *La Pucelle, ou France Delivrée*, which employed him ſeveral years; and which, raiſing the expectation of the public, was as much decried by ſome as extolled by others. He was one of the king's counſellors; and died in 1674, very rich, but was very covetous and ſordid.

CHAPELET, in the manege, a couple of ſtirrup-leathers, mounted each of them with a ſtirrup, and joined at top in a ſort of leather buckle, called the *head of the chapelets*, by which they are made faſt to the pummel of the ſaddle, after being adjuſted to the rider's length and bore. They are uſed both to avoid the trouble of taking up or letting down the ſtirrups every time that the gentleman mounts on a different horſe and

and ſaddle, and to ſupply the place of the academy ſaddles, which have no ſtirrups to them.

CHAPELLE, (Claudius Emanuel Luillier) the natural ſon of Francis Lullier, took the name of *Chapelle* from a village between Paris and St Denys, where he was born. He diſtinguiſhed himſelf by writing ſmall pieces of poetry, in which he diſcovered great delicacy, an eaſy turn, and an admirable facility of expreſſion. He was the friend of Gaſſendi and Moliere; and died in 1686.

CHAPERON, **CHAPERONNE**, or **CHAPEROON**, properly ſignifies a ſort of hood or covering of the head anciently worn both by men and women, the nobles and the populace, and afterwards appropriated to the doctors, and licentiates in colleges, &c. Hence the name paſſed to certain little ſhields, and other funeral devices, placed on the foreheads of the horſes that drew the hearſes in pompous funerals, and which are ſtill called *chaperoons*, or *ſhafferoons*; becauſe ſuch devices were originally faſtened on the *chaperonnes*, or hoods, worn by thoſe horſes with their other coverings of ſtate.

CHAPERON *of a bit-mouth*, in the manege, is only uſed for ſcatch-mouths, and all others that are not cannon-mouths, ſignifying the end of the bit that joins to the branch juſt by the banquet. In ſcatch-mouths the chaperon is round, but in others it is oval: and the ſame part that in ſcatch and other mouths is called *chaperon*, is in cannon-mouths called *fronceau*.

CHAPITERS, in architecture, the ſame with CAPITALS.

CHAPITERS, in law, formerly ſignified a ſummary of ſuch matters as were inquired of, or preſented before juſtices in eyre, juſtices of aſſize, or of the peace in their ſeſſions.

Chapiters, at this time, denote ſuch articles as are delivered by the mouth of the juſtice in his charge to the inqueſt.

CHAPLAIN properly ſignifies a perſon provided with a chapel; or who diſcharges the duty thereof.

CHAPLAIN is alſo uſed for an eccleſiaſtical perſon, in the houſe of a prince, or a perſon of quality, who officiates in their chapels, &c.

In England there are 48 chaplains to the king, who wait four each month, preach in the chapel, read the ſervice to the family, and to the king in his private oratory, and ſay grace in the abſence of the clerk of the cloſet. While in waiting they have a table, and attendance, but no ſalary. In Scotland the king has ſix chaplains, with a ſalary of L. 50 each, three of them having in addition the deanery of the chapel-royal divided between them, making up above L. 100 to each. Their only duty at preſent is to ſay prayers at the election of peers for Scotland to ſit in parliament.——According to a ſtatute of Henry VIII. the perſons veſted with a power of retaining chaplains, together with the number each is allowed to qualify, is as follows: An archbiſhop, eight; a duke or biſhop, ſix; marquis or earl, five; viſcount, four; baron, knight of the garter, or lord chancellor three; a ducheſs, marchioneſs, counteſs, baroneſs, the treaſurer and comptroller of the king's houſe, clerk of the cloſet, the king's ſecretary, dean of the chapel, almoner, and maſter of the rolls, each of them two; chief juſtice of the kings bench, and warden of the cinque-parts, each one. All theſe chaplains may purchaſe a licence or diſpenſation, and take two benefices with cure of ſouls. A chaplain muſt be retained by letters teſtimonial under hand and ſeal; for it is not ſufficient that he ſerve as chaplain in the family.

The firſt chaplains are ſaid to have been thoſe inſtituted by the ancient kings of France, for preſerving the chape, or cape, with the other relics of St Martin, which the kings kept in their palace, and carried out with them to the war. The firſt chaplain is ſaid to have been Gul. de Meſmes, chaplain to St Louis.

CHAPLAIN *in the order of Malta*, is uſed for the ſecond rank, or claſs, in that order; otherwiſe called *diaco*.

The knights make the firſt claſs, and the chaplains the ſecond.

CHAPLAINS *of the Pope*, are the auditors, or judges of cauſes in the ſacred palace; ſo called, becauſe the pope anciently gave audience in his chapel, for the deciſion of caſes ſent from the ſeveral parts of Chriſtendom. He hither ſummoned as aſſeſſors the moſt learned lawyers of his time; and they hence acquired the appellation of *capellani*, chaplains. It is from the decrees formerly given by theſe, that the body of decretals is compoſed: their number pope Sixtus IV. reduced to twelve.

Some ſay, the ſhrines of relics were covered with a kind of tent, cape, or *capella*, i. e. little cape; and that hence the prieſts that had the care of them, were called chaplains. In time theſe relics where repoſited in a little church, either contiguous to a larger, or ſeparate from it; and the ſame name, *capella*, which was given to the cover, was alſo given to the place where it was lodged: and hence the prieſt who ſuperintended it came to be called chaplain.

CHAPLET, an ancient ornament for the head, like a garland or wreath; but this word is frequently uſed to ſignify the circle of a crown. There are inſtances of its being borne in a coat of arms, as well as for creſts; the paternal arms for Laſcelles are argent, three chaplets, gules.

CHAPLET alſo denotes a ſtring of beads uſed by the Roman Catholics, to count the number of their prayers. The invention of it is aſcribed to Peter the hermit, who probably learned it of the Turks, as they owe it to the Eaſt-Indians.

Chaplets are ſometimes called *pater-noſters*; and are made of coral, of diamonds, of wood, *&c.* The common chaplet contains fifty ave-marias, and five pater-noſters. There is alſo a chaplet of our Saviour, conſiſting of 33 beads, in honour of his 33 years living on earth, inſtituted by father Michael the Camaldulian.

The Orientals have a kind of chaplets which they call *chains*, and which they uſe in their prayers, rehearſing one of the perfections of God on each link or head. The great Mogul is ſaid to have 18 of theſe chains, all precious ſtones; ſome diamonds, others rubies, pearls, &c. The Turks have likewiſe chaplets, which they bear in the hand, or hang it at the girdle; but father Dandini obſerves, they differ from thoſe uſed by the Romaniſts, in that they are all of the ſame bigneſs, and have not that diſtinction into decads; though they conſiſt of ſix decads, or 60 beads. He adds, that the muſſulmans run over the chaplet almoſt in an inſtant, the prayers being extremely ſhort, as containing only theſe words, "praiſe to God," or "glory to God," for each bead. Beſides the common chaplet they have likewiſe a larger one conſiſting of 100 beads, where there is ſome diſtinction, as being divided by little threads into three parts; on one of which they repeat 30 times *ſoubhan Allah*, i. e "God is worthy to be praiſed;" on another, *ellamb Allah*, "glory be to God;" and on the third, *Allah echer*, "God is great." Theſe thrice thirty times making only 90; to complete the number 100, they add other prayers for the beginning of the chaplet.—He adds, that the Mahometan chaplet appears to have had its riſe from the *mea beracoth*, or "hundred benedictions; which the Jews are obliged to repeat daily, and which we find in their prayer-books; the Jews and Mahometans having this in common, that they ſcarce do any thing without pronouncing ſome laud or benediction.

Menage derives the word *chaplet* from *chapeau*, "hat." The modern Latins call it *chapellina*, the Italians more frequently *corona*.

Chaplet, or *Chapelet*, in architecture, a little moulding, cut, or carved into round beads, pearls, olives, or the like.

CHAPMAN, (George) born in 1557, a man highly eſteemed in his time for his dramatic and poetic works. He wrote 17 plays; tranſlated Homer and ſome other ancient poets; and was thought no mean genius. He died in 1634; and he was buried in St Gile's in the fields, where his friend Inigo Jones erected a monument to him.

CHAPPE', in heraldry, the dividing an eſcutheon by lines drawn from the centre of the upper edge to the angles below, into three parts, the ſections on the ſides being of different metal or colour from the reſt.

CHAPPEL in frith, a market-town of Derbyſhire, about 26 miles north-weſt of Derby; W. Long. 1. 50. N. Lat. 53. 22.

Chappel, (William) a learned and pious biſhop of Cork, Cloyne, and Roſs, in Ireland, born in Nottinghamſhire in 1582. When the troubles began under Charles I. he was proſecuted by the puritan party in parliament, and retired to Derby, where he devoted himſelf to ſtudy until his death in 1649. He wrote *Methodus Concionandi*, i. e. "the method of preaching:" and he is one of thoſe to whom the *Whole Duty of Man* has been attributed. He left behind him alſo his own life written by himſelf in Latin, which has been twice printed.

CHAPTER, in eccleſiaſtical polity, a ſociety or community of clergymen belonging to the cathedrals and collegiate churches.

It was in the eighth century that the body of canons began to be called a chapter. The chapter of the canons of a cathedral were a ſtanding council to the biſhop, and, during the vacancy of the ſee, had the juriſdiction of the dioceſe. In the earlier ages, the biſhop was head of the chapter; afterwards abbots and other dignitaries, as deans, provoſts, treaſurers, &c. were preferred to this diſtinction. The deans and chapters had the privilege of chooſing the biſhops in England; but Henry VIII. got this power veſted in the crown: and as the ſame prince expelled the monks from the cathedrals, and placed ſecular canons in their room, thoſe he thus regulated were called deans and chapters of the new foundation; ſuch are Canterbury, Wincheſter, Ely, Carliſle, &c. See Dean.

Chapter, in matters in literature, a diviſion in a book for keeping the ſubject treated of more clear and diſtinct.

CHAR, in ichthyology, a ſpecies of Salmo.

CHARA, in botany: A genus of the monandria order, belonging to the monœcia claſs of plants. There is neither male calyx nor corolla; and the anthera is placed under the germen. The female calyx is tetraphyllous; no corolla; the ſtigma quinquefid, with one roundiſh ſeed.

CHARABON, a ſea-port town on the northern coaſt of the iſland of Java in the Eaſt-Indies; E. Long. 10. 8. S. Lat. 6.

CHARACENE, the moſt ſouthern part of Suſiana, a province of Perſia, lying on the Perſian gulph, between the Tigris and the Eulæus. It was ſo named from the city of Chorax, called firſt Alexandria, from its founder Alexander the Great; afterwards Antiochia, from Antiochus V. king of Syria, who repaired and beautified it; and laſtly, Chorax Spaſinæ, or Paſinæ, that is the Mole of the Spaſines, an Arabian king of that name having ſecured it againſt the overflowing of the Tigris, by a high bank or mole extending three miles, which ſerved as a fence to all that country. Dionyſius Periegetes, and Iſidorus, author of the Parthicæ Manſiones, were both natives of this city. The ſmall diſtrict of Characene was ſeized by Paſines, the ſon of Sogodonacus, king of the neighbouring Arabs, during the troubles of Syria, and erected into a kingdom. Lucian calls him Hyſpaſines, and adds, that he ruled over the Characeni and the neighbouring people: he died in the 85th year of his age. The other kings of this country we find mentioned by the ancients are, Teræus, who died in the 92d year of his age, and after him Artabazus the ſeventh, as Lucian informs us, who was driven from the throne by his own ſubjects, but reſtored by the Parthians. And this is all we find in the ancients relating to the kings of Characene.

CHARACTER, in a general ſenſe, ſignifies a mark or figure, drawn on paper, metal, ſtone, or other matter, with a pen, graver, chiſſel, or other inſtrument, to ſignify or denote any thing. The word is Greek, χαρακτηρ, formed from the verb, χαρασσειν, *inſculpere*, "to ingrave, impreſs," *&c.*

The various kinds of characters may be reduced to three heads, viz. *Literal Characters*, *Numeral Characters*, and *Abbreviations*.

I. *Literal Character*, is a letter of the alphabet, ſerving to indicate ſome articulate ſound, expreſſive of ſome idea or conception of the mind. See Alphabet.

1. Theſe may be divided, with regard to their nature and uſe, into *Nominal Characters*, or thoſe we properly call *letters*; which ſerve to expreſs the names of things: See Letter. *Real Characters*; thoſe that inſtead of names expreſs things and ideas: See Idea, &c. *Emblematical* or *Symbolical Characters*: which have this in common with real ones, that they expreſs the things themſelves; but have this further, that they in ſome meaſure perſonate them, and exibit their form: ſuch are the hieroglyphics of the ancient Egyptians. See Hieroglyphic, Symbol, &c.

2. *Literal Characters* may be again divided, with regard

regard to their invention and uſe, into *particular* and *general* or *univerſal*.

Particular CHARACTERS, are thoſe peculiar to this or that nation. Such are the Roman, Italic, Greek, Hebrew, Arabic, Gothic, Chineſe, &c. *characters*. See HEBREW, GOTHIC, CHINESE, *&c.*

Univerſal CHARACTERS, are alſo *real characters*, and make what ſome authors call a *Philoſophical Language*.

That diverſity of *characters* uſed by the ſeveral nations to expreſs the ſame idea, is found the chief obſtacle to the advancement of learning: to remove this, ſeveral authors have taken occaſion to propoſe plans of *characters* that ſhould be univerſal, and which each people ſhould read in their own language. The *character* here is to be real, not nominal: to expreſs things and notions; not as the common ones, letters or ſounds: yet to be mute like letters, and arbitrary; not emblematical like hieroglyphics.

Thus, every nation ſhould retain its own language, yet every one underſtand that of each other, without learning it; only by ſeeing a real or univerſal *character*, which ſhould ſignify the ſame things to all people, by what ſounds ſoever each expreſs it in their particular idiom. For inſtance, by ſeeing the *character* deſtined to ſignify *to drink*, an Engliſhman ſhould read *to drink*; a Frenchman, *boire*; a Latin, *bibere*; a Greek, πινειν; a Jew, שמה; a German *trincken*; and ſo of the reſt: in the ſame manner as ſeeing a horſe, each people expreſſes it after their own manner; but all mean the ſame animal.

This real *character* is no chimera; the Chineſe and Japoneſe have already ſomething like it. They have a common *character* which each of thoſe nations underſtand alike in their ſeveral languages; though they pronounce them with ſuch different ſounds, that they do not underſtand one another in ſpeaking.

The firſt and moſt conſiderable attempts for a *real character*, or philoſophical language, in Europe, are thoſe of biſhop Wilkins and Dalgarme: but theſe, with how much art ſoever they were contrived, have yet proved ineffectual.

M. Leibnitz had ſome thoughts the ſame way; he thinks thoſe great men did not hit the right method. It was probable, indeed, that by their means, people, who do not underſtand one another, might eaſily have a commerce together; but they have not hit on true *real characters*.

According to him, the *characters* ſhould reſemble thoſe uſed in Algebra: which, in effect, are very ſimple, yet very expreſſive, without any thing ſuperfluous or equivocal; and contain all the varieties required.

The *real character* of biſhop Wilkins has its juſt applauſe: Dr Hook recommends it on his own knowledge and experience as a moſt excellent ſcheme; and to engage the world to the ſtudy thereof, publiſhes ſome fine inventions of his own therein.

M. Leibnitz tells us, he had under conſideration an *alphabet of human thoughts*; in order to a new philoſophical language, on his own ſcheme: but his death prevented its being brought to maturity.

M. Lodwic, in the Engliſh *philoſophical tranſactions*, gives us a plan of *an univerſal alphabet* or *character* of another kind: this was to contain an enumeration of all ſuch ſingle ſounds, or letters, as are uſed in any language; by means whereof, people ſhould be enabled to pronounce truly and readily any language; to deſcribe the pronunciation of any language that ſhall be pronounced in their hearing, ſo as others accuſtomed to this language, though they had never heard the language pronounced, ſhall at firſt be able truly to pronounce it: and, laſtly, this *character* to ſerve as a ſtandard to perpetuate the ſounds of any language. In the Journal Literaire, *an.* 1720, we have a very ingenious project for an univerſal *character*. The author, after obviating the objections that might be made againſt the feaſibleneſs of ſuch ſchemes in the general, propoſes his own: his *characters* are to be the common Arabic, or numeral figures. The combinations of theſe nine are ſufficient to expreſs diſtinctly an incredible quantity of numbers, much more than we ſhall need terms to ſignify our actions, goods, evils, duties, paſſions, &c. Thus is all the trouble of framing and learning any new *character* at once ſaved; the Arabic figures having already all the univerſality required.

The advantages are immenſe. For, 1*mo*, We have here a ſtable, faithful interpreter; never to be corrupted or changed, as the popular languages continually are. 2*do*, Whereas the difficulty of pronouncing a foreign language is ſuch as uſually gives the learner the greateſt trouble, and there are even ſome ſounds which foreigners never attain to; in the *character* here propoſed, this difficulty has no place: every nation is to pronounce them according to the particular pronunciation that already obtains among them. All the difficulty is, the accuſtoming the pen and the eye to affix certain notions to *characters* that do not, at firſt ſight, exhibit them. But this trouble is no more than we find in the ſtudy of any language whatever.

The inflections of words are here to be expreſſed by the common letters. For inſtance the ſame *character* ſhall expreſs a *filly* or a *colt*, a *horſe* or a *mare*, an *old horſe* or an *old mare*, as accompanied with this or that diſtinctive letter, which ſhall ſhow the ſex, youth, maturity, or old age: a letter alſo to expreſs the bigneſs or ſize of things; thus *v. g.* a man with this or that letter, to ſignify a *great man*, or a *little man*, &c.

The uſe of theſe letters belongs to the grammar; which, once well underſtood, would abridge the vocabulary exceedingly. An advantage of this grammar is, that it would only have one declenſion and one conjugation: thoſe numerous anomalies of grammarians are exceeding troubleſome; and ariſe hence, that the common languages are governed by the populace, who never reaſon on what is beſt: but in the character here propoſed, men of ſenſe having the introduction of it, would have a new ground whereon to build regularly.

But the difficulty is not in inventing the moſt ſimple, eaſy, and commodious *character*, but in engaging the ſeveral nations to uſe it; there being nothing they agree leſs in, than the underſtanding and purſuing their common intereſt.

3. Literal characters may again be divided, with reſpect to the nations among whom they have been invented, into Greek characters, Roman characters, Hebrew characters, &c. The Latin character now uſed through all Europe, was formed from the Greek, as the Greek was from the Phœnician; and the Phœnician,

Characters. as well as the Chaldee, Syriac, and Arabic characters, were formed from the ancient Hebrew, which ſubſiſted till the Babyloniſh captivity; for after that event the character of the Aſſyrians, which is the ſquare Hebrew now in uſe, prevailed, the ancient being only found on ſome Hebrew medals, commonly called Samaritan medals. It was in 1091, that the Gothic characters, invented by Ulfilas, were aboliſhed, and the Latin ones eſtabliſhed in their room.

Medalliſts obſerve, that the Greek character, conſiſting only of majuſcule letters, has preſerved its uniformity on all medals, as low as the time of Gallienus; from which time it appears ſomewhat weaker and rounder: from the time of Conſtantine to Michael we find only Latin characters: after Michael, the Greek characters recommence; but from that time they began to alter with the language, which was a mixture of Greek and Latin. The Latin medals preſerve both their character and language as low as the tranſlation of the ſeat of the empire to Conſtantinople: towards the time of Decius the character began to loſe its roundneſs and beauty; ſome time after, it retrieved, and ſubſiſted tolerably till the time of Juſtin, when it degenerated gradually into the Gothic. The rounder, then, and better formed a character is upon a medal, the fairer pretence it has to antiquity.

II. *Numeral* CHARACTERS, are characters uſed to expreſs numbers, are either letters or figures.

The Arabic character, called alſo the common one, becauſe it is uſed almoſt throughout Europe in all ſorts of calculations, conſiſts of theſe ten digits, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

The Roman numeral character conſiſts of ſeven majuſcule letters of the Roman alphabet, *viz.* I, V, X, L, C, D, M. The I denotes one, V five, X ten, L fifty, C, a hundred, D, five hundred, and M a thouſand. The I repeated twice makes two, II; thrice, three, III: four is expreſſed thus IV, as I before V or X takes an unit from the number expreſſed by theſe letters. To expreſs ſix, an I is added to a V, VI; for ſeven, two, VII; and for eight, three, VIII. nine is expreſſed by an I before X, thus IX. The ſame remark may be made of the X before L or C, except that the diminution is by tens; thus XL denotes forty, XC ninety, and LX ſixty. The C before D or M diminiſhes each by a hundred. The number five hundred is ſometimes expreſſed by an I before a C inverted thus, IↃ; and inſtead of M, which ſignifies a thouſand, an I is ſometimes uſed between two C's, the one direct, and the other inverted, thus CIↃ. The addition of C and Ↄ before or after raiſes CIↃ by tens, thus, CCIↃↃ expreſſes ten thouſand, CCCIↃↃↃ, a hundred thouſand. The Romans alſo expreſſed any number of thouſands by a-line drawn over any numeral leſs than a thouſand; thus $\overline{\mathrm{V}}$ denotes five thouſand, $\overline{\mathrm{LX}}$, ſixty thouſand: ſo likewiſe $\overline{\mathrm{M}}$ is one million, $\overline{\mathrm{MM}}$ is two millions, &c.

The Grecks had three ways of expreſſing numbers: 1. Every letter, according to its place in the alphabet, denoted a number, from α, one, to ω, twenty-four. 2. The alphabet was divided into eight units, α one, β two, three, *&c.;* into γ eight tens, ι ten, κ twenty, λ thirty, *&c.;* and eight hundreds, ρ one hundred, σ two hundred, τ three hundred, *&c.* 3. I ſtood for one, Π five, Δ ten, H a hundred, X a thouſand, M ten thouſand; and when the letter Π incloſed any of theſe, except I, it ſhowed the incloſed letter to be five times its value: as $\overline{|\Delta|}$ fifty, $\overline{|\mathrm{H}|}$ five hundred, $\overline{|\mathrm{X}|}$ five thouſand, $\overline{|\mathrm{M}|}$ fifty thouſand. Characters.

The French CHARACTER uſed in the chamber of accounts, and by perſons concerned in the management of the revenue, is, properly ſpeaking, nothing elſe than the Roman numerals, in letters that are not majuſcule: thus, inſtead of expreſſing fifty-ſix by LVI, they denote it by ſmaller characters lvj.

III. CHARACTERS of Abbreviations, &c. in ſeveral of the arts, are ſymbols contrived for the more conciſe and immediate conveyance of the knowledge of things. For the

CHARACTERS uſed in Algebra. See ALGEBRA, Introduction.

CHARACTERS uſed in Aſtronomy, viz.

Of the Planets. See Plate LXII. fig. 19.

Of the Signs. Plate LXXVI. fig. 158. & LXXXV. fig. 204.

Of the Aſpects.

☌ or S Conjunction
SS Semiſextile
⚹ Sextile
Q Quintile
□ Quartile
Td Tredecile
△ Trine
Bq Biquintile
Vc Quincunx
☍ Oppoſition.
☊ Dragon's head
☋ Dragon's tail.

Of time.

A. M. *ante meridiem*, before the ſun comes upon the meridian.
O. or N. noon.
P. M. *poſt meridiem*, when the ſun is paſt the meridian.

CHARACTERS in Commerce.

D° *ditto*, the ſame
N° *numero*, or number
F° *folio*, or page
C or ⊕ hundred weight, or 112 pounds
$\mathrm{q^{rs}}$ quarters
S or *s* ſhillings
d pence or deniers
℔ pound weight.
R° *recto* } *folio*
V° *vero* } *folio*
£ or *l.* pounds ſterling
$\mathrm{p^r}$ *per*, or by, as $\mathrm{p^r}$ *ann.* by the year, $\mathrm{p^r}$ *cent.*
$\mathrm{R^x}$ rixdollar
$\mathrm{D^t}$ ducat
P. S. poſtſcript, *&c.*

CHARACTERS in Chemiſtry. See Pl. cxxxii. & cxxxiii.

CHARACTERS in Geometry and Trigonometry.

∥ the character of parallеliſm
△ triangle
□ ſquare
▯ ▭ rectangle
⊙ circle
$\overset{\vee}{=}$ equiangular, or ſimilar
$\overset{\mathrm{I}}{=}$ equilateral
< an angle
∟ right angle
⊥ perpendicular

° denotes a degree; thus 45° implies 45 degrees.

′ denotes a minute; thus 50′, is 50 minutes. ″, ‴, ⁗, denotes ſeconds, thirds, and fourths: and the ſame characters are uſed where the progreſſions are by tens, as it is here by ſixties.

CHARACTERS in Grammar, Rhetoric, Poetry, &c.

() parentheſis
[] crotchet
- hyphen
’ apoſtrophe
´ emphaſis or accent
˘ breve
¨ dialyſis
^ caret and circumflex
† ‡ and * references
D. D. doctor in divinity.
V. D. M. miniſter of the word of God.
L. L. D. doctor of laws
J. V. D. doctor of civil and canon law
“ quotation
M. D. doctor in phyſic.

§

§ ſection or diviſion
¶ paragraph
A. M. maſter of arts
A. B. bachelor of arts
F. R. S. fellow of the royal ſociety.

For the other characters uſed in grammar, ſee COMMA, COLON, SEMICOLON, *&c.*

CHARACTERS among the ancient Lawyers, and in ancient Inſcriptions.

§ paragraphs
ff digeſts
Scto. ſenatus conſulto
E. extra
S. P. Q. R. ſenatus populuſque Romanus
P. P. pater patriæ
C. code
C. C. conſules
T. titulus
P. P. D. D. propria pecunia dedicavit
D. D. M. dono dedit monumentum.

CHARACTERS in Medicine and Pharmacy.

℞ recipe
ā, *āā*, or ana, of each alike
℔ a pound, or a pint
℥ an ounce
ʒ a drachm
℈ a ſcruple
gr. grains
ſs or *ſs* half of any thing
cong. congius, a gallon,
coch. cochleare, a ſpoonful
M. manipulus, a handful
P. a pugil
P. Æ. equal quantities
S. A. according to art
q. s. a ſufficient quantity
q. pl. as much as you pleaſe
P. P. pulvis patrum, the Jeſuit's bark.

CHARACTERS upon Tomb-ſtones.

S. V. Siſte viator, *i. e.* Stop traveller.
M. S. Memoriæ ſacrum, *i. e.* Sacred to the memory.
D. M. Diis manibus.
J. H. S. Jeſus.
X. P. a character found in the catacombs, about the meaning of which authors are not agreed.

CHARACTERS uſed in Muſic, and of Muſical Notes with their proportions, are as follow.

𝆷 character of a large 8
𝆶 a long 4
𝅜 a breve 2
𝅝 a ſemibreve 1
𝅗𝅥 a minim $\frac{1}{2}$
♩ crotchet $\frac{1}{4}$
♪ quaver $\frac{1}{8}$
𝅘𝅥𝅯 ſemiquaver $\frac{1}{16}$
𝅘𝅥𝅰 demiſemiquaver $\frac{1}{32}$

※ character of a ſharp note: this character at the beginning of a line or ſpace, denotes that all the notes in that line are to be taken a ſemitone higher than in the natural ſeries; and the ſame affects all the octaves above and below, though not marked: but when prefixed to any particular note it ſhows that note alone to be taken a ſemitone higher than it would be without ſuch character.

♭ or *b*, character of a flat note: this is the contrary to the other above; that is, a ſemitone lower.

♮ character of a natural note: when in a line or ſeries of artificial notes, marked at the beginning *b* or ※, the natural note happens to be required, it is denoted by this character

𝄞 character of a treble cliff.

𝄡 character of the mean cliff.

𝄢 baſs cliff.

$\frac{2}{4}$, or $\frac{4}{8}$ characters of common duple time, ſignifying the meaſure of two crotchets to be equal to two notes, of which four make a ſemibreve.

C ₵ ⦶, characters that diſtinguiſh the movements of common time, the firſt implying ſlow, the ſecond quick, and the third very quick.

$\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{16}$, characters of ſimple triple time, the meaſure of which is equal to three ſemibreves, or to three minims.

$\frac{4}{6}$, $\frac{6}{8}$, or $\frac{6}{16}$, characters of a mixed triple time, where the meaſure is equal to ſix crotchets, or ſix quavers.

$\frac{9}{4}$, or $\frac{9}{8}$, or $\frac{9}{16}$, or $\frac{9}{1}$, or $\frac{9}{2}$, characters of compound triple time.

$\frac{4}{12}$, $\frac{8}{12}$, $\frac{12}{16}$, or $\frac{1}{12}$, or $\frac{2}{12}$, characters of that ſpecies of triple time called the meaſure of twelve times.

CHARACTER, in human life, that which is peculiar in the manners of any perſon, and diſtinguiſhes him from all others.

Good CHARACTER is particularly applied to that conduct which is regulated by virtue and religion; in an inferior but very common ſenſe, it is underſtood of mere honeſty of dealing between man and man The importance of a good character in the commerce of life ſeems to be univerſally acknowledged.—To thoſe who are to make their own way either to wealth or honours, a good character is uſually no leſs neceſſary than addreſs and abilities. To tranſcribe the obſervation of an elegant moraliſt: Though human nature is degenerate, and corrupts itſelf ſtill more by its own inventions; yet it uſually retains to the laſt an eſteem for excellence. But even if we are arrived at ſuch an extreme degree of depravity as to have loſt our native reverence for virtue; yet a regard to our own intereſt and ſafety, which we ſeldom loſe, will lead us to apply for aid, in all important tranſactions, to men whoſe integrity is unimpeached. When we chooſe an aſſiſtant, a partner, a ſervant, or firſt enquiry is concerning his character. When we have occaſion for a counſellor or attorney, a phyſician or apothecary, whatever we may be ourſelves, we always chooſe to truſt our property and perſons to men of the beſt character. When we fix on the tradeſmen who are to ſupply us with neceſſaries, we are not determined by the ſign of the lamb, or the wolf, or the fox; nor by a ſhop fitted up in the moſt elegant taſte, but by the faireſt reputation. Look into a daily newſpaper, and you will ſee, from the higheſt to the loweſt rank, how important the characters of the employed appear to the employers. After the advertiſement has enumerated the qualities required in the perſon wanted, there conſtantly follows, that none need apply who cannot bring an undeniable character. Offer yourſelf as a candidate for a ſeat in the legiſlature, be promoted to honour and emolument, or in any reſpect attract the attention of mankind upon yourſelf, and, if you are vulnerable in your character, you will be deeply wounded. This is a general teſtimony in favour of honeſty, which no writings and no practices can poſſibly refute.

Young men, therefore, whoſe characters are yet unfixed, and who, conſequently, may render them juſt ſuch as they wiſh, ought to pay great attention to the firſt ſteps which they take on entrance into life. They are uſually careleſs and inattentive to this object. They purſue their own plans with ardour, and neglect the opinions which others entertain of them. By ſome thoughtleſs action or expreſſion, they ſuffer a mark to be impreſſed upon them, which ſcarcely any ſubſequent merit can entirely eraſe. Every man will find ſome perſons,

ſons, who, though they are not profeſſed enemies, yet view him with an envious or a jealous eye, and who will gladly revive any tale to which truth has given the ſlighteſt foundation.

In this turbulent and confuſed ſcene, where our words and actions are often miſunderſtood, and oftener miſrepreſented, it is indeed difficult even for innocence and integrity to avoid reproach, abuſe, contempt, and hatred. Theſe not only hurt our intereſt and impede our advancement in life, but ſorely afflict the feelings of a tender and delicate mind. It is then the part of wiſdom firſt to do every thing in our power to preſerve an irreproachable character, and then to let our happineſs depend chiefly on the approbation of our own conſciences, and on the advancement of our intereſt in a world where liars ſhall not be believed, and where ſlanderers ſhall receive countenance from none but him who, in Greek, is called, by way of eminence, *Diabolus*, or the calumniator.

CHARACTER, in poetry, particularly the epopee and drama, is the reſult of the manners or peculiarities by which each perſon is diſtinguiſhed from others.

The poetical character, ſays Mr Boſſu, is not properly any particular virtue or quality, but a compoſition of ſeveral which are mixed together, in a different degree, according to the neceſſity of the fable and the unity of the action: there muſt be one, however, to reign over all the reſt; and this muſt be found, in ſome degree, in every part. The firſt quality in Achilles, is wrath; in Ulyſſes, diſſimulation; and in Æneas, mildneſs: but as theſe characters cannot be alone, they muſt be accompanied with others to embelliſh them, as far as they are capable, either by hiding their defects, as in the anger of Achilles, which is palliated by extraordinay valour; or by making them centre in ſome ſolid virtue, as in Ulyſſes, whoſe diſſimulation makes a part of his prudence; and in Æneas, whoſe mildneſs is employed in a ſubmiſſion to the will of the gods. In the making up of which union, it is to be obſerved, the poets have joined together ſuch qualities as are by nature the moſt compatible; valour with anger, piety with mildneſs, and prudence with diſſimulation. The fable required prudence in Ulyſſes, and piety in Æneas; in this, therefore, the poets were not left to their choice: but Homer might have made Achilles a coward without abating any thing from the juſtneſs of his fable: ſo that it was the neceſſity of adorning his character that obliged him to make him valiant: the character, then, of a hero in the epic poem, is compounded of three ſorts of qualities; the firſt eſſential to the fable; the ſecond, embelliſhments of the firſt; and valour, which ſuſtains the other two, makes the third.

Unity of character is as neceſſary as the unity of the fable. For this purpoſe a perſon ſhould be the ſame from the beginning to the end: not that he is always to betray the ſame ſentiments, or one paſſion; but that he ſhould never ſpeak nor act inconſiſtently with his fundamental character. For inſtance, the weak may ſometimes ſally into a warmth, and the breaſt of the paſſionate be calm, a change which often introduces in the drama a very affecting variety; but if the natural diſpoſition of the former was to be repreſented as boiſterous, and that of the latter mild and ſoft, they would both act out of character, and contradict their perſons.

True characters are ſuch as we truly and really ſee in men, or may exiſt without any contradiction to nature: no man queſtions but there have been men as generous and as good as Æneas, as paſſionate and as violent as Achilles, as prudent and wiſe as Ulyſſes, as impious and atheiſtical as Mezentius, and as amorous and paſſionate as Dido; all theſe characters, therefore, are true, and nothing but juſt imitations of nature. On the contrary, a character is falſe when an author ſo feigns it, that one can ſee nothing like it in the order of nature wherein he deſigns it ſhall ſtand: theſe characters ſhould be wholly excluded from a poem, becauſe tranſgreſſing the bounds of probability and reaſon, they meet with no belief from the readers; they are fictions of the poet's brain, not imitations of nature; and yet all poetry conſiſts in an imitation of nature.

CHARACTER is alſo uſed for certain viſible qualities, which claim reſpect or reverence to thoſe veſted therewith.—The majeſty of kings gives them a character which procures reſpect from the people. A biſhop ſhould ſuſtain his character by learning and ſolid piety, rather than by worldly luſtre, &c. The law of nations ſecures the character of an ambaſſador from all inſults.

CHARACTER, among naturaliſts, is ſynonymous with the definition of the genera of animals, plants, &c.

CHARACTERISTIC, in the general, is that which characteriſes a thing or perſon, i. e. conſtitutes its character, whereby it is diſtinguiſhed. See CHARACTER.

CHARACTERISTIC, is peculiarly uſed in grammar, for the principal letter of a word: which is preſerved in moſt of its tenſes and moods, its derivatives and compounds.

CHARACTERISTIC of a Logarithm, is its index or exponent. See LOGARITHM.

CHARACTERISTIC Triangle of a Curve, in the higher geometry, is a rectilinear right-angled triangle, whoſe hypothenuſe makes a part of the curve, not ſenſibly different from a right-line. It is ſo called, becauſe curve lines are uſed to be diſtinguiſhed hereby. See CURVE.

CHARADE, the name of a new ſpecies of compoſition or literary amuſement. It owes its name to the idler who invented it. Its ſubject muſt be a word of two ſyllables, each forming a diſtinct word; and theſe two ſyllables are to be concealed in an enigmatical deſcription, firſt ſeparately, and then together. The exerciſe of charades, if not greatly inſtructive, is at leaſt innocent and amuſing. At all events, as it has made its way into every faſhionable circle, and has employed even Garrick, it will ſcarcely be deemed unworthy of attention. The ſillineſſes indeed of moſt that have appeared in the papers under this title, are not only deſtitute of all pleaſantry in the ſtating, but are formed in general of words utterly unfit for the purpoſe. They have therefore been treated with the contempt they deſerved. In trifles of this nature, inaccuracy is without excuſe. The following examples therefore are at leaſt free from this blemiſh.

I.

My *firſt*, however here abuſed,
Deſigns the ſex alone;
In Cambria, ſuch is cuſtom's pow'r,
'Tis Jenkin, John, or Joan.

Charade, Charadrius.

My *ſecond* oft is loudly call'd,
When men prepare to liſt it:
Its name delights the female ear;
Its force, may none reſiſt it!
It binds the weak, it binds the ſtrong,
The wealthy and the poor;
Still 'tis to joy a paſſport deem'd,
For ſullied fame a cure.
It may inſure an age of bliſs,
Yet miſ'ries oft attend it;
To fingers, ears, and noſes too,
Its various lords commend it.
My *whole* may chance to make one drink,
Though vended in a fiſh-ſhop;
'Tis now the monarch of the ſeas,
And has been an archbiſhop. *Her-ring.*

II.

My *firſt*, when a Frenchman is learning Engliſh, ſerves him to ſwear by. My *ſecond*, is either hay or corn. My *whole* is the delight of the preſent age, and will be the admiration of poſterity. *Gar-rick.*

III.

My *firſt*, is plowed for various reaſons, and grain is freqently buried in it to little purpoſe. My *ſecond*, is neither riches nor honours; yet the former would generally be given for it, and the latter is often taſteleſs without it. My *whole* applies equally to ſpring, ſummer, atumn, and winter; and both fiſh and fleſh, praiſe and cenſure, mirth and melancholly, are the better for being in it. *Sea-ſon.*

IV.

My *firſt*, with the moſt rooted antipathy to a Frenchman, prides himſelf, whenever they meet, upon ſticking cloſe to his jacket. My *ſecond* has many virtues, nor is it its leaſt that it gives name to my firſt. My *whole*, may I never catch! *Tar-tar.*

V

My *firſt* is one of England's prime boaſts; it rejoices the ear of a horſe, and anguiſhes the toe of a man. My *ſecond*, when brick is good; when ſtone, better; when *wooden*, beſt of all. My *whole* is famous alike for rottenneſs and tin. *Corn-wall.*

VI.

My *firſt* is is called bad or good,
May pleaſure or offend ye;
My *ſecond*, in a thirſty mood,
May very much befriend ye.
My *whole*, tho' ſtyled a "cruel word,"
May yet appear a kind one;
It often may with joy be heard,
With tears may often blind one. *Fare-well.*

VII.

My *firſt* is equally friendly to the thief and the lover, the toper, and the ſtudent. My *ſecond* is light's oppoſite: yet they are frequently ſeen hand in hand; and their union, if judicious, gives much pleaſure. My *whole*, is tempting to the touch, grateful to the ſight, fatal to the taſte. *Night-ſhade.*

CHARADRIUS, in ornithology, a genus belonging to the order of grallæ. The beak is cylindrical and blunt; the noſtrils are linear; and the feet have three toes.

1. The Hiaticula, or Sea-lark of Ray, has a black breaſt; a white ſtreak along the front; the top of the head is brown; and the legs and beak are reddiſh. It is found on the ſhores of Europe and America. They frequent our ſhores in the ſummer, but are not numerous. They lay four eggs, of a dull whitiſh colour, ſparingly ſprinkled with black: at the approach of winter they diſappear.

Charadrius.

2. The Alexandrinus, or Alexandrian Dotterel, is of a browniſh colour, with the forehead, collar, and belly white; the prime tail-feathers on both ſides are white; and the legs are black. It is about the ſize of a lark, and lives upon inſects.

3. The Vociferous, or Noiſy Plover of Cateſby, has black ſtreaks on the breaſt, neck, forehead, and cheeks; and the feet are yellow. It is a native of North-America.

4. The Egyptius, has a black ſtreak on the breaſt, white eye-brows, the prime tail-feathers ſtreaked with black at the points, and bluiſh legs. It is found in the plains of Egypt, and feeds on inſects.

5. The Morinellus has an iron-coloured breaſt, a ſmall white ſtreak on the breaſt and eye-brows, and black legs. It is the Dotterel of Ray, and a native of Europe. They are found in Cambridgeſhire, Lincolnſhire, and Derbyſhire: on Lincoln-heath, and on the moors of Derbyſhire, they are migratory; appearing there in ſmall flocks of eight or ten only in the latter end of April, and ſtay there all May and part of June, during which time they are very fat, and much eſteemed for their delicate flavour. In the months of April and September, they are taken on the Wiltſhire and Berkſhire downs; they are alſo found in the beginning of the former month on the ſea ſide at Meales in Lancaſhire, and continue there about three weeks, attending the barley fallows: from thence they remove northward to a place called *Leyton Haws*, and ſtay there about a fortnight; but where they breed, or where they reſide during the winter, we have not been able to diſcover. They are reckoned very fooliſh birds, ſo that a dull fellow is proverbially ſtyled a *dotterel*. They were alſo believed to mimic the action of the fowler, ſtretching out a wing when he ſtretches out an arm, &c. continuing their imitation, regardleſs of the net that is ſpreading for them.

6. The Apricarius has a black belly; the body is brown, and variegated with white and yellow ſpots; and the legs are aſh-coloured. It is the ſpotted Plover of Edwards, and a native of Canada.

7. The Pluvialis is black above, with green ſpots, white underneath, and the feet are aſh-coloured. It is the green plover of Ray, and is a native of Europe. They lay four eggs, ſharply pointed at the leſſer end, of a dirty white colour, and irregularly marked, eſpecially at the thicker end, with blotches and ſpots. It breeds on ſeveral unfrequented mountains of Scotland; and is very common on theſe of the iſle of Rum, and others of the loftier Hebrides. They make a ſhrill whiſtling noiſe; and may be enticed within a ſhot by a ſkilful imitator of the note.

8. The Torquatus has a black breaſt, and a white front; the top of the head and the collar is black; and the beak and feet are bluiſh. It is a native of St Domingo.

9. The Calidris has black feet, and a black bill; the rump is greyiſh; and the body is pure white below. It frequents the ſhores of Europe.

10. The Oedicnemus or Stone-curlew of Ray, is of a grey colour, with two of the prime wing-feathers black, but white in the middle: it has a ſharp bill, and

and aſh-coloured feet; and is about the ſize of a crow. In Hampſhire, Norfolk, and on Lincoln-heath, it is called the ſtone-curlew, from a ſimilarity of colours to the curlew. It breeds in ſome places in rabbit-burrows; alſo among ſtones on the bare ground, laying two eggs of a copper-colour ſpotted with a darker red. The young run ſoon after they are hatched. Theſe birds feed in the night on worms and caterpillars: they will alſo eat toads, and will catch mice. They inhabit fallow lands and downs; affect dry places, never being ſeen near any waters. When they fly, they extend their legs ſtraight out behind: are very ſhy birds; run far before they take to wing; and often ſquat: are generally ſeen ſingle; and are eſteemed very delicate food.—Haſſelquiſt informs us, that this bird is alſo met with in Lower Egypt, in the Acacia groves, near the villages Abuſir and Sackhara, near the ſepulchres of the ancient Egyptians, and in the deſarts. The Arabians call it Kervan. It has a ſhrill voice, ſomewhat reſembling that of the black woodpecker, which it raiſes and lowers ſucceſſively, uttering agreeable notes. The Turks and Egyptians value it much, if they can get it alive; and keep it in a cage for the ſake of its ſinging. Its fleſh is hard, and of a very good taſte, inclined to aromatic. It is a very voracious bird, catching and devouring rats and mice, which abound in Egypt. It ſeldom drinks; and when taken young, and kept in a cage in Egypt, they give it no water for ſeveral months, but feed it with freſh meat macerated in water, which it devours very greedily. It is found in deſarts, and is therefore accuſtomed to be without water.

11. The Himantopus is white below, with a black back, and a long black bill; the feet are red, and very long. It is the autumnal dotterel of the Engliſh authors, and frequents the ſea ſhores of Europe. It is alſo found in the lakes of Egypt in the month of October.

12. The Spinoſus, armed Dotterel, or Lapwing, has black breaſt, legs, and wings; it has a creſt on the hinder part of the head. It is of the ſize of a pigeon; the French call it *dominicanus*, from the reſemblance it has to the dreſs of a Dominican monk. It is a native of Egypt.

13. The New-Zealand plover, has the forepart of the head, taking in the eye, chin, and throat, black, paſſing backward in a collar at the hind-head; all the back part of the head, behind the eye, greeniſh aſh-colour; theſe two colours divided by white: the plumage on the upper parts of the body is the ſame colour as the back of the head: the quills and tail are duſky: the laſt order of coverts is white for ſome part of their length, forming a bar on the wing: the under parts of the body are white; and the legs red. It inhabits Queen Charlotte's ſound; where it is known by the name of *Doodooroa-attoo*. See Plate CXXII. There are 12 or 13 more ſpecies.

CHARAG, the tribute which Chriſtians and Jews pay to the grand ſignior.

It conſiſts of ten, twelve, or fifteen franks *per annum*, according to the eſtate of the party. Men begin to pay it at nine or at ſixteen years old; women are diſpenſed with, as alſo prieſts, rabbins, and religious.

CHARAIMS, a ſect of the Jews in Egypt. They live by themſelves, and have a ſeparate ſynagogue; and as the other Jews are remarkable for their eyes, ſo are thoſe for their large noſes, which run through all the families of this ſect. Theſe are the ancient Eſſenes. They ſtrictly obſerve the five books of Moſes, according to the letter; and receive no written traditions. It is ſaid that the other Jews would join the *Charaims*; but thoſe not having obſerved the exact rules of the law with regard to divorces, theſe think they live in adultery.

CHARANTIA, in botany. See MOMORDICA.

CHARBON, in the manege, that little black ſpot or mark which remains after a large ſpot in the cavity of the corner teeth of a horſe: about the ſeventh or eighth year, when the cavity fills up, the tooth being ſmooth and equal, it is ſaid to be raſed.

CHARCAS, the ſouthern diviſion of Peru in South America, remarkable for the ſilver mines of Potoſi.

CHARCOAL, a ſort of artificial coal, or fuel, conſiſting of wood half burnt; chiefly uſed where a clear ſtrong fire, without ſmoke, is required; the humidity of the wood being here moſtly diſſipated, and exhaled in the fire wherein it is prepared.

The microſcope diſcovers a ſurpriſing number of pores in charcoal: they are diſpoſed in order, and traverſe it lengthwiſe; ſo that there is no piece of charcoal, how long ſoever, but may be eaſily blown through. If a piece be broken pretty ſhort, it may be ſeen through with a microſcope. In a range the 18th part of an inch long, Dr Hook reckoned 150 pores; whence he concludes, that in a charcoal of an inch diameter, there are no leſs than 5,724,000 pores. It is to this prodigious number of pores, that the blackneſs of charcoal is owing; for the rays of light ſtriking on the charcoal, are received and abſorbed in its pores, inſtead of being reflected; whence the body muſt of neceſſity appear black, blackneſs in a body being no more than a want of reflection. Charcoal was anciently uſed to diſtinguiſh the bounds of eſtates and inheritances; as being incorruptible, when let very deep within ground. In effect, it preſerves itſelf ſo long, that there are many pieces found entire in the ancient tombs of the northern nations. M. Dodart ſays, there is charcoal made of corn, probably as old as the days of Cæſar: he adds, that it has kept ſo well, that the wheat may be ſtill diſtinguiſhed from the rye; which he looks on as proof of its incorruptibility.

The operation of charring wood, is performed in the following manner: The wood intended for this purpoſe is cut into proper lengths, and piled up in heaps near the place where the charcoal is intended to be made: when a ſufficient quantity of wood is thus prepared, they begin conſtructing their ſtacks, for which there are three methods. The firſt is this: They level a proper ſpot of ground, of about twelve or fifteen feet in diameter, near the piles of wood; in the centre of this area a large billet of wood, ſplit acroſs at one end and pointed at the other, is fixed with its pointed extremity in the earth, and two pieces of wood inſerted through the clefts of the other end, forming four right angles; againſt theſe croſs pieces four other billets of wood are placed, one end on the ground, and the other leaning againſt the angles. This being finiſhed, a number of large and ſtraight billets

billets are laid on the ground to form a floor, each being as it were the radius of the circular area; on this floor a proper quantity of bruſh or ſmall wood is ſtrewed, in order to fill up the interſtices, when the floor will be complete; and in order to keep the billets in the ſame order and poſition in which they were firſt arranged, pegs or ſtumps are driven into the ground in the circumference of the circle, about a foot diſtant from one another: upon this floor a ſtage is built with billets ſet upon one end, but ſomething inclining towards the central billet; and on the tops of theſe another floor is laid in a horizontal direction, but of ſhorter billets, as the whole is, when finiſhed, to form a cone.

The ſecond method of building the ſtacks for making charcoal is performed in this manner: A long pole is erected in the centre of the area above deſcribed, and ſeveral ſmall billets ranged round the pole on their ends: the interſtices between theſe billets and the pole is filled with dry bruſh-wood, then a floor is laid, on that a ſtage in a reclining poſition, and on that a ſecond floor, *&c.* in the ſame manner as deſcribed above; but in the lower floor there is a billet larger and longer than the reſt, extending from the central pole to ſome diſtance beyond the circumference of the circle.

The third method is this: A chimney, or aperture of a ſquare form, is built with billets in the centre, from the bottom to the top; and round theſe, floors and inclined ſtages are erected, in the ſame manner as in the ſtacks above deſcribed, except that the baſe of this inſtead of being circular like the others, is ſquare; and the whole ſtack, when completed, forms a pyramid.

The ſtack of either form being thus finiſhed, is coated over with turf, and the ſurface plaſtered with a mixture of earth and charcoal-duſt well tempered together.

The next operation is the ſetting the ſtack on fire. In order to this, if it be formed according to the firſt conſtruction, the central billet in the upper ſtage is drawn out, and ſome pieces of very dry and combuſtible wood are placed in the void ſpace, called, by workmen, the chimney, and fire ſet to theſe pieces. If the ſtack be built according to the ſecond conſtruction, the central pole is drawn out, together with the large horizontal billet above deſcribed; and the void ſpace occupied by the latter being filled with pieces of very dry combuſtible wood, the fire is applied to it at the baſe of the ſtack. With regard to the third conſtruction, the ſquare aperture or chimney is filled with ſmall pieces of very dry wood, and the fire applied to it at the top or apex of the pyramidal ſtack. When the ſtack is ſet on fire, either at the top or bottom, the greateſt attention is neceſſary in the workman; for in the proper management of the fire the chief difficulty attending the art of making good charcoal conſiſts. In order to this, care is taken, as ſoon as the flame begins to iſſue ſome height above the chimney, that the aperture be covered with a piece of turf, but not ſo cloſe as to hinder the ſmoke from paſſing out: and whenever the ſmoke appears to iſſue very thick from any part of the pile, the aperture muſt be covered with a mixture of earth and charcoal duſt. At the ſame time, as it is neceſſary that every part of the ſtack ſhould be equally burnt, it will be requiſite for the workman to open vents in one part and ſhut them in another. In this manner the fire muſt be kept up till the charcoal be ſufficiently burnt, which will happen in about two days and a half, if the wood be dry; but if green the operation will not be finiſhed in leſs than three days. When the charcoal is thought to be ſufficiently burnt, which is eaſily known from the appearance of the ſmoke, and the flames no longer iſſuing with impetuoſity through the vents; all the apertures are to be cloſed up very carefully with a mixture of earth and charcoal-duſt, which by excluding all acceſs of the external air, prevents the coals from being any further conſumed, and the fire goes out of itſelf. In this condition it is ſuffered to remain, till the whole is ſufficiently cooled; when the cover is removed and the charcoal is taken away. If the whole proceſs is ſkilfully managed, the coals will exactly retain the figure of the pieces of wood: ſome are ſaid to have been ſo dexterous as to char an arrow without altering even the figure of the feather.

There are conſiderable differences in the coals of different vegetables, in regard to their habitude to fire: the very light coals of linen, cotton, ſome fungi, *&c.* readily catch fire from a ſpark, and ſoon burn out; the more denſe ones of woods and roots are ſet on fire more difficultly, and burn more ſlowly: the coals of the black berry-bearing alder, of the hazel, the willow, and the lime-tree, are ſaid to anſwer beſt for the making of gunpowder and other pyrotechnical compoſitions, perhaps from their being eaſily inflammable: for the reduction of metallic calces thoſe of the heavier woods, as the oak and the beech, are preferable, theſe ſeeming to contain a larger proportion of the phlogiſtic principle, and that perhaps, in a more fixed ſtate: conſidered as common fuel, thoſe of the heavy woods give the greateſt heat, and require the moſt plentiful ſupply of air to keep them burning; thoſe of the light woods preſerve a glowing heat, without much draught of air, till the coals themſelves are conſumed; the bark commonly crackles and flies about in burning, which the coal of the wood itſelf very ſeldom does.

Mathematical inſtrument makers, engravers, *&c.* find charcoal of great uſe to poliſh their braſs and copper-plates after they have been rubbed clean with powdered pumice-ſtone. Plates of horn are poliſhable in the ſame way, and a gloſs may be afterwards given with tripoli.

The coals of different ſubſtances are alſo uſed as pigments; hence the bone-black, ivory-black, *&c.* of the ſhops. Moſt of the paints of this kind, beſides their incorruptibility, have the advantage of a full colour, and work freely in all the forms in which powdery pigments are applied; provided they have been carefully prepared, by thoroughly burning the ſubject in a cloſe veſſel, and afterwards grinding the coal into a powder of due fineneſs. Pieces of charcoal are uſed alſo in their entire ſtate for tracing the outlines of drawing *&c.*; in which intention they have an excellence, that their mark is eaſily wiped out. For theſe purpoſes, either the finer pieces of common charcoal are picked out and cut to a proper ſhape; or the pencils are formed of wood, and afterwards burnt into charcoal in a proper veſſel well covered. The artiſts commonly make choice of the ſmaller branches of the tree freed from the bark and pith; and the willow and

Philoſoph. Commerce of Arts.

vine are preferred to all others. This choice is confirmed by the experiments of Dr Lewis who has found that the wood of the trunks of trees produces charcoal of a harder nature than their ſmall twigs or branches; and the hard woods, ſuch as box and guaiacum, produced coals very ſenſibly harder than the ſofter woods. Willow he prefers to all others. The ſhells and ſtones of fruits yielded coals ſo hard that they would ſcarce mark on paper at all; while the coals of the kernels of fruits were quite ſoft and mellow. The ſeveral coals produced by the doctor's experiments were levigated into fine powder, mixed both with gum-water and oil, and applied as paints both thin and thick, and diluted with different degrees of white. All of them, when laid on thick, appeared of a ſtrong full black, nor could it be judged that one was of a finer colour than another; diluted with white, or when ſpread thin, they had all ſomewhat of a bluiſh caſt.

Horns and the bones both of fiſhes and land-animals, gave coals rather gloſſier and deeper-coloured than vegetables; and which, in general were very hard, ſo as difficultly, or not at all, to ſtain paper. Here alſo the hardneſs of the coal ſeemed to depend on that of the ſubject from whence it was prepared; for ſilk, woollen, leather, blood, and the fleſhy parts of animals, yielded ſoft coals, ſome of theſe differed from others very ſenſibly in colour: that of ivory is ſuperior to all the reſt, and indiſputably the fineſt of all the charcoal blacks. The animal coals had much leſs of the bluiſh caſt in them than the vegetable, many of them inclining rather to a brown. Charred pit-coal, on the other hand, ſeemed to have this blueneſs in a greater degree.

Charcoal is not ſoluble in any of the acids; but may be diſſolved in conſiderable quantities by a ſolution of *hepar ſulphuris*, to which it communicates a green colour. Melted with colourleſs fruits or glaſſes, it gives a pale yellow, dark yellow, reddiſh, browniſh, or blackiſh colour, acccording as the inflammable matter is in greater or leſs proportion; the phlogiſton, or inflammable matter of the the coal ſeeming to be the direct tinging ſubſtance. When the phlogiſtic matter is thus diffuſed through glaſs, it is no more affected by continued ſtrong fire than charcoal is when excluded from the air.

The vapour of burning charcoal is found to be highly noxious, being no other than *fixed air*. How this affects the animal ſyſtem is explained under the article BLOOD.

From ſome late experiments it appears, that charcoal poſſeſſes many extraordinary properties altogether unſuſpected by former chemiſts. It has particularly a great attraction for what is called the *phlogiſton*, or rather for any kind of oily matter with which other ſubſtances may be ſullied; ſo that it now promiſes to be very uſeful in the arts in various ways never thought of before. M. Lowits has found that it is uſeful in preparing cryſtals of tartar of a very white colour; and that the marine and nitrous acids are decompoſed by being diſtilled upon it: the red juices of vegetable fruits are diſcoloured, without loſing any of their acidity; brown rancid oils are rendered ſweet and clear by agitating them for ſome days with charcoal in powder; it changes the ſmell of putrid vegetables to that of a pure volatile alkali, and it produces the ſame effect on freſh meat. On boiling coals in powder with honey, the pure ſaccharine parts of the latter are ſaid to be ſeparated, and the honey to become a well-taſted ſugar; the purification of real ſugar is alſo ſaid to be facilitated by the ſame method. Thus alſo the mother-water of the Pruſſian alkali and of the tartareous acid are made to cryſtallize eaſily; terra foliata tartari may be made white without calcination, by previouſly diſtilling the vinegar from coals. Vinegar concentrated by freezing, and diſtilled from a large proportion of powdered coal, is extremely ſtrong, pure, and fragrant. Corn ſpirit merely ſhaken with coal loſes its bad flavour; and if honey is added, it becomes a ſweet and pleaſant liquor. Even when ardent ſpirits are impregnated with any vegetable oils, the flavour is deſtroyed in this way: and if the ſpirit be diſtilled the reſiduum is ſaid not to be brown; ſo that if the diſtillation is carried too far, no inconvenience enſues. With Peruvian bark, a clear decoction was formed, and the reſiduum was a ſalt, in taſte like digeſtive ſalt. Theſe effects were produced by every kind of coal, whether foſſil or charred vegetable ſubſtances.

Charcoal has lately been ſeparated from the pureſt ſpirit of wine in the proceſs for making ether*; and by M. Lavoiſier is ſuppoſed to be one of the conſtituent parts or elements of that very volatile liquid. But the moſt extraordinary modern diſcovery concerning this ſubſtance is that of Dr Prieſtley, who has found that ſeveral of the metals may be converted into charcoal by paſſing the ſteam of ſpirit of wine over them when red-hot; and this, by way of diſtinction, he calls the *charcoal of metals*.

This ſurpriſing diſcovery was made accidentally, while the Doctor was repeating the experiments by which Mr Lavoiſier imagined water might be converted into air. Having tranſmitted the ſteam of water thro' a copper tube, on which it had no effect, he was willing to try the effects of that of other fluids; and for this purpoſe made choice of ſpirit of wine, having before procured inflammable air by ſending the ſame ſteam through a red-hot tobacco-pipe. No ſooner had the vapour of this fluid, however, touched the red-hot copper, than he was aſtoniſhed at the rapid production of air from it, which reſembled the blowing of a pair of bellows; and before four ounces of the ſpirit were expended, the tube was found to be perforated in two or three places. In a moment afterwards it was ſo far deſtroyed, that it fell to pieces on attempting to remove it from the fire; the inſide being filled with a black matter reſembling lamp-black. Having now recourſe to earthen tubes, the Doctor found that, by melting copper and other metals in them, and tranſmitting the vapour of ſpirit of wine in contact with them while in a ſtate of ignition, different ſubſtances were formed according to the metals employed. On ſending three ounce-meaſures of ſpirit of wine over two ounces of copper, the metal loſt 28 grains of its weight, and 446 grains of charcoal were procured, chiefly in the form of powder, though ſome of it was in large flakes ſeveral inches long; having ſeparated at once from the ſurface of the melted metal. Theſe pieces were almoſt quite black, and bore handling without any danger of being broken. In another experiment, 508 grains of charcoal were obtained from 19 grains of copper; but here the metal had been previouſly re-

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* See *Chemiſtry*, Index.

duced to thin plates, and they were not all converted into charcoal, being ſomething harder, and therefore partially metallic in the middle.

Silver was found to be affected very much as copper had been; but the larger maſſes of charcoal procured from this metal were much whiter than thoſe from copper. Only a ſmall quantity of charcoal could be procured from lead. Three ounce-meaſures of ſpirit of wine and near four ounces of lead, gave only a ſmall quantity of whitiſh powdery ſubſtance, though 58 grains of the lead were miſſing; but the inſide of the glaſs-tube through which the air was tranſmitted became very black. The like quantity of ſpirit of wine ſent over 360 grains of melted tin, and produced 26 grains of black duſt, the metal not being diminiſhed quite four grains. The vapour of two ounce-meaſures of ſpirit of wine, ſent over 960 grains of iron-ſhavings, diminiſhed the metal only two grains; but no charcoal could be collected, though the air was loaded with black particles. The iron had acquired a dark blue colour. Gold was not ſenſibly changed or diminiſhed in weight; and it not only remained unalterable by the proceſs itſelf, but effectually protected a tenth-part of its weight of copper from the action of the ſteam.

Spirit of turpentine was found to anſwer for the production of this charcoal, as well as ſpirit of wine; 120 grains of the former being obtained from five of copper by means of the turpentine, notwithſtanding a very denſe black ſmoke which iſſued from the end of the tube during the whole time of the operation. The Doctor obſerves, indeed, that in all thoſe experiments, where the heat is very great, the minute diviſion and volatility of this charcoal is very extraordinary. Seeing it iſſue from the end of a tube in a denſe black cloud, he endeavoured to collect it in a large glaſs receiver; but after having given the glaſs a very thin black coating, not diſtinguiſhable in appearance from ſoot, it iſſued from the orifice like denſe ſmoke, and appeared to be altogether incoercible, even when ſeveral adopters were connected with the receiver, and a tube, from whence it finally iſſued, plunged deep into water.

It is obſerved, that charcoal of wood, when freſh made, has a ſtrong attraction for air, and will continue to abſorb it for a conſiderable time; a property which it has in common with ſeveral other ſubſtances. Dr Prieſtley made ſome experiments to aſcertain the quantity abſorbed. For this purpoſe, he left in an open diſh, on the fourth of September, ſome charcoal freſh made from dry oak, and weighing 364 grains. Two or three days after it weighed 390 grains; on the 24th of October, 419; and on the 26th of April following it weighed 421 grains. By diſtillation in an earthen retort it yielded a quantity of air conſiderably phlogiſticated, and then weighed 312 grains, but the retort appeared to have been cracked. On expoſing it again to the open air for a whole year, it weighed 371 grains. In another experiment, a quantity of charcoal which had yielded by a ſtrong heat 336 ounce-meaſures of air, and weighed immediately afterwards 756 grains, increaſed in three days to 817; and on expelling the air from it was reduced to 711 grains. In all theſe experiments the air was worſe than that of the atmoſphere, and a part was fixed air.

It has been generally ſuppoſed by chemiſts, that charcoal was indeſtructible by any other means than burning in an open fire, though of late it is found totally diſſipable and convertible into inflammable air, by the heat of a burning lens *in vacuo*, at leaſt with the aſſiſtance of a ſmall quantity of water. By burning in dephlogiſticated air, it is found to convert almoſt the whole of it into fixed air. See AEROLOGY, n° 110—113, 129, 131. From the experiments there related, it is now evident, that charcoal as ſuch, and without any decompoſition, is an ingredient in both thoſe aerial fluids, and is indeed the phlogiſton of Stahl ſo long ſought in vain. This diſcovery, however, has not by any means put an end to the diſputes betwixt the *Phlogiſtians* and *Antiphlogiſtians*, though it certainly ought to have done ſo, and muſt aſſuredly do ſo in a ſhort time. The experiments of Dr Prieſtley are not doubted; and charcoal, the gravitating matter of light inflammable air, and *phlogiſton*, are allowed to be the ſame by the Antiphlogiſtians as well as by the oppoſite party. "The preſent controverſy (ſays Mr Higgins) among the philoſophers depends upon the following queſtions: 1. Whether water be or be not compoſed of dephlogiſticated and light inflammable air? 2. Whether or no the condenſation of dephlogiſticated air, or its union to different bodies, does not depend upon one principle, common to all combuſtible bodies? or, in other words, whether or no all bodies which burn or calcine, ſuch as ſulphur, phoſphorus, charcoal, oils, metals, phlogiſticated air, &c. contain the matter of light inflammable air as one of their conſtituent principles? One ſhould ſuppoſe, if theſe ſubſtances were compoſed of two principles, namely a peculiar baſis, and the matter of light inflammable air or phlogiſton, that it would be poſſible to reſolve them into theſe principles; more eſpecially when we conſider the great attraction of the matter of light inflammable air to fire; but the maintainers of phlogiſton have not as yet been able to do this," &c.

Higgins's Comparative View, Pref. p. 5.

The limits of this work will not allow us to enter on a full diſcuſſion of this controverſy, nor can we pretend to be able to ſettle the diſputes on the ſubject. It nevertheleſs ſeems ſomewhat unnatural to call iron, lead, copper, ſulphur, phoſphorus, &c. ſimple and unchangeable bodies, or if we pleaſe *elements*; as thus the number of elementary bodies might be increaſed without number, and *water*, which has generally been reckoned a ſimple one, ſuppoſed to be almoſt the only compound body in nature. It is alſo certain, that Dr Prieſtley has made ſome very ſtriking and apparently deciſive experiments on the ſubject of metals, to which no proper reply has ever been made. In order to ſee the force of theſe experiments, however, we muſt ſtill obſerve, that, according to the Phlogiſtians, the calces of metals are reduced, on the addition of charcoal, not only by emitting the dephlogiſticated air which adheres to them when in the form of calces, but by the admiſſion of a quantity of the charcoal itſelf into their ſubſtance. This the Antiphlogiſtians deny; and though they admit the neceſſity of charcoal in the operation, yet they affirm that it acts only by attracting the dephlogiſticated air contained in the calx, with which it forms fixed air; and hence they muſt ſay, that in all metallic reductions a quantity of fixed air is produced, equivalent not only to the weight of the charcoal employed, but alſo to that of the dephlogiſticated air contained in the calx. The deciſive experiment therefore would be, to expel from a metallic calx all the air it contained, to weigh it exactly in that ſtate, and then obſerve whether it gained any thing in weight by being reduced to a metal. This, however, has not been done; and the Antiphlogiſtians complain that their adverſaries have not been able to produce a pure metallic calx free from all kind of aerial vapour. But though it is not pretended that any ſuch calx has yet been produced, if the Phlogiſtians can ſhow the poſſibility of reducing a calx without the production of fixed air, it would ſeem to be equally deſtructive of the antiphlogiſtic doctrine. This appears to have been done by Dr Prieſtley in the experiments above alluded to; and it is even doubtful whether he did not obtain the ſo much deſired calx, viz. one perfectly free from air altogether. "I put (ſays he) upon a piece of broken crucible, which could yield no air, a quantity of minium, *out of which all air* had been extracted; and placing it upon a convenient ſtand, introduced it into a large receiver filled with inflammable air confined by water. As ſoon as the minium was dry, by means of the heat thrown upon it, I obſerved that it became black, and then ran in the form of perfect lead, at the ſame time that the air diminiſhed at a great rate the water aſcending within the receiver. Before this firſt experiment was concluded, I perceived, that if the phlogiſton in inflammable air had any baſe, it muſt be very inconſiderable; for the proceſs went on till there was no more room to operate without endangering the receiver; and examining the air that remained, I found that it could not be diſtinguiſhed from that in which I began the experiment, which was air extracted from iron by oil of vitriol.

"I afterwards carefully expelled, from a quantity of minium, all the phlogiſton, and every thing elſe that could have aſſumed the form of air, by giving it a red heat when mixed with ſpirit of nitre; and immediately uſing it in the manner mentioned above, I reduced 101 ounce-meaſures of inflammable air to two. To judge of its degree of inflammability, I preſented the flame of a ſmall candle to the mouth of a vial filled with it, and obſerved, that it made 13 ſeparate exploſions, though weak ones (ſtopping the mouth of the phial with my finger after each exploſion); when freſh made inflammable air, in the ſame circumſtances, made only 14 exploſions, though ſtronger ones. In this experiment, however, I overlooked one obvious conſideration, viz. that water, or any thing ſoluble in water, might be the baſis of inflammable air. All that could be abſolutely inferred from the experiment was, that this baſis could not be any thing that was capable of ſubſiſting in the form of air. It will be ſeen, that I afterwards made the experiment with air confined by mercury."

In this experiment it is to be regretted that the Doctor did not inform us whether the weight of his calces was on the whole increaſed or diminiſhed by the operation. As it ſtands, though ſufficient to overthrow the doctrine of the Antiphlogiſtians, it is not altogether ſufficient to eſtabliſh that of their adverſaries. Mr Higgins, however, though he does not reply to this experiment, gives an account of another from Dr Higgins, which he conſiders as abſolutely deciſive againſt the phlogiſtians. "Dr Higgins (ſays he) introduced ſome pieces of well-burned charcoal into a deep crucible, and covered them over an inch deep with powdered charcoal. Having luted on a cover, he expoſed them for two hours to heat ſufficient to melt ſilver; he then placed the crucible in ſuch a manner that the powder might remain red hot for ſome time after the pieces next the bottom had cooled. This he had done, as the charcoal muſt imbibe ſomething on cooling, both to ſupply it with inflammable air, and to prevent a communication with the external air, which the charcoal would otherwiſe have imbibed.

"One hundred and twenty grains of this charcoal quickly powdered, were well mixed with 7680 grains of litharge, which had been previouſly fuſed to ſeparate any uncalcined lead it might contain. The mixture was charged into a coated retort juſt large enough to contain it; ſo that the common air muſt have been nearly ſecluded. Being then placed in a reverberating furnace, and heat duly applied, it yielded by eſtimation, after cooling to the mean temperature of the atmoſphere, 384 grains of fixable air, at the rate of 0.57 grains to a cubic inch, 8.704 of phlogiſticated air, and 0.911 grains of dephlogiſticated air, beſides 49 grains of water. On breaking the retort, 3888 grains of revived lead were found, beſides ſome vitrified litharge; but not an atom of charcoal was left, nor was there a particle of inflammable air produced. Now, let my reader conſider the weight that 3888 grains of lead acquire by its converſion to litharge, and the quantity of inflammable air that 120 grains of charcoal will afford (which, according to Dr Prieſtley, is about 360 ounce-meaſures), and he will find, making allowance for the phlogiſticated air, that theſe nearly correſpond with the proportion of heavy inflammable air and dephlogiſticated air neceſſary to the formation of fixable air by the electric ſpark. Hence we may conclude, that not a particle of charcoal entered into the conſtitution of the revived lead, but muſt have been wholly converted into fixable air."

To this experiment, however, the Phlogiſtians will reply, that ſo far from being deciſive on the ſubject, no concluſion whatever can be drawn from it, on account of its *enormous* inaccuracy. The quantity of matter put into the retort was 7680+120, or 7800 grains, and the whole produce was 3888+384+8.704 +0.911+49=4330.615 grains: a deficiency therefore of no leſs than 3469.385 grains is to be accounted for; and of this we hear not one word; ſo that we are at liberty to ſuppoſe that the vitrified litharge had perforated the retort in ſuch a manner as to admit the fixed and phlogiſticated air from without, as Dr Prieſtley found earthen retorts pervious to air from without; and this, though coated, might by a corroſion of the glaſs (if it was a glaſs one) be reduced to a ſimilar ſituation.

We do not mean that this ſhould be reckoned a formal anſwer to Dr Higgins's experiment; all we intend here, is to ſtate the arguments fairly on both ſides, ſo that the reader who has not an opportunity of making experiments himſelf, may be able to judge on which ſide the truth lies. Dr Prieſtley informs us, that in his experiment, the calx of lead abſorbed a quantity of inflammable air without the extrication of fixed air, or any thing elſe that could be perceived. Whether or not have we reaſon to conclude from thence, that the gravitating, ſolid, or coally, part of the inflammable air was received into the calx, and became part of the revived metal? In Dr Higgins's experiment a quantity of elaſtic fluid was produced, and a quantity of lead revived; but we neither know how much of the calx went to this lead, how much the litharge had originally attracted from the air, nor whether the elaſtic fluids were certainly produced; or indeed whether any of them, the ſmall quantity of dephlogiſticated air alone excepted, came from the materials or not. From ſuch a ſtate of the caſe, then, have we reaſon to "conclude, that not a particle of charcoal entered into the conſtitution of the lead?"

Higgins's Comparative View, p.49.

We ſhall next conſider an experiment made by Mr Higgins himſelf, and which he likewiſe conſiders as deciſive againſt the Phlogiſtians. "I introduced (ſays he) ſome iron nails, free from ruſt, into ſtrong volatile vitriolic acid; when it ſtood for a few minutes, it acquired a milky appearance, and the ſolution went on without ebullition or extrication of air. On ſtanding for a few hours, the ſolution acquired a darkiſh colour, and a black powder was precipitated. This powder, when collected and waſhed, put on red hot iron, burned partly like ſulphur and partly like charcoal duſt, and the incombuſtible reſiduum was of a purpliſh colour. The filtered ſolution was perfectly neutraliſed, and free from the leaſt ſulphureous pungency. Its taſte was ſtrongly chalybeate, but not ſo diſagreeable as that of the ſolution of iron in the perfect vitriolic acid, or in any of the mineral acids. Nitrous acid dropped into the ſolution inſtantly produced a cloudineſs, which immediately diſappeared without ebullition, though volatile ſulphureous acid was extricated in its utmoſt degree of pungency. The vitriolic, marine, and acetous acids, decompoſed this ſolution, but cauſed no turbidneſs, nor was any inflammable air produced.

In order to know whether the ſulphur was diſengaged from the volatile ſulphureous acid or the iron, I poured marine acid on the ſame nails, when light inflammable air and hepatic air were copiouſly produced, and likewiſe ſulphur was produced in its crude ſtate. When I uſed vitriolic or the nitrous acid, no ſulphur was produced. I tried different nails, and likewiſe iron-filings, with the ſame reſult. Theſe facts convinced me that the ſulphur came from the iron; but that all ſorts of iron contain ſulphur is what I cannot pretend to know, as I have not tried ſteel, or varieties enough of malleable iron. However, I have ſtrong reaſons to ſuſpect, that ſulpur has more to do in the different properties of iron than we are aware of. That iron ſhould contain ſulphur, notwithſtanding the different proceſſes it muſt neceſſarily undergo before it acquires malleability, conſidering the volatility of ſulphur, points out the force of their attraction to one another; and the ſeparation of this again by volatile ſulphureous acid, ſhows likewiſe the greater attraction of iron to ſulphur and dephlogiſticated air jointly. That volatile ſulphureous acid ſhould diſſolve iron without the extrication of inflammable air or phlogiſton, is a very ſtrong inſtance of the fallacy of the phlogiſtic doctrine. A ſmall quantity of inflammable air is produced, but it is ſo trifling comparatively to what ſhould be produced from the quantity of iron diſſolved, that it is hardly worth noticing; and in my opinion proceeds from a portion of perfect vitriolic acid, which is generally inſeparable from the volatile acid. If volatile vitriolic acid were a compound of phlogiſton, a certain baſis, and dephlogiſticated air, a greater quantity of inflammable air ſhould have been diſengaged during the ſolution of iron in this acid than when the perfect vitriolic acid is uſed. Let us even ſuppoſe volatile ſulphureous acid to be compoſed of the baſis of ſulphur, phlogiſton, and dephlogiſticated air, which is the opinion of all the phlogiſtians, though they differ with reſpect to the modification of theſe three principles; and likewiſe iron to be compoſed of a certain baſis and phlogiſton; I would aſk the Phlogiſtians, What becomes of the phlogiſton of the iron during its ſolution?"

But however much Mr Higgins may be convinced, from this experiment, of the fallacy of the phlogiſtic doctrine, his adverſaries inſtead of being ſilenced, will urge his own experiment againſt himſelf. He owns, that during the ſolution ſomething was ſeparated of a black colour, and which burned like charcoal duſt. Unleſs therefore Mr Higgins ſhall prove the contrary, they will ſay that this was the real *phlogiſton* or *charcoal* which entered into the ſubſtance of the metal; and that it appeared in its native form, becauſe the volatile vitriolic acid had not ſpecific or latent heat ſufficient to convert it into inflammable air. At any rate, it was incumbent on Mr Higgins to have accounted for the coally part of his reſiduum as well as the ſulphureous one; yet he has been at conſiderable pains to deduce the latter from the iron, without ſpeaking a word about the former. Indeed whether he deduced this from the iron or the vitriolic acid, it will make equally againſt him; for his principles do not allow that the volatile vitriolic acid contains any charcoal. That the latter really does ſo, however, appears from an experiment of Dr Prieſtley, in which he reduced a calx of lead by means of vitriolic acid air, the ſame with the vitriolic or volatile ſulphureous acid. It is true, that only a ſmall quantity of metal was then procured; but however ſmall this was, the Antiphlogiſtians do not pretend that metals can be reduced to their metallic ſtate in any quantity, except by the mediation of charcoal.

Thus it appears, that with regard to metals the diſpute is as yet far enough from being decided in favour of the Antiphlogiſtians. Their cauſe is equally doubtful with regard to ſulphur and phoſphorus, both of which Dr Prieſtley has produced by heating vitriolic and phoſphoric acid in inflammable air. Indeed, by ſome experiments on ſulphur, the matter ſeems to be decided againſt them. "Perhaps (ſays Dr Prieſtley) as deciſive a proof as any, of the real production of fixed air from phlogiſton and dephlogiſticated air, may be drawn from the experiments in which I always found a quantity of it when I burned ſulphur in dephlogiſticated air. In one of theſe experiments to which I gave more particular attention, ſix ounce-meaſures and an half of the dephlogiſticated air were reduced to about two ounce-meaſures, and one-fifth of this was fixed air." Now, though the Doctor inferred from this, that fixed air was compoſed of phlogiſton and dephlogiſticated air, on the ſuppoſition of ſulphur containing phlogiſton; yet admitting from other proofs, that fixed air is compoſed of theſe two principles, the expeririment unanſwerably proves, that ſulphur contains phlogiſton or charcoal, though indeed in a very ſmall quantity; but if the ſulphur contained none at all, and the dephlogiſticated air as little, as the Antiphlogiſtians would have it, how is it poſſible that a compound, of which phlogiſton makes a part, ſhould reſult from an union of the two*? Another experiment equally deciſive, even with regard to metals, is that quoted from Dr Prieſtley in the place juſt referred to (A), where he obtained pure fixed air from a mixture of red precipitate and iron-filings. Now, according to the antiphlogiſtic doctrine, neither of theſe materials contained an atom of charcoal or phlogiſton; whence then came the phlogiſton in the fixed air which iſſued from the mixture?

* See *Aerology*, n° 111.

Thus the Antiphlogiſtians ſeem to be unanſwerably refuted with regard to ſulphur and metallic ſubſtances; for if the two experiments juſt related be accurate, it is impoſſible to invalidate them by any argumentation whatever. Their laſt reſource therefore is the decompoſition of water: and even here it is evident they have little reaſon to boaſt. On this ſubject, however, we are ſorry to obſerve, that the opinions have been ſo many, ſo various, and ſo fluctuating, that it is not only impoſſible to ſay what are the prevailing ones, but even difficult to aſcertain what are the ſentiments of any individual on the ſubject. Under the article AEROLOGY, n° 81. we have quoted Dr Prieſtley as favouring the doctrine of the decompoſition of water; and in Mr Higgins's work we find him quoted as oppoſing it. "Dr Prieſtley (ſays he) ſuppoſes that the water produced by the condenſation of inflammable and dephlogiſticated air, is only what was ſuſpended and attached to them in their elaſtic ſtate, and that their reſpective gravitating particles form a different compound, namely, the nitrous acid. To aſcertain this, he confined his mixture of airs with dry fixed alkali over mercury, in order to abſtract from it as much water as poſſible. Having thus prepared his mixture of airs, he found, after exploding them, that the product of water fell far ſhort of the weight of both airs, and he obſerved a denſe vapour after every exploſion, which ſoon condenſed, and adhered in a ſolid ſtate to the ſides of the veſſel, which he found afterwards to be the nitrous acid." To this Mr Higgins anſwers, that the airs ought to have been accurately weighed after abſtracting the water from them, when (he ſuppoſes) the weight of water produced would have equalled them. This indeed ought to have been done; but Mr Higgins, or ſome Antiphlogiſtian, ought to have done ſo before he decided poſitively in favour of the oppoſite doctrine. At any rate, it cannot be pretended, that in any experiment, let the circumſtances of it be what they would, the quantity of water produced ever equalled that of the two airs. It is evident, therefore, that till this ſhall ſome how or other be cleared up, the matter muſt remain uncertain. That the pureſt water we can obtain always contains phlogiſton, is what no Phlogiſtian denies; that it eſſentially belongs to it is doubtful, though indeed it muſt be probable, that it does ſo until experiments ſhow the contrary. Mr Cavendiſh ſuppoſes that *dephlogiſticated* air and *dephlogiſticated water* may be the ſame; and indeed this would ſeem to be almoſt certain, were it not for a circumſtance taken notice of by Mr Higgins, viz. that in the firing of iron in dephlogiſticated air the latter appears to be totally abſorbed; though it is certain, that a quantity of undecompoſed water enters into its compoſition.

Comparative View, p. 3.

How far this circumſtance throws any obſcurity on the matter the reader muſt determine. For a more full inveſtigation of the ſubject, however, we muſt refer to the article WATER; and in the mean time ſhall diſmiſs the article with a few obſervations on the compoſition of charcoal.

From the days of Stahl till very lately, the component parts of this ſubſtance have been reckoned a certain kind of earth combined with what was called phlogiſton. The late experiments of Dr Prieſtley have ſhown, that this doctrine is erroneous, and that charcoal is wholly diſſipable into vapour. "On the whole (ſays the tranſlator of Wiegleb's Chemiſtry), charcoal appears from the experiments of Lavoiſier and Barthollet, to be an oil deprived of its inflammable gas. But coal of wood (or common charcoal) likewiſe contains fixed alkali, which the ſoot (or the coal of oil) does not, but inſtead of this exhibits volatile alkali. The fixed alkali of the former proceeds from the plant itſelf, and this, in the caſe of ſoot, is joined with inflammable gas, and forms volatile alkali, the earthy part being left behind, as happens when this latter is prepared from fixed alkali. Genuine charcoal, therefore, conſiſts of this vegetable principle, united with a little fixed alkali and part of the phlogiſton that conſtituted the oil of the plant of which it is made: for ſome of this principle is carried off, together with the *hydrophloge* (B), in the form of inflammable gas, if diſtilled in cloſe veſſels; but if burned in the open air, the hyrophloge unites with the pure part of the air, and forms water. From theſe conſiderations, as well as from the experiments and obſervations of M. Berthollet, in the Mem. de l'Acad. des Sciences pour 1786, p. 33. *et ſeq.* it appears, that common charcoal conſiſts of the vegetable principle, ſome phlogiſton, fixed alkali, and no inflammable gas."

On all this, however, we muſt obſerve, that it is entirely diſproved by the experiments of Dr Prieſtley, ſo often quoted, in which it was totally diſſipated into inflammable air*. On this occaſion indeed he acknowledges, that ſome very minute particles of aſhes were obſerved, which could not have amounted to a ſingle grain from many pounds of wood. Even theſe, according to what he obſerves in the ſame place, may be ſuppoſed to have come from the ſmall quantity of air in the receiver; and it is to be wiſhed that the Doctor would repeat the experiment in one of thoſe perfect vacuums through which the electric fluid cannot be made to paſs. From undoubted experiments, however, it appears, that charcoal cannot be decompoſed by mere heat; as *in vacuo* it is diſſipated into inflammable air; and

* See *Aerology*, n° 129, 130.

(A) See *Encycl.* Vol. I. p. 169. col. 1. where, in lines 18, 19, from the top, read *precipitate* for *charcoal.*

(B) A word uſed by Mr Wiegleb, as far as we can comprehend the author's meaning, for one of the component parts of water. See his General Syſtem of Chemiſtry, tranſlated by Hopſon, p. 39.

and this, on preſenting a proper ſubſtance to attract the ſolid part again diſcovers itſelf, by its blackneſs, to be real charcoal. As little does it appear deſtructible by burning in the open air; for though ſome aſhes are left, it appears probable that thoſe differ from the coal itſelf in nothing but having a quantity of air attached to them. By far the greateſt part of it, even in the common way of burning, is converted into fixed air; and from that it may again be ſeparated by taking the electric ſpark in that fluid, when it is reſolved into very pure dephlogiſticated and inflammable air. The ſame ſeparation may be effected by merely heating iron in fixed air; in which caſe the dephlogiſticated part will unite to the iron, and the coaly part, together with part of the phlogiſton of the metal, be converted into inflammable air. From all theſe, and other conſiderations, a ſuſpicion is induced, that the matter of charcoal is not different from the element of earth itſelf; and that, according to the different modifications of this ſubſtance, it either appears as coal, aſhes, earth of various kinds, or even metals. This receives ſome confirmation from the following experiments of Mr Watt, related in the 74th volume of the Philoſophical Tranſactions: “ I diſſolved (ſays he) magneſia alba, calcareous earth, and minium, in nitrous acid dephlogiſticated by boiling, and diluted with proper proportions of water. I made uſe of glaſs-retorts coated with clay; and I received the air in glaſs-veſſels, whoſe mouths were immerſed in a glazed earthen baſon containing the ſmalleſt quantity of water that could be uſed for the purpoſe. As ſoon as the retort was heated a little above the degree of boiling water, the ſolutions began to diſtil watery vapours containing nitrous acid. Soon after theſe vapours ceaſed, yellow fumes, and, in ſome of the caſes, dark red fumes, began to appear in the neck of the retort; and, at the ſame time, there was a production of dephlogiſticated air, which was greater in quantity from ſome of theſe mixtures than from others, but continued in all of them until the ſubſtances were reduced to dryneſs. I found in the receiving water, &c. very near the whole of the nitrous acid uſed for their ſolution, but highly phlogiſticated, ſo as to emit nitrous air by the application of heat; and there is reaſon to believe, that with more precaution the whole might have been obtained. As the quantity of dephlogiſticated air produced by theſe proceſſes did not form a ſufficient part of the whole weight to enable me to judge whether any of the real acid entered into the compoſition of the air I obtained, I ceaſed to purſue them further, having learned from them the fact, that however much the acid and the earths were dephlogiſticated before the ſolution, the acid always became highly phlogiſticated in the proceſs.

“ In order to examine whether this phlogiſton was furniſhed by the earths, ſome dephlogiſticated nitrous acid was diſtilled from minium till no more air or acid came over. More of the ſame acid was added to the minium as ſoon as it was cold, and the diſtillation repeated, which produced the ſame appearances of red fumes and dephlogiſticated air. This operation was repeated a third time on the ſame minium, without any ſenſible variation in the phænomena. The proceſs ſhould have been ſtill farther repeated, but the retort broke about the end of the third diſtillation; the quantity of minium uſed was 120 grains, and the quantity of nitrous acid added each time was 240 grains, of ſuch ſtrength that it could diſſolve half its weight of mercury by means of heat. It appears from this experiment, that unleſs minium be ſuppoſed principally to conſiſt of phlogiſton, the ſource of the phlogiſton thus obtained, was either the nitrous acid itſelf, or the water with which it was diluted; or elſe that it came through the retort with the light; for the retort was in this caſe red hot before any air was produced. Yet this latter concluſion does not appear very ſatisfactory, when it is conſidered, that in the proceſs wherein the earth made uſe of was magneſia, the retort was not red hot, or very obſcurely ſo, in any part of the proceſs, and by no means luminous when the yellow and red fumes firſt made their appearance.”

To theſe experiments, however, the Antiphlogiſtians will no doubt reply, that there was no phlogiſton in the caſe, and that the nitrous acid was only decompoſed; and indeed the deciſive experiment here would be, the entire diſſipation of a quantity of earth into ſome kind of air, as may be done with charcoal; but to do this in the way of diſtillation muſt be attended with incredible labour, though, as finally deciding this point, it ſeems to be well worth purſuing.

A pretty ſtrong proof of the identity of metallic calces with charcoal, is their converſion into it in the manner already related. Experiments, however, are yet wanting on the ſubject; though it ſeems probable from what Dr Prieſtley has already done, that they may thus be entirely diſſipated into air as well as common charcoal.

CHARDIN, (Sir John) a celebrated traveller, was born at Paris, 1643. His father, who was a jeweller, had him educated in the Proteſtant religion; after which he travelled into Perſia and India. He traded in jewels, and died at London in 1713. The account he wrote of his travels is much eſteemed.

CHARENTON, the name of two towns of France, the one upon the Marmaude in the Bourbonnois; the other in the iſle of France, near the confluence of the Marne with the Seine.

CHARES the Lydian, a celebrated ſtatuary, was the diſciple of Lyſippus; and made the famous Coloſſus of the ſun in the city of Rhodes. Flouriſhed 288 years before Chriſt.

CHARGE, in gunnery, the quantity of powder and ball wherewith a gun is loaded for execution.

The rules for charging large pieces in war are, That the piece be firſt cleaned or ſcoured withinſide: that the proper quantity of powder be next driven in and rammed down; care, however, being taken, that the powder, in ramming, be not bruiſed, becauſe that weakens its effect: that a little quantity of paper, hay, lint, or the like, be rammed over it; and that the ball or ſhot be intruded. If the ball be red hot, a tompion, or trencher of green wood, is to be driven in before it. The common allowance for a charge of powder of a piece of ordnance is half the weight of the ball. In the Britiſh Navy, the allowance for 32 pounders is but ſeven-ſixteenths of the weight of the bullet. But a late author is of opinion, that if the powder in all ſhip-cannon whatever was reduced to one-third weight of the ball, or even leſs, it would be of conſiderable advantage, not only by ſaving ammunition, but by keeping

Robin's Propoſal for increaſing the Strength of the Navy.

ing the guns cooler and quieter, and at the ſame time more effectually injuring the veſſels of the enemy. With the preſent allowance of powder the guns are heated, and their tackle and furniture ſtrained; and this only to render the bullets leſs efficacious: for a bullet which can but juſt paſs through a piece of timber, and loſes almoſt all its motion thereby, has a much better chance of rending and fracturing it, than if it paſſes through with a much greater velocity.

Charge, in heraldry, is applied to the figures repreſented on the eſcutcheon, by which the bearers are diſtinguiſhed from one another; and it is to be obſerved, that too many charges are not ſo honorable as fewer.

Charge of Lead, denotes a quantity of 36 pigs. See Pig.

To Charge in the military language, is to attack the enemy either with horſe or foot.

Charge, in law, denotes the inſtructions given to the grand jury, with reſpect to the articles of their inquiry, by the judge who preſides on the bench.

Charge, in law, alſo ſignifies a thing done that bindeth him that doeth it; and diſcharge is the removal of that charge. Lands may be charged in various ways; as by grant of rent out of it, by ſtatutes, judgments, conditions, warranties, &c.

Charge of horning, in Scots law. See Horning.

Charge to enter Heir, in Scots law, a writing paſſing under the ſignet, obtained at the inſtance of a creditor, either againſt the heir of his debtor, for fixing upon him the debt as repreſenting the debtor, which is called a general charge; or, againſt the debtor himſelf or his heir, for the purpoſe of veſting him in the right of any heritable ſubject to which he has made up no title, in order that the creditor may attach that ſubject for payment of his debt, in the ſame manner as if his debtor or his heir were legally veſted in it by ſervice or otherwiſe. This laſt kind is called a *ſpecial charge*.

Charge, or rather *Overcharge*, in painting is an exaggerated repreſentation of any perſon; wherein the likeneſs is preſerved, but at the ſame time ridiculed.

Few painters have the genius neceſſary to ſucceed in theſe charges: the method is, to ſelect and heighten ſomething already amiſs in the face, whether by way of defect, or redundancy; thus *v. g.* if Nature have given a man a noſe a little larger than ordinary, the painter falls in with her, and makes the noſe extravagantly long: or if the noſe be naturally too ſhort, in the painting it will be a mere ſtump; and thus of the other parts.

CHARGED, in heraldry, a ſhield carrying ſome impreſs or figure, is ſaid to be charged therewith; ſo alſo, when one bearing, or charge has another figure added upon it, it is properly ſaid to be charged.

Charged, in electrical experiments, is when a vial, pane of glaſs, or other electric ſubſtance, properly coated on both ſides, has a quantity of electricity communicated to it; in which caſe the one ſide is always electrified poſitively, and the other negatively.

CHARIOT, a half coach, having only a ſeat behind, with a ſtool before. See Coach.

The chariots of the ancients, chiefly uſed in war, were called by the ſeveral names *bigæ*, *trigæ*, &c. according to the number of horſes applied to draw them. Every chariot carried two men, who were probably the warrior and the charioteer; and we read of ſeveral men of note and valour employed in driving the chariot. When the warriors came to encounter in cloſe fight; they alighted out of the chariot, and fought on foot; but when they were weary, which often happened by reaſon of their armour, they retired into their chariot, and thence annoyed their enemies with darts and miſſive weapons. Theſe chariots were made ſo ſtrong, that they laſted for ſeveral generations.

Beſides this ſort, we find frequent mention of the *currus falcati*, or thoſe charriots armed with hooks, or ſcythes, with which whole ranks of ſoldiers were cut off together, if they had not the art of avoiding the danger; theſe were not only uſed by the Perſians, Syrians, Egyptians, *&c.* but we find them among the ancient Britons; and notwithſtanding the imperfect ſtate of ſome of the moſt neceſſary arts among that nation before the invaſion of the Romans, it is certain that they had war-chariots in great abundance. By the Greek and Roman hiſtorians, theſe chariots are deſcribed by the ſix following names; *viz* Benna, Petoritum, Currus or Carrus Covinus, Eſſedum, and Rheda The benna ſeems to have been a chariot deſigned rather for travelling than war. It contained two perſons, who were called *combennones*, from their ſitting together in the ſame machine. The petoritum ſeems to have been a larger kind of chariot than the benna; and is thought to have derived its name from the Britiſh word *pedwar*, ſignifying *four;* this kind of carriage having four wheels. The carrus or currus was the common cart or waggon. This kind of chariot was uſed by the ancient Britons, in times of peace, for the purpoſes of agriculture and merchandiſe; and in times of war, for carrying their baggage, and wives and children, who commonly followed the armies of all the Celtic nations. The covinus was a war-chariot, and a very terrible inſtrument of deſtruction; being armed with ſharp ſcythes and hooks for cutting and tearing all who were ſo unhappy as to come within its reach. This kind of chariot was made very ſlight, and had few or no men in it beſides the charioteer; being deſigned to drive with great force and rapidity, and to do execution chiefly with its hooks and ſcythes. The eſſedum and rheda were alſo war-chariots, probably of a large ſize, and ſtronger made than the covinus, deſigned for containing a charioteer for driving it, and one or two warriors for fighting. The far greateſt number of the Britiſh war-chariots ſeem to have been of this kind. Theſe chariots, as already obſerved, were to be found in great numbers among the Britons; inſomuch that Cæſar relates that Caſſibelanus, after diſmiſſing all his other forces, retained no fewer than 4000 of theſe war-chariots about his perſon. The ſame author relates, that, by continual experience, they had at laſt arrived at ſuch perfection, in the management of their chariots, that "in the moſt ſteep and difficult places they could ſtop their horſes upon full ſtretch, turn them which way they pleaſed, run along the pole, reſt on the harneſs, and throw themſelves back into their chariots, with incredible dexterity."

Chariots, in the heathen mythology, were ſometimes conſecrated to the ſun; and the ſcripture obſerves, that Joſiah burnt thoſe which had been offered to the ſun by the king's predeceſſors. This ſuperſtitious

tious cuſtom was an imitation of the heathens, and principally of the Perſians, who had horſes and chariots conſecrated in honour of the ſun. Herodotus, Xenophon, and Quintus Curtius, ſpeak of white chariots crowned, which were conſecrated to the ſun, among the Perſians, which in their ceremonies were drawn by white horſes conſecrated to the ſame luminary.

Triumphal Chariot, was one of the principal ornaments of the Roman celebration of a victory.

The Roman triumphal chariot was generally made of ivory, round like a tower, or rather of a cylindrical figure; it was ſometimes gilt at the top, and ornamented with crowns, and to repreſent a victory more naturally, they uſed to ſtain it with blood. It was uſually drawn by four white horſes; but oftentimes by lions, elephants, tygers, bears, leopards, dogs, &c.

CHARISIA, in the heathen theology, a wake, or night-feſtival, inſtituted in honour of the graces. It continued the whole night, moſt of which time was ſpent in dancing; after which, cakes made of yellow flour mixed with honey, and other ſweetmeats, were diſtributed among the aſſiſtants.—Chariſia is alſo ſometimes uſed to ſignify the ſweetmeats uſed on ſuch occaſions.

CHARISIUS, in the heathen theology, a ſurname given to Jupiter. The word is derived from χαρις, *gratia*, "grace" or "favour;" he being the God by whoſe influence men obtain the favour and affection of one another. On which account the Greeks uſed at their meals to make a libation of a cup to Jupiter Chariſius.

CHARISTIA, a feſtival of the ancient Romans, celebrated in the month of February, wherein the relations by blood and marriage met, in order to preſerve a good correſpondence; and that if there happened to be any difference among them, it might be the more eaſily accommodated, by the good humour and mirth of the entertainment. *Ovid. Faſt.* i. 617.

CHARISTICARY, commendatory, or donatory, a perſon to whom is given the enjoyment of the revenues of a monaſtery, hoſpital, or benefice.

The chariſticaries among the Greeks, were a kind of donatories, or commendatories, who enjoyed all the revenues of hoſpitals and monaſteries, without giving an account thereof to any perſon—The original of this abuſe is referred to the Iconoclaſtæ, particularly Conſtantine, Copronymus, the avowed enemy of the monks, whoſe monaſteries he gave away to ſtrangers. In after times, the emperors and patriarchs gave many to people of quality, not by way of gift, to reap any temporal advantage from them; but to repair, beautify, and patronize them. At length avarice crept in, and thoſe in good condition were given away, eſpecially ſuch as were rich; and at laſt they were all given away, rich and poor, thoſe of men and of women, and that to laymen and married men.

CHARITY, among divines, one of the three grand theological virtues, conſiſting in the love of God and of our neighbour, or the habit and diſpoſition of loving God with all our heart, and our neighbour as ourſelves.

CHARITY is alſo uſed for the effect of a moral virtue, which conſiſts in ſupplying the neceſſities of others, whether with money, counſel, aſſiſtance, or the like.

As pecuniary relief is generally the moſt efficacious, and at the ſame time that from which we are moſt apt to excuſe ourſelves, this branch of the duty merits particular illuſtration; and a better cannot be offered than what is contained in the following extracts (if we may be permitted to make them) from the elegant *Moral Syſtem* of Archdeacon *Paley*.

Whether pity be an inſtinct or a habit, it is in fact a property of our nature, which God appointed: and the final cauſe for which it was appointed, is to afford to the miſerable, in the compaſſion of their fellow creatures, a remedy for thoſe inequalities and diſtreſſes which God foreſaw that many muſt be expoſed to, under every general rule for the diſtribution of property.

The Chriſtian ſcriptures are more copious and explicit upon this duty than almoſt any other. The deſcription which Chriſt has left us of the proceedings of the laſt day, eſtabliſhes the obligation of bounty beyond controverſy. When the Son of Man ſhall come in his glory, and all the holy angels with him, then ſhall he ſit upon the throne of his glory, and before him ſhall be gathered all nations; and he ſhall ſeparate them one from another. Then ſhall the king ſay unto them on his right hand, Come ye bleſſed of my father, inherit the kingdom prepared for you from the foundation of the world: For I was an hungered, and ye gave me meat; I was thirſty, and ye gave me drink; I was a ſtranger, and ye took me in; naked, and ye clothed me; I was ſick, and ye viſited me; I was in priſon, and ye came unto me. And inaſmuch as ye have done it to one of the leaſt of theſe my brethren, ye have done it unto me." It is not neceſſary to underſtand this paſſage as a literal account of what will actually paſs on that day. Suppoſing it only a ſcenical deſcription of the rules and principles by which the Supreme Arbiter of our deſtiny will regulate his deciſions, it conveys the ſame leſſon to us; it equally demonſtrates of how great value and importance theſe duties in the ſight of God are, and what ſtreſs will be laid upon them. The apoſtles alſo deſcribe this virtue as propitiating the divine favour in an eminent degree. And theſe recommendations have produced their effect. It does not appear that, before the times of Chriſtianity, an infirmary, hoſpital, or public charity of any kind, exiſted in the world; whereas moſt countries in Chriſtendom have long abounded with theſe inſtitutions. To which may be added, that a ſpirit of private liberality ſeems to flouriſh amidſt the decay of many other virtues: not to mention the legal proviſion for the poor, which obtains in ſome countries, and which was unknown and unthought of by the moſt poliſhed nations of antiquity.

St Paul adds upon the ſubject an excellent direction; and which is practicable by all who have any thing to give. "Upon the firſt day of the week (or any other ſtated time) let every one of you lay by in ſtore, as God hath proſpered him." By which the apoſtle may be underſtood to recommend what is the very thing wanting with moſt men, *the being charitable upon a plan*; that is, from a deliberate compariſon of our fortunes with the reaſonable expences and expectations of our families, to compute what we can ſpare, and to lay by ſo much for charitable purpoſes, in ſome mode or other. The mode will be a conſideration afterwards.

The effect, which Chriſtianity produced upon ſome of its converts, was ſuch as might be looked for from a divine religion coming with full force and miraculous evidence upon the conſciences of mankind. It overwhelmed all worldly conſiderations in the expectation of a more important exiſtence. “And the multitude of them that believed were of one heart and of one ſoul; neither ſaid any of them that aught of the things which he poſſeſſed, was his own; but they had all things in common.—Neither was there any among them that lacked; for as many as were poſſeſſors of lands or houſes ſold them, and brought the prices of the things that were ſold, and laid them down at the apoſtle's feet; and diſtribution was made unto every man, according as he had need.” Acts iv. 32.

Nevertheleſs, this community of goods, however it manifeſted the ſincere zeal of the primitive Chriſtians, is no precedent for our imitation. It was confined to the church at Jeruſalem; continued not long there; was never enjoined upon any (Acts v. 4.); and, although it might ſuit with the particular circumſtances of a ſmall and ſelect ſociety, is altogether impracticable in a large and mixed community.

The conduct of the apoſtles upon the occaſion deſerves to be noticed. Their followers laid down their fortunes at their feet: but ſo far were they from taking advantage of this unlimited confidence to enrich themſelves or eſtabliſh their authority, that they ſoon after got rid of this buſineſs as inconſiſtent with the main object of their miſſion, and transferred the cuſtody and management of the public funds to deacons, elected to that office by the people at large. (Acts vi.)

There are three kinds of charity, our author obſerves, which prefer a claim to attention.

1. The firſt, and apparently one of the beſt, is to give ſtated and conſiderable ſums, by way of penſion or annuity to individuals or families, with whoſe behaviour and diſtreſs we ourſelves are acquainted. In ſpeaking of conſiderable ſums, it is meant only, that five pounds, or any other ſum, given at once, or divided amongſt five or fewer families, will do more good than the ſame ſum diſtributed amongſt a greater number in ſhillings or half crowns; and that, becauſe it is more likely to be properly applied by the perſons who receive it. A poor fellow, who can find no better uſe for a ſhilling than to drink his benefactor's health, and purchaſe half an hour's recreation for himſelf, would hardly break into a guinea for any ſuch purpoſe, or be ſo improvident as not to lay it by for an occaſion of importance, for his rent, his clothing, fuel, or ſtock of winter's proviſion. It is a ſtill greater recommendation of this kind of charity, that penſions and annuities, which are paid regularly, and can be expected at the time, are the only way by which we can prevent one part of a poor man's ſufferings, the dread of want.

2. But as this kind of charity ſuppoſes that proper objects of ſuch expenſive benefactions fall within our private knowledge and obſervation, which does not happen to all, a ſecond method of doing good, which is in every one's power who has the money to ſpare, is by ſubſcription to public charities. Public charities admit of this argument in their favour, that your money goes farther towards attaining the end for which it is given, than it can do by any private and ſeparate beneficence. A guinea, for example, contributed to an infirmary, becomes the means of providing one patient, at leaſt, with a phyſician, ſurgeon, apothecary; with medicine, diet, lodging, and ſuitable attendance; which is not the tenth part of what the ſame aſſiſtance, if it could be procured at all, would coſt to a ſick perſon or family in any other ſituation.

3. The laſt, and, compared with the former, the loweſt exertion of benevolence, is the relief of beggars. Nevertheleſs, the indiſcriminate rejection of all who implore our alms in this way, is by no means approved. Some may periſh by ſuch a conduct. Men are ſometimes overtaken by diſtreſs, for which all other relief would come too late. Beſides which, reſolutions of this kind compel us to offer ſuch violence to our humanity, as may go near, in a little while, to ſuffocate the principle itſelf; which is a very ſerious conſideration. A good man, if he do not ſurrender himſelf to his feelings without reſerve, will at leaſt lend an ear to importunities which come accompanied with outward atteſtations of diſtreſs; and after a patient hearing of the complaint, will direct himſelf by the circumſtances and credibility of the account that he receives.

There are other ſpecies of charity well contrived to make the money expended *go far;* ſuch as keeping down the price of fuel or proviſion in caſe of a monopoly or temporary ſcarcity, by purchaſing the articles at the beſt market, and retailing them at prime coſt, or at a ſmall loſs; or the adding a bounty to a particular ſpecies of labour, when the price is accidentally depreſſed.

The proprietors of large eſtates have it in their power to facilitate the maintenance, and thereby encourage the eſtabliſhment of families (which is one of the nobleſt purpoſes to which the rich and great can convert their endeavours), by building cottages, ſplitting farms, erecting manufactures, cultivating waſtes, embanking the ſea, draining marſhes, and other expedients, which the ſituation of each eſtate points out. If the profits of theſe undertakings do not repay the expence, let the authors of them place the difference to the account of charity. It is true of almoſt all ſuch projects, that the public is a gainer by them, whatever the owner be. And where the loſs can be ſpared, this conſideration is ſufficient.

It is become a queſtion of ſome importance, Under what circumſtances works of charity ought to be done in private, and when they may be made public without detracting from the merit of the action; if indeed they ever may, the Author of our religion having delivered a rule upon this ſubject, which ſeems to enjoin univerſal ſecrecy. “When thou doeſt alms, let not thy left hand know what thy right hand doth; that thy alms may be in ſecret, and thy Father which ſeeth in ſecret, himſelf ſhall reward thee openly.” (Matth. vi. 3, 4.) From the preamble to this prohibition, it is plain that our Saviour's ſole deſign was to forbid *oſtentation,* and all publiſhing of good works which proceeds from that motive. Take heed that ye do not your alms before men, *to be ſeen of them;* otherwiſe ye have no reward of your Father, which is in heaven: therefore, when thou doeſt thy alms, do not ſound a trumpet before thee, as the hypocrites do in the ſynagogues and in the ſtreets, *that they may have glory of men.*

men. Verily I ſay unto thee, they have their reward," v. 2. There are motives for the doing our alms in public beſide thoſe of oſtentation; with which therefore our Saviour's rule has no concern; ſuch as to teſtify our approbation of ſome particular ſpecies of charity, and to recommend it to others; to take off the prejudice which the want, or, which is the ſame thing, the ſuppreſſion of our name in the liſt of contributors, might excite againſt the charity or againſt ourſelves. And, ſo long as theſe motives are free from any mixture of vanity, they are in no danger of invading our Savour's prohibition: they rather ſeem to comply with another direction which he has left us: "Let your light ſo ſhine before men, that they may ſee your good works, and glorify your father which is in heaven." If it be neceſſary to propoſe a preciſe diſtinction upon the ſubject, there can be none better than the following: When our bounty is beyond our fortune or ſtation, that is, when it is more than could be expected from us, our charity ſhould be private, if privacy be practicable; when it is not more than might be expected, it may be public: for we cannot hope to influence others to the imitation of extraordinary generoſity, and therefore want, in the former caſe, the only juſtifiable reaſon for making it public.

The pretences by which men excuſe themſelves from giving to the poor, are various; as,

1. "That they have nothing to ſpare;" i. e. nothing, for which they have not ſome other uſe; nothing which their plan of expence, together with the ſavings they have reſolved to lay by, will not exhauſt: never reflecting whether it be in their power, or that it is their duty, to retrench their expences, and contract their plan, "that they may have to give to them that need;" or rather that this ought to have been part of their plan originally.

2. "That they have families of their own, and that charity begins at home." A father is no doubt bound to adjuſt his œconomy with a view to the reaſonable demands of his family upon his fortune; and until a ſufficiency for theſe is acquired, or in due time probably will be acquired (for in human affairs probability is enough), he is juſtified in declining *expenſive* liberality; for to take from thoſe who want, in order to give to thoſe who want, adds nothing to the ſtock of public happineſs. Thus far, therefore, and no farther, the plea in queſtion, is an excuſe for parſimony, and an anſwer to thoſe who ſolicit our bounty.

3. "That charity does not conſiſt in giving money, but in benevolence, philanthropy, love to all mankind, goodneſs of heart," *&c.* Hear St James: "If a brother or ſiſter be naked, and deſtitute of daily food, and one of you ſay unto them, depart in peace, be ye warmed and filled, notwithſtanding *ye give them not thoſe things which are needful to the body*, what doth it profit?" (James ii. 15, 16.)

4. "That giving to the poor is not mentioned in St Paul's deſcription of charity, in the 13th chapter of his firſt epiſtle to the Corinthians." This is not a deſcription of charity, but of good nature; and it is not neceſſary that every duty be mentioned in every place.

5. "That they pay the poor-rates." They might as well allege that they pay their debts; for the poor have the ſame righ to that proportion of a man's property, which the laws aſſign them, that the man himſelf has to the remainder.

6. "That they employ many poor perſons:"—for their own ſake, not the poor's—otherwiſe it is a good plea.

7. "That the poor do not ſuffer ſo much as we imagine; that education and habit have reconciled them to the evils of their condition, and make them eaſy under it." Habit can never reconcile human nature to the extremities of cold, hunger, and thirſt, any more than it can reconcile the hand to the touch of a red-hot iron: beſides, the queſtion is not, how unhappy any one is, but how much more happy we can make him.

8. "That theſe people, give them what you will, will never thank you, or think of you for it." In the firſt place, this is not true: in the ſecond place, it was not for the ſake of their thanks that you relieved them.

9. That we are ſo liable to be impoſed upon." If a due enquiry be made, our motive and merit is the ſame: beſide that, the diſtreſs is generally real, whatever has been the cauſe of it.

10. "That they ſhould apply to their pariſhes." This is not always practicable: to which we may add, that there are many requiſites to a comfortable ſubſiſtence, which pariſh-relief does not always ſupply; and that there are ſome who would ſuffer almoſt as much from receiving pariſh-relief as by the want of it: and laſtly, that there are many modes of charity, to which this anſwer does not relate at all.

11. "That giving money encourages idleneſs and vagrancy." This is true only of injudicious and indiſcriminate generoſity.

12. "That we have too many objects of charity at home to beſtow any thing upon ſtrangers; ſo that there are other charities which are more uſeful, or ſtand in greater need." The value of this excuſe depends entirely upon the *fact*, whether we actually relieve thoſe neighbouring objects, and contribute to thoſe other charities.

Beſides all theſe excuſes, pride, or prudery, or delicacy, or love of eaſe, keep one half of the world out of the way of obſerving what the other half ſuffer.

CHARITY Schools, are ſchools erected and maintained in various pariſhes by the voluntary contributions of the inhabitants, for teaching poor children to read, write, and other neceſſary parts of education. See SCHOOL.

Brothers of CHARITY, a ſort of religious hoſpitallers, founded about the year 1297, ſince denominated *Billetins*. They took the third order of St Francis, and the ſcapulary, making three uſual vows, but without begging.

Brothers of CHARITY, alſo denote an order of hoſpitallers ſtill ſubſiſting in Romiſh countries, whoſe buſineſs is to attend the ſick poor, and miniſter to them both ſpiritual and temporal ſuccour.

They are all laymen, except a few prieſts, for adminiſtering the ſacraments to the ſick in their hoſpitals. The brothers of charity uſually cultivate botany, pharmacy, ſurgery, and chemiſtry, which they practiſe with ſucceſs.

They were firſt founded at Granada, by St John de

Dieu; and a ſecond eſtabliſhment was made at Madrid in the year 1553: the order was confirmed by Gregory XIII. in 1572: Gregory XIV. forbad them to take holy orders; but by leave of Paul V. in 1609, a few of the brothers might be admitted to orders. In 1619 they were exempted from the juriſdiction of the biſhop. Thoſe of Spain are ſeparated from the reſt; and they, as well as the brothers of France, Germany, Poland, and Italy, have their diſtinct generals, who reſide at Rome. They were firſt introduced into France by Mary of Medicis in 1601, and have ſince built a fine hoſpital in the Fauxbourg St Germain.

Charity of St Hippolitus, a religious congregation founded about the end of the 14th century, by one Bernardin Alvarez, a Mexican, in honour of St Hippolitus the martyr, patron of the city of Mexico; and approved by Pope Gregory XIII.

Charity of our Lady, in church-hiſtory, a religious order in France, which though charity was the principal motive of their union, grew in length of time ſo diſorderly and irregular, that their order dwindled, and at laſt became extinct.

There is ſtill at Paris a religions order of women, called *nuns hoſpitallers of the charity of our lady*. The religious of this hoſpital are by vow obliged to adminiſter to the neceſſities of the poor and the ſick, but thoſe only women.

CHARLATAN, or Charletan, ſignifies an empiric or quack, who retails his medicines on a public ſtage, and draws people about him with his buffooneries, feats of activity, &c. The word according to Calepine, comes from the Italian *ceretano*; of *Cæretum*, a town near Spoletto in Italy, where theſe impoſtors are ſaid to have firſt riſen. Menage derives it from *ciarlatano*, and that from *circulatorius*, of *circulator*, a quack.

CHARLEMAGNE, or Charles the I. king of France by ſucceſſion, and emperor of the weſt by conqueſt in 800, (which laid the foundation of the dynaſty of the weſtern Franks, who ruled the empire 472 years till the time of Radolphus Auſpurgenſis, the founder of the houſe of Auſtria). Charlemagne was as illuſtrious in the cabinet as in the field; and though he could not write his name, was the patron of men of letters, the reſtorer of learning, and a wiſe legiſlator: he wanted only the virtue of humanity to render him the moſt accompliſhed of men; but when we read of his beheading 4500 Saxons, ſolely for their loyalty to their prince, in oppoſing his conqueſts, we cannot think he merits the extravagant encomiums beſtowed on him by ſome hiſtorians. He died in 814, in the 74th year of his age, and 47th of his reign.

France had nine ſovereigns of his name, of whom Charles V. merited the title of *the wiſe* (crowned in 1364, died in 1380): and charles VIII. ſignalized himſelf in the field by rapid victories in Italy; crowned 1483, died in 1498. The reſt do not deſerve particular mention in this place. See *(Hiſtory of)* France.

CHARLEMONT, a town of the province of Namur in the Auſtrian Netherlands, about 18 miles ſouth of Namur. E. Long. 4. 40. N. Lat. 50. 10.

Charlemont is alſo the name of a town of Ireland, ſituated on the river Blackwater, in the county of Armagh, and province of Ulſter, about ſix miles ſouth-eaſt of Dungannon. W. Long. 6. 50. N. Lat. 50. 16.

CHARLEROY, a ſtrong town in the province of Namur, in the Auſtrian Netherlands, ſituated on the river Sambre, about 19 miles weſt of Namur. E. Long. 4. 20. N. Lat. 50. 30.

CHARLES Martel, a renowned conqueror in the early annals of France. He depoſed and reſtored Chilperic king of France; and had the entire government of the kingdom, once with the title of *mayor of the palace* and afterwards as *duke of France*; but he would not accept the crown. He died, regretted, in 741.

Charles le Gros, emperor of the weſt in 881, king of Italy and Suabia, memorable for his reverſe of fortune, being dethroned at a diet held near Mentz, by the French, the Italians, and the Germans, in 887: after which he was obliged to ſubſiſt on the bounty of the archbiſhop of Mentz. He died in 888.

Charles V. (emperor and king of Spain), was ſon of Philip I. archduke of Auſtria, and of Jane queen of Caſtile. He was born at Ghent, February 24, 1500. and ſucceeded to the crown of Spain in 1517. Two years afterwards he was choſen emperor at Francfort after the death of Maximilian his grandfather. He was a great warrior and politician; and his ambition was not ſatisfied with the many kingdoms and provinces he poſſeſſed; for he is ſuppoſed, with reaſon, to have aſpired at univerſal empire. He is ſaid to have fought 60 battles in moſt of which he was victorious. He took the king of France (Francis I.) priſoner, and ſold him his liberty on very hard terms; yet afterwards, when the people of Ghent revolted, he aſked leave to paſs through his dominions; and though the generous king thus had him in his power, and had an opportunity of revenging his ill-treatment, yet he received and attended him with all pomp and magnificence. He ſacked Rome, and took the Pope priſoner; and the cruelties which his army exerciſed there are ſaid to have exceeded thoſe of the northern barbarians. Yet the pious emperor went into mourning on account of this conqueſt: forbad the ringing of bells; commanded proceſſions to be made, and prayers to be offered up for the deliverance of the Pope his priſoner; yet did not inflict the leaſt puniſhment on thoſe who treated the holy father and the holy ſee with ſuch inhumanity. He is accuſed by ſome Romiſh writers of favouring the Lutheran principles, which he might eaſily have extirpated. But the truth is, he found his account in the diviſions which that ſect occaſioned; and he for ever made his advantage of them, ſometimes againſt the Pope, ſometimes againſt France, and at other times againſt the empire itſelf. He was a great traveller, and made 50 different journeys into Germany, Spain, Italy, Flanders, France, England, and Africa. Though he had been ſucceſsful in many unjuſt enterpriſes, yet his laſt attempt on Metz, which he beſieged with an army of 100,000 men, was very juſt and very unſucceſsful.

Vexed at the reverſe of fortune which ſeemed to attend his latter days, and oppreſſed by ſickneſs, which unfitted him any longer from holding the reigns of government with ſteadineſs, or to guide them with addreſs,

dreſs, he reſigned his dominions to his brother Ferdinand and his ſon Philip; and retreated to the monaſtery of St Juſtus near Placentia in Eſtramadura.

When Charles entered this retreat, he formed ſuch a plan of life for himſelf as would have ſuited a private gentleman of moderate fortune. His table was neat, but plain; his domeſtics few; his intercourſe with them familiar; all the cumberſome and ceremonious forms of attendance on his perſon were entirely aboliſhed, as deſtructive of that ſocial eaſe and tranquillity which he courted in order to ſooth the remainder of his days. As the mildneſs of the climate, together with his deliverance from the burdens and cares of government procured him at firſt a conſiderable remiſſion from the acute pains of the gout, with which he had been long tormented, he enjoyed perhaps more complete ſatisfaction in this humble ſolitude than all his grandeur had ever yielded him. The ambitious thoughts and projects which had ſo long engroſſed and diſquieted him, were quite effaced from his mind. Far from taking any part in the political tranſactions of the princes of Europe, he reſtrained his curioſity even from an enquiry concerning them; and he ſeemed to view the buſy ſcene which he had abandoned with all the contempt and indifference ariſing from his thorough experience of its vanity, as well as from the pleaſing reflection of having diſentangled himſelf from its cares.

Other amuſements, and other objects, now occupied him. Sometimes he cultivated the plants in his garden with his own hand; ſometimes he rode out to the neighbouring wood on a little horſe, the only one that he kept, attended by a ſingle ſervant on foot. When his infirmities confined him to his apartment, which often happened, and deprived him of theſe more active recreations, he either admitted a few gentlemen who reſided near the monaſtery to viſit him, and entertained them familiarly at his table; or he employed himſelf in ſtudying mechanical principles, and in forming curious works of mechaniſm, of which he had always been remarkably fond, and to which his genius was peculiarly turned. With this view he had engaged Turriano, one of the moſt ingenious artiſts of that age, to accompany him in his retreat. He laboured together with him in framing models of the moſt uſeful machines, as well as in making experiments with regard to their reſpective powers; and it was not ſeldom that the ideas of the monarch aſſiſted or perfected the inventions of the artiſt. He relieved his mind at intervals with ſlighter and more fantaſtic works of mechaniſm, in faſhioning puppets, which, by the ſtructure of internal ſprings, mimicked the geſtures and actions of men, to the no ſmall aſtoniſhment of the ignorant monks, who, beholding movements which they could not comprehend, ſometimes diſtruſted their own ſenſes, and ſometimes ſuſpected Charles and Turriano of being in compact with inviſible powers. He was particularly curious with regard to the conſtruction of clocks and watches; and having found, after repeated trials, that he could not bring any two of them to go exactly alike, he reflected, it is ſaid, with a mixture of ſurpriſe as well as regret on his own folly, in having beſtowed ſo much time and labour in the more vain attempt of bringing mankind to a preciſe uniformity of ſentiment concerning the intricate and myſterious doctrines of religion.

But in what manner ſoever Charles diſpoſed of the reſt of his time, he conſtantly reſerved a conſiderable portion of it for religious exerciſes. He regularly attended divine ſervice in the chapel of the monaſtery every morning and evening; he took great pleaſure in reading books of devotion, particularly the works of St Auguſtine and St Bernard; and converſed much with his confeſſor, and the prior of the monaſtery, on pious ſubjects. Thus did Charles paſs the firſt year of his retreat in a manner not unbecoming a man perfectly diſengaged from the affairs of this preſent life, and ſtanding on the confines of a future world, either in innocent amuſements which ſoothed his pains, and relieved a mind worn out with exceſſive application to buſineſs; or in devout occupations, which he deemed neceſſary in preparing for another ſtate.

But, about ſix months before his death, the gout, after a longer intermiſſion than uſual, returned with a proportional increaſe of violence. His ſhattered conſtitution had not ſtrength enough remaining to withſtand ſuch a ſhock. It enfeebled his mind as much as his body; and from this period we hardly diſcern any traces of that ſound and maſculine underſtanding which diſtinguiſhed Charles among his cotemporaries. An illiberal and timid ſuperſtition depreſſed his ſpirit. He had no reliſh for amuſements of any kind. He endeavoured to conform, in his manner of living, to all the rigour of monaſtic auſterity. He deſired no other ſociety than that of monks, and was almoſt continually employed in chanting with them the hymns of the miſſal. As an expiation for his ſins, he gave himſelf the diſcipline in ſecret with ſuch ſeverity, that the whip of cords which he employed as the inſtrument of his puniſhment, was found, after his deceaſe, tinged with his blood. Nor was he ſatisfied with theſe acts of mortification, which, however ſevere, were not unexampled. The timorous and diſtruſtful ſolicitude which always accompanies ſuperſtition, ſtill continued to diſquiet him, and depreciating all that he had done, prompted him to aim at ſomething extraordinary, at ſome new and ſingular act of piety, that would diſplay his zeal, and merit the favour of heaven. The act on which he fixed was as wild and uncommon as any that ſuperſtition ever ſuggeſted to a diſordered fancy. He reſolved to celebrate his own obſequies before his death. He ordered his tomb to be erected in the chapel of the monaſtery. His domeſtics marched thither in funeral proceſſion, with black tapers in their hands. He himſelf followed in his ſhroud. He was laid in his coffin with much ſolemnity: The ſervice for the dead was chanted; and Charles joined in the prayers which were offered up for the reſt of his ſoul, mingled his tears with thoſe which his attendants ſhed, as if they had been celebrating a real funeral. The ceremony cloſed with ſprinkling holy water on the coffin in the uſual form, and, all the aſſiſtants retiring, the doors of the chapel were ſhut. Then Charles roſe out of the coffin, and withdrew to his apartment, full of thoſe awful ſentiments which ſuch a ſingular ſolemnity was calculated to inſpire. But either the fatiguing length of the ceremony, or the impreſſion which this image of death left on his mind, affected him ſo much, that next day he was ſeized with a fever. His feeble frame could not long reſiſt its violence; and he expired on the 21ſt of September, after a life of 58 years ſix months and 21 days.

CHARLES I. } Kings of Britain. See BRITAIN,
CHARLES II. } n° 49,——254.

CHARLES XII. king of Sweden, was born in 1682. By his father's will, the adminiſtration was lodged in the hands of the queen-dowager Eleonora with five ſenators till the young prince was 18: but he was declared major at 15, by the ſtates convened at Stockholm. The beginning of his adminiſtration raiſed no favourable ideas of him, as he was thought both by Swedes and foreigners to be a perſon of mean capacity. But the difficulties that gathered round him ſoon afforded him an opportunity to diſplay his real character. Three powerful princes, Frederic king of Denmark, Auguſtus king of Poland and elector of Saxony, and Peter the Great czar of Muſcovy, preſuming on his youth, conſpired his ruin almoſt at the ſame inſtant. Their meaſures alarming the council, they were for diverting the ſtorm by negociations; but Charles, with a grave reſolution that aſtoniſhed them, ſaid, "I am reſolved never to enter upon an unjuſt war, nor to put an end to a juſt one but by the deſtruction of my enemies. My reſolution is fixed: I will attack the firſt who ſhall declare againſt me; and when I have conquered him, I may hope to ſtrike a terror into the reſt." The old counſellors received his orders with admiration; and were ſtill more ſurpriſed when they ſaw him on a ſudden renounce all the enjoyments of a court, reduce his table to the utmoſt frugality, dreſs like a common ſoldier, and, full of the ideas of Alexander and Cæſar, propoſe thoſe two conquerors for his models in every thing but their vices. The king of Denmark began by ravaging the territories of the duke of Holſtein. Upon this Charles carried the war into the heart of Denmark; and made ſuch a progreſs, that the king of Denmark thought it beſt to accept of peace, which was concluded in 1700. He next reſolved to advance againſt the king of Poland, who had blocked up Riga. He had no ſooner given orders for his troops to go into winter-quarters, than he received advice that Narva, where count Horne was governor, was beſieged by an army of 100,000 Muſcovites. This made him alter his meaſures, and move toward the Czar; and at Narva he gained a ſurpriſing victory, which coſt him not above 2000 men killed and wounded. The Muſcovites were forced to retire from the provinces they had invaded. He purſued his conqueſts, till he penetrated as far as where the diet of Poland was ſitting; when he made them declare the throne of Poland vacant, and elect Staniſlaus their king: then making himſelf maſter of Saxony, he obliged Auguſtus himſelf to renounce the crown of Poland, and acknowledge Staniſlaus by a letter of congratulation on his acceſſion. All Europe was ſurpriſed with the expeditious finiſhing of this great negociation, but more at the diſintereſtedneſs of the king of Sweden, who ſatisfied himſelf with the bare reputation of this victory, without demanding an inch of ground for enlarging his dominions. After thus reducing the king of Denmark to peace, placing a new king on the throne of Poland, having humbled the emperor of Germany, and protected the Lutheran religion, Charles prepared to penetrate into Muſcovy in order to dethrone the Czar. He quickly obliged the Muſcovites to abandon Poland, purſued them into their own country, and won ſeveral battles over them. The Czar diſpoſed to peace, ventured to make ſome propoſals: Charles only anſwered, "I will treat with the Czar at Moſcow." When this haughty anſwer was brought to Peter, he ſaid, "My brother Charles ſtill affects to act the Alexander, but I flatter myſelf he will not in me find a Darius." The event juſtified him: for the Muſcovites, already beaten into diſcipline, and under a prince of ſuch talents as Peter, entirely deſtroyed the Swediſh army at the memorable battle of Pultowa, July 8, 1709; on which deciſive day, Charles loſt the fruits of nine years labour, and of almoſt 100 battles! The king, with a ſmall troop, purſued by the Muſcovites, paſſed the Boriſthenes to Oczakow in the Turkiſh territories: and from thence through deſart countries, arrived at Bender; where the Sultan, when informed of his arrival, ſent orders for accommodating him in the beſt manner, and appointed him a guard. Near Bender Charles built a houſe, and intrenched himſelf; and had with him 1800 men, who were all clothed and fed, with their horſes, at the expence of the Grand Signior. Here he formed a deſign of turning the Ottoman arms upon his enemies; and is ſaid to have had a promiſe from the Vizir of being ſent into Muſcovy with 200,000 men. While he remained here, he inſenſibly acquired a taſte for books: he read the tragedies of Corneille and Racine, with the works of Deſpreaux, whoſe ſatires he reliſhed, but did not much admire his other works. When he read that paſſage in which the author repreſents Alexander as a fool and a madman, he tore out the leaf. He would ſometimes play at cheſs: but when he recovered of his wounds, he renewed his fatigues in exerciſing his men; he tired three horſes a day; and thoſe who courted his favour were all day in their boots. To diſpoſe the Ottoman Porte to this war, he detached about 800 Poles and Coſaques of his retinue, with orders to paſs the Neiſter, that runs by Bender, and to obſerve what paſſed on the frontiers of Poland. The Muſcovite troops, diſperſed in thoſe quarters, fell immediately upon this little company, and purſued them even to the territories of the Grand Signior. This was what the king expected. His miniſters at the Porte excited the Turks to vengeance; but the Czar's money removed all difficulties, and Charles found himſelf in a manner priſoner among the Tartars. He imagined the Sultan was ignorant of the intrigues of his Grand Vizir. Poniatoſky undertook to make his complaints to the Grand Signior. The Sultan, in anſwer, ſome days after, ſent Charles five Arabian horſes, one of which was covered with a ſaddle and houſing of great riches; with an obliging letter, but conceived in ſuch general terms, as gave reaſon to ſuſpect that the miniſter had done nothing without the Sultan's conſent: Charles therefore refuſed them. Poniatoſky had the courage to form a deſign of depoſing the Grand Vizir;

who accordingly was deprived of his dignity and wealth, and baniſhed. The ſeal of the empire was given to Numan Cuproughly; who perſuaded his maſter, that the law forbid him to invade the Czar, who had done him no injury; but to ſuccour the king of Sweden as an unfortunate prince in his dominions. He ſent his majeſty 800 purſes, every one of which amounted to 500 crowns, and adviſed him to return peaceably to his own dominions. Charles rejected this advice, threatening to hang up the baſhaws, and ſhave the beards of any Janiſaries who brought him ſuch meſſages; and ſent word that he ſhould depend upon the Grand Signior's promiſe, and hoped to re-enter Poland as a conqueror with an army of Turks. After various intrigues at the Porte, an order was ſent to attack this *head of iron*, as he was called, and to take him either alive or dead. He ſtood a ſiege in his houſe, with forty domeſtics, againſt the Turkiſh army; killed no leſs than 20 Janiſaries with his own hand; and performed prodigies of valour on a very unneceſſary and unwarrantable occaſion. But the houſe being ſet on fire, and himſelf wounded, he was at laſt taken priſoner, and ſent to Adrianople; where the Grand Signior gave him audience, and promiſed to make good all the damages he had ſuſtained. At laſt, after a ſtay of about five years, he left Turkey; and, having diſguiſed himſelf, traverſed Wallachia, Tranſylvania, Hungary, and Germany, attended only by one perſon: and in 16 days riding, during which time he never went to bed, came to Stralſund at midnight, November 21, 1714. His boots were cut from his ſwollen legs, and he was put to bed; where, when he had ſlept ſome hours, the firſt thing he did was to review his troops, and examine the ſtate of the fortifications. He ſent out orders that very day, to renew the war with more vigour than ever. But affairs were now much changed: Auguſtus had recovered the throne of Poland; Sweden had loſt many of its provinces, and was without money, trade, credit, or troops. The kings of Denmark and Pruſſia ſeized the iſland of Rugen; and beſieged him in Stralſund, which ſurrendered; but Charles eſcaped to Carlſcroon. When his country was threatened with invaſion by ſo many princes, he, to the ſurpriſe of all Europe, marched into Norway with 20,000 men. A very few Danes might have ſtopped the Swediſh army; but ſuch a quick invaſion they could not foreſee. Europe was yet more at a loſs to find the Czar ſo quiet, and not making a deſcent upon Sweden, as he had before agreed with his allies. This inaction was the conſequence of one of the greateſt deſigns, and at the ſame time the moſt difficult of any that were ever formed by the imagination of man. In ſhort, a ſcheme was ſet on foot for a reconciliation with the Czar; for replacing Staniſlaus on the throne of Poland; and ſetting James the ſecond's ſon upon that of England, beſide reſtoring the duke of Holſtein to his dominions. Charles was pleaſed with theſe grand ideas, though without building much upon them, and gave his miniſter leave to act at large. In the mean time, Charles was going to make a ſecond attempt upon Norway in 1718; and he flattered himſelf with being maſter of that kingdom in ſix months: but while he was examining the works at Fredericſhall, a place of great ſtrength and importance, which is reckoned to be the key of that kingdom, he was killed by a ſhot from the enemy, as has been generally believed; though it has been alſo reported that he fell by the treachery of one of his own officers, who had been bribed for that purpoſe.

This prince experienced the extremes of proſperity and of adverſity, without being ſoftened by the one, or diſturbed for a moment at the other: but was a man rather extroardinary than great, and fitter to be admired than imitated. He was honoured by the Turks for his rigid abſtinence from wine, and his regularity in attending public devotion.

As to his perſon, he was tall and of a noble mien, had a fine open forehead, large blue eyes, flaxen hair, fair complexion, an handſome noſe, but little beard, and a laugh not agreeable. His manners were harſh and auſtere, not to ſay ſavage; and as to his religion, he was indifferent towards all, though exteriorly a Lutheran, and a ſtrong believer in predeſtination. A few anecdotes will illuſtrate his character. No dangers, however great, made the leaſt impreſſion upon him. When a horſe or two were killed under him at the battle of Narva in 1700, he leaped nimbly upon freſh ones, ſaying, “theſe people find me exerciſe.” One day, when he was dictating letters to a ſecretary, a bomb fell through the roof into the next room of the houſe, where they were ſitting. The ſecretary, terrified leaſt the houſe ſhould come down upon them, let his pen drop out of his hand; “What is the matter,” ſays the king calmly. The ſecretary could only reply, “Ah, Sir, the bomb.” “The bomb (ſays the king)! what has the bomb to do with what I am dictating to you? Go on.”

He preſerved more humanity than is uſually found among conquerors. Once, in the middle of an action, finding a young Swediſh officer wounded and unable to march, he obliged the officer to take his horſe, and continued to command his infantry on foot. The princeſs Lubomirſki, who was very much in the intereſt and good graces of Auguſtus, falling by accident into the hands of one of his officers, he ordered her to be ſet at liberty; ſaying, “that he did not make war with women.” One day, near Leipſic, a peaſant threw himſelf at his feet, with a complaint againſt a grenadier, that he had robbed him of certain eatables provided for himſelf and his family. “Is it true, (ſaid Charles ſternly), that you have robbed this man?” The ſoldier replied, “Sir, I have not done near ſo much harm to this man as your majeſty has done to his maſter; for you have taken from Auguſtus a kingdom, whereas I have only taken from this poor ſcoundrel a dinner.” Charles made the peaſant amends, and pardoned the ſoldier for his firmneſs: “However, my friend (ſays he to him), you will do well to recollect, that if I took a kingdom from Auguſtus, I did not take it for myſelf.”

Though Charles lived hardily himſelf, a ſoldier did not fear to remonſtrate to him againſt ſome bread, which was very black and mouldy, and which yet was the only proviſion the troops had. Charles called for a piece of it, and calmly eat it up; ſaying, “that it was indeed not good, but that it might be eaten.” From the danger he was in in Poland, when he beat

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the Saxon troops in 1702, a comedy was exhibited at Marienburg, where the combat was repreſented to the diſadvantage of the Swedes. "Oh, (ſays Charles, hearing of it), I am far from envying them in this pleaſure. Let them beat me upon the theatres as long as they will, provided I do but beat them in the field." He wrote ſome obſervations on war, and on his own campaigns from 1700 to 1709; but the MS. was loſt at the unfortunate battle of Pultowa.

CHARLES's-cape, a promontory of Virginia, in North-America, forming the northern head-land of the ſtrait that enters the bay of Cheaſepeak.

Charles's-Fort, a fortreſs in the county of Cork, and province of Munſter, in Ireland, ſituated at the mouth of Kinſale harbour. W. Long. 8. 20. and N. Lat. 51. 21.

Morſe's Geography.

CHARLESTON, the capital of the ſtate of South-Carolina, is the only conſiderable town in that ſtate. It is ſituated on the tongue of land which is formed by the the confluence of Aſhley and Cooper rivers, which are large and navigable. Theſe rivers mingle their waters immediately below the town, and form a ſpacious and convenient harbour, which communicates with the ocean at Sullivan's iſland, ſeven miles ſouth-eaſt of the town. In theſe rivers the tide riſes, in common, about five feet. The continued agitation which this occaſions in the waters which almoſt ſurround Charleſton, and the refreſhing ſea breezes which are regularly felt, render Charleſton more healthy than any part of the low country in the ſouthern ſtates. On this account it is the reſort of great numbers of gentlemen, invalids from the Weſt-India iſlands, and of the rich planters from the country, who come here to ſpend the *ſickly months*, as they are called, in queſt of health and of the ſocial enjoyments which the city affords. And in no part of America are the ſocial bleſſings enjoyed more rationally and liberally than in Charleſton. Unaffected hoſpitality—affability—eaſe in manners and addreſs—and a diſpoſition to make their gueſts welcome, eaſy and pleaſed with themſelves, are characteriſtics of the reſpectable people in Charleſton.

The land on which the town is built is flat and low, and the water brackiſh and unwholeſome. The inhabitants are obliged to raiſe banks of earth as barriers to defend themſelves againſt the higher floods of the ſea. The ſtreets from eaſt to weſt extend from river to river, and running in a ſtraight line, not only open beautiful proſpects each way, but afford excellent opportunities, by means of ſubterranean drains, for removing all nuiſances and keeping the city clean and healthy. Theſe ſtreets are interſected by others, nearly at right angles, and throw the town into a number of ſquares, with dwelling houſes in front, and office houſes and little gardens behind. Some of the ſtreets are conveniently wide, but moſt of them are much too narrow, eſpecially for ſo populous a city, in ſo warm a climate. From their confined ſituation, they have been found extremely inconvenient in caſe of fires, the deſtructive effects of which have been frequently felt in this city. The houſes, which have been lately built, are brick, with tiled roofs. Some of the buildings in Charleſton are elegant, and moſt of them are neat, airy, and well furniſhed. The public buildings are an exchange, ſtate-houſe, armoury, poor-houſe, two large churches for Epiſcopalians, two for Congregationaliſts or Independents, one for Scotch Preſbyterians, two for the Baptiſts, one for the German Lutherans, one for the Methodiſts, one for French Proteſtants—beſides a meeting houſe for Quakers, and two Jewiſh ſynagogues, one for the Portugueſe, the other for the German Jews. There are upwards of a thouſand Roman Catholics in Charleſton, but they have no public building for worſhip.

In 1787, there were 1,600 houſes in this city, and 9,600 white inhabitants, and 5,400 negroes: and what evinces the healthineſs of the place, upwards of 200 of the white inhabitants were above ſixty years of age.

Charleſton was incorporated in 1783, and divided into 13 wards, who chooſe as many wardens, who, from among themſelves, elect an intendant of the city. The intendant and wardens form the city council, who have power to make and enforce bye-laws for the regulation of the city. W. Long. 79. 0. and N. Lat. 32. 30.

Charles's-Wain, in aſtronomy, ſeven ſtars in the conſtellation called *urſa major*, or the Great Bear.

CHARLETON, an iſland at the bottom of Hudſon's-bay, in North-America, ſubject to Great-Britain. W. Long. 80. 0. and N. Lat. 52. 30.

Charleton, (Walter) a learned Engliſh phyſician born in 1619, was phyſician in ordinary to Charles I. and Charles II. one of the firſt members of the royal ſociety, and preſident of the college of phyſicians. He wrote on various ſubjects; but at laſt his narrow circumſtances obliged him to retire to the iſland of Jerſey, where he died in 1707.

CHARLOCK, the Engliſh name of the Raphanus; it is a very troubleſome weed among corn, being more frequent than almoſt any other. There are two principal kinds of it; the one with a yellow flower, the other with a white. Some fields are particularly ſubject to be over-run with it, eſpecially thoſe which have been manured with cow-dung alone, that being a manure very favourable to the growth of it. The farmers in ſome places are ſo ſenſible of this, that they always mix horſe-dung with their cow-dung, when they uſe it for arable land. When barley, as is often the caſe, is infeſted with this weed to ſuch a degree as to endanger the crop, it is a very good method to mow down the charlock in May, when it is in flower, cutting it ſo low as juſt to take off the tops of the leaves of barley with it: by this means the barley will get up above the weed: and people have got four quarters of grain from an acre of ſuch land as would have ſcarce yielded any thing without this expedient. Where any land is particularly ſubject to this weed, the beſt method is to ſow it with graſs ſeed, and make a paſture of it; for then the plant will not be troubleſome, it never growing where there is a coat of graſs upon the ground.

Queen CHARLOTTE's Island, an iſland in the South Sea, firſt diſcovered by captain Wallis in the Dolphin, in 1767, who took poſſeſſion of it in the name of King George III. Here is good water, and plenty of cocoa-nuts, palm-nuts, and ſcurvy-graſs. The inhabitants are of a middle ſtature, and dark complexion, with long hair hanging over their ſhoulders; the

the men are well made, and the women handſome; their cloathing is a kind of coarſe cloth, or matting, which they faſten about their middle.

Queen Charlotte's *Iſlands*, a cluſter of South-ſea iſlands diſcovered in 1767 by captain Carteret. He counted ſeven, and there were ſuppoſed to be many more. The inhabitants of theſe iſlands are deſcribed as extremely nimble and vigorous, and almoſt as well qualified to live in the water as upon land: they are very warlike; and, on a quarrel with ſome of captain Carteret's people, they attacked them with great reſolution; mortally wounded the maſter and three of the ſailors; were not at all intimidated by the fire-arms; and at laſt, notwithſtanding the averſion of captain Carteret to ſhed blood, he was obliged to ſecure the watering places by firing grape-ſhot into the woods, which deſtroyed many of the inhabitants. Theſe iſlands lie in S. Lat. 11°. E. Long. 164°. They are ſuppoſed to be the Santa Cruz of Mandana, who died there in 1595.

CHARM, a term derived from the Latin *carmen*, a "verſe;" and uſed to denote a magic power, or ſpell, by which, with the aſſiſtance of the devil, ſorcerers and witches, were ſuppoſed to do wonderful things, far ſurpaſſing the power of nature.

CHARNEL, or Charnel-house, a kind of portico or gallery, uſually in or near a church-yard, over which were anciently laid the bones of the dead, after the fleſh was wholly conſumed. Charnel-houſes are now uſually adjoining to the church.

CHARON, in fabulous hiſtory, the ſon of Erebus and Nox, whoſe office was to ferry the ſouls of the deceaſed over the waters of Acheron, for which each ſoul was to pay a piece of money. For this reaſon the Pagans had a cuſtom of putting a piece of money into the mouth of the dead, in order that they might have ſomething to pay Charon for their paſſage.

CHARONDAS, a celebrated legiſlator of the Thurians, and a native of Catanea in Sicily, flouriſhed 446 before Chriſt. He forbad any perſon's appearing armed in the public aſſemblies of the nation; but one day going thither in haſte, without thinking of his ſword, he was no ſooner made to obſerve his miſtake than he ran it through his body.

CHAROST, a town of France, in Berry, with the title of a duchy. It is ſeated on the river Arnon, E. Long. 2. 15. N. Lat. 46. 56.

CHAROUX, a town of France, in the Bourbonnois, ſeated on an eminence, near the river Sioulle. It has two pariſhes, which are in different dioceſes. E. Long. 3. 15. N. Lat. 46. 10.

CHARPENTIER, (Francis) dean of the French academy, was born in 1620. His early capacity inclined his friends to educate him for the bar: but he was much more delighted with the ſtudy of languages and antiquity than of the law; and preferred repoſe to tumult. M. Colbert made uſe of him in eſtabliſhing his new academy of medals and inſcriptions; and no perſon of that learned ſociety contributed more than himſelf towards that noble ſeries of medals which were ſtruck on the conſiderable events that diſtinguiſhed the reign of Louis XIV. He publiſhed ſeveral works, which were all well received; and died in 1702.

CHARR, in ichthyology. See Salmo.

CHARRON, (Peter) the author of a book intitled *Of Wiſdom*, which gained him great reputation, was born at Paris in the year 1541. After being advocate in the parliament of Paris for five or ſix years, he applied himſelf to divinity; and became ſo great a preacher, that the biſhops of ſeveral dioceſes offered him the higheſt dignities in their gift. He died at Paris, ſuddenly in the ſtreet, November 16, 1603.

CHART, or Sea-chart, an hydrographical map, or a projection of ſome part of the earth's ſuperficies *in plano*, for the uſe of navigators.

Charts differ very conſiderably from geographical or land-maps, which are of no uſe in navigation. Nor are ſea-charts all of the ſame kind, ſome being what we call plane-charts others, mercator-charts, and others globular-charts.

Plane-Chart, is a repreſentation of ſome part of the ſuperficies of the terraqueous globe, in which the meridians are ſuppoſed parallel to each other, the parallels of latitude at equal diſtances, and conſequently the degrees of latitude and longitude every where equal to each other. See *Plane-Chart*.

Mercator's-Chart, is that where the meridians are ſtraight lines, parallel to each other, and equidiſtant; the parallels are alſo ſtraight lines, and parallel to each other: but the diſtance between them increaſes from the equinoctial towards either pole, in the ratio of the ſecant of the latitude to the radius. See Navigation.

Globular-Chart, a meridional projection, wherein the diſtance of the eye from the plane of the meridian, upon which the projection is made, is ſuppoſed to be equal to the ſine of the angle 45°. This projection comes the neareſt of all to the nature of the globe, becauſe the meridians therein are placed at equal diſtances; the parallels alſo are nearly equidiſtant, and conſequently the ſeveral parts of the earth have their proper proportion of magnitude, diſtance, and ſituation, nearly the ſame as on the globe itſelf. See *Globular Projection*.

Hydrographic Charts, ſheets of large paper, whereon ſeveral parts of the land and ſea are deſcribed, with their reſpective coaſts, harbours, ſounds, flats, rocks, ſhelves, ſands, &c. together with the longitude and latitude of each place, and the points of the compaſs. See *Mercator's-Chart*.

Selenographic-Charts, particular deſcriptions of the ſpots, appearances, and maculæ of the moon. See Astronomy, n° 63. and 140.

Topographic-Charts, draughts of ſome ſmall parts of the earth only, or of ſome particular places, without regard to its relative ſituation, as London, York, &c.

CHARTA, or Carta, primarily ſignifies a ſort of paper made of the plant *papyrus* or *biblus*. See Paper and Charter.

Charta-Emporetica, in pharmacy, &c. a kind of paper made very ſoft and porous, uſed to filter withal. See Filtration, &c.

Charta is alſo uſed in ancient cuſtoms for a charter, or deed in writing. See Charter.

Magna Charta, the great charter of the liberties of Britain, and the baſis of their laws and privileges.

Charta.

This charter may be ſaid to derive its origin from king Edward the Confeſſor, who granted ſeveral privileges to the church and ſtate by charter: theſe liberties and privileges were alſo granted and confirmed by king Henry I. by a celebrated great charter now loſt; but which was confirmed or re-enacted by king Henry II. and king John. Henry III. the ſucceſſor of this laſt prince, after having cauſed 12 men make inquiry into the liberties of England in the reign of Henry I. granted a new charter; which was the ſame as the preſent magna charta. This he ſeveral times confirmed, and as often broke; till, in the 37th year of his reign, he went to Weſtminſter-hall, and there, in preſence of the nobility and biſhops, who held lighted candles in their hands, magna charta was read, the king all the time holding his hand to his breaſt, and at laſt ſolemnly ſwearing faithfully and inviolably to obſerve all the things therein contained, &c. Then the biſhops extinguiſhing the candles, and throwing them on the ground, they all cried out, "Thus let him be extinguiſhed, and ſtink in hell, who violates this charter." It is obſerved, that, notwithſtanding the ſolemnity of this confirmation, king Henry, the very next year, again invaded the rights of his people, till the barons entered into a war againſt him; when, after various ſucceſs, he confirmed this charter, and the charter of the foreſt, in the 52d year of his reign.

This charter confirmed many liberties of the church, and redreſſed many grievances incident to feodal tenures, of no ſmall moment at the time; tho' now, unleſs conſidered attentively and with this retroſpect, they ſeem but of trifling concern. But, beſides theſe feodal proviſions, care was alſo taken therein to protect the ſubject againſt other oppreſſions, then frequently ariſing from unreaſonable amercements, from illegal diſtreſſes, or other proceſs for debts or ſervices due to the crown, and from the tyrannical abuſe of the prerogative of purveyance and pre-emption. It fixed the forfeiture of lands for felony in the ſame manner as it ſtill remains; prohibited for the future the grants of excluſive fiſheries; and the erection of new bridges ſo as to oppreſs the neighbourhood. With reſpect to private rights, it eſtabliſhed the teſtamentary power of the ſubject over part of his perſonal eſtate, the reſt being diſtributed among his wife and children; it laid down the law of dower, as it hath continued ever ſince; and prohibited the appeals of women, unleſs after the death of their huſbands. In matters of public police and national concern, it enjoined an uniformity of weights and meaſures; gave new encouragements to commerce, by the protection of merchant-ſtrangers; and forbad the alienation of lands in mortmain. With regard to the adminiſtration of juſtice: beſides prohibiting all denials or delays of it, it fixed the court of common-pleas at Weſtminſter, that the ſuitors might no longer be harraſſed with following the king's perſon in all his progreſſes; and at the ſame time brought the trial of iſſues home to the very doors of the freeholders, by directing aſſizes to be taken in the proper counties, and eſtabliſhing annual circuits: it alſo corrected ſome abuſes then incident to the trials by wager of law and of battle; directed the regular awarding of inqueſts for life or member; prohibited the king's inferior miniſters from holding pleas of the crown, or trying any criminal charge, whereby many forfeitures might otherwiſe have unjuſtly accrued to the exchequer; and regulated the time and place of holding the inferior tribunals of juſtice, the county-court, ſheriff's torn, and court leet. It confirmed and eſtabliſhed the liberties of the city of London, and all other cities, boroughs, towns, and ports of the kingdom. And laſtly (which alone would have merited the title that it bears, of the *great charter*), it protected every individual of the nation in the free enjoyment of his life, his liberty, and his property, unleſs declared to be forfeited by the judgment of his peers, or the law of the land.

This excellent charter, ſo equitable, and beneficial to the ſubject, is the moſt ancient written law in the kingdom. By the 25th Edward I. it is ordained, that it ſhall be taken as the common law; and by the 43d Edward III. all ſtatutes made againſt it are declared to be void.

Charter, Charter-party.

CHARTER, in law, a written inſtrument, or evidence of things acted between one perſon and another. The word charter comes from the Latin *charta*, anciently uſed for a public and authentic act, a donation, contract, or the like; from the Greek χαρτης, "thick paper" or "paſteboard," whereon public acts were wont to be written. Britton divides charters into thoſe of the king, and thoſe of private perſons. 1. Charters of the king, are thoſe whereby the king paſſeth any grant to any perſon or body politic, as a *charter of exemption* of privilege, &c.; *charter of pardon*, whereby a man is forgiven a felony, or other offence committed againſt the king's crown and dignity; *charter of the foreſt*, wherein the laws of the foreſt are compriſed, ſuch as the charter of Canutus, &c. 2. Charters of private perſons, are deeds and inſtruments for the conveyance of lands, &c. And the purchaſer of lands ſhall have all the charters, deeds, and evidences, as incident to the ſame, and for the maintenance of his title.

Charter-Governments in America. See Colony.

Charter-Land, ſuch land as a perſon holds by charter; that is, by evidence in writing, otherwiſe called freehold.

CHARTERPARTY, in commerce, denotes the inſtrument of freightage, or articles of agreement for the hire of a veſſel. See Freight, &c.

The charterparty is to be in writing; and to be ſigned both by the proprietor or the maſter of the ſhip, and the merchant who freights it. It is to contain the name and the burden of the veſſel; the names of the maſter and the freighter; the price or rate of freight; and the time of loading and unloading; and the other conditions agreed on. It is properly a deed, or policy, whereby the maſter or proprietor of the veſſel engages to furniſh immediately a tight ſound veſſel, well equipped, caulked, and ſtopped, provided with anchors, ſails, cordage, and all other furniture to make the voyage required, as equipage, hands, victuals, and other munitions; in conſideration of a certain ſum to be paid by the merchant for the freight. Laſtly, the ſhip with all its furniture, and the cargo, are reſpectively ſubjected to the conditions of the *charterparty*. The *charterparty* differs from a *bill of lading*, in that the firſt is for the entire freight or lading, and that both for going and returning; whereas the latter is only for a part of the freight, or at moſt only for the voyage one way.

The preſent Boyer ſays, the word comes from hence, that *per medium charta incidebatur, et ſic fiebat charta partita*; becauſe, in the time when notaries were leſs common, there was only one inſtrument made for both parties: this they cut in two, and gave each his proportion; joining them together at their return, to know if each had done his part. This he obſerves to have ſeen practiſed in his time; agreeable to the method of the Romans, who, in their ſtipulations, uſed to break a ſtaff, each party retaining a moiety thereof as a mark.

CHARTOPHYLAX, the name of an officer of the church of Conſtantinople, who attends at the door of the rails when the ſacrament is adminiſtered, and gives notice to the prieſts to come to the holy table. He repreſents the patriarch upon the bench, tries all eccleſiaſtical cauſes, keeps all the marriage regiſters, aſſiſts at the conſecration of biſhops, and preſents the biſhop elect at the ſolemnity, and likewiſe all other ſubordinate clergy. This office reſembles in ſome ſhape that of the *bibliothecarius* at Rome.

CHARTRES, a large city of France, in the province of Orleanois, ſituated on the river Eure, in E. Long. 1. 32. N. Lat. 48. 47. It is a biſhop's ſee.

CHARTREUSE, or CHARTREUSE-GRAND, a celebrated monaſtery, the capital of all the convents of the Carthuſian monks, ſituated on a ſteep rock in the middle of a large foreſt of fir-trees, about ſeven miles north-eaſt of Grenoble, in the province of Dauphine in France: E. Long. 5. 5. N. Lat. 45. 20. See CARTHUSIANS.

From this mother-convent, all the others of the ſame order take their name; among which was the Chartreuſe of London, corruptly called the charterhouſe, now converted into an hoſpital, and endowed with a revenue of 600l. *per ann.*

Here are maintained 80 decayed gentlemen, not under 50 years of age: alſo forty boys are educated and fitted either for the univerſity or trades. Thoſe ſent to the univerſity, have an exhibition of 20l. a year for eight years; and have an immediate title to nine church-livings in the gift of the governors of the hoſpital, who are ſixteen in number, all perſons of the firſt diſtinction, and take their turns in the nomination of penſioners and ſcholars.

CHARTULARY, CHARTULARIUS, a title given to an ancient officer in the Latin church, who had the care of charters and papers relating to public affairs. The chartulary preſided in eccleſiaſtical judgments, in lieu of the pope. In the Greek church the chartulary was called *chartophylax*; but his office was there much more conſiderable; and ſome even diſtinguiſh the chartulary from the chartophylax in the Greek church. See CHARTOPHYLAX.

CHARYBDIS, (anc. geog.) a whirlpool in the ſtraits of Meſſina, according to the poets; near Sicily, and oppoſite to Scylla, a rock on the coaſt of Italy. Thucydides makes it to be only a ſtrong flux and reflux in the ſtrait, or a violent reciprocation of the tide, eſpecially if the wind ſets ſouth. But on diving into the Charybdis, there are found vaſt gulphs and whirlpools below, which produce all the commotion on the ſurface of the water.

Charybdis is uſed by Horace to denote a rapacious proſtitute.

CHASE, or CHACE, in law, is uſed for a driving of cattle to or from any place; as to a diſtreſs, or fort-let, *&c.*

CHASE, or *Chace*, is alſo a place of retreat for deer and wild beaſts; of a middle kind between a foreſt and a park, being uſually leſs than a foreſt, and not poſſeſſed of ſo many privileges; but wanting, *v. g.* courts of attachment, ſwainmote, and juſtice-ſeat.* Yet it is of a large extent, and ſtocked both with a greater diverſity of wild beaſts or game, and more keepers than a park. Crompton obſerves, that a foreſt cannot be in the hands of a ſubject, but it forthwith loſes its name, and becomes a *chaſe*; in regard all thoſe courts loſe their nature when they come into the hands of a ſubject; and that none but a king can make a lord chief juſtice in eyre of the foreſt. See JUSTICE *in Eyre*.

* See *Foreſt*.

“When our barons began to form a power, they claimed a vaſt, but more limited, tract for a diverſion that the Engliſh were always fond of. They were very jealous of any encroachments on their reſpective bounds, which were often the cauſe of deadly feuds: ſuch a one gave cauſe to the fatal day of *Chevy-chace*; a fact which, though recorded only in a ballad, may, from what we know of the manners of the times, be founded on truth: not that it was attended with all the circumſtances which the author of that natural but heroic compoſition hath given it; for, on that day, neither a *Percy* nor a *Douglas* fell: here the poet ſeems to have claimed his privilege, and mixed with this fray ſome of the events of the battle of *Otterbourne*.”

Britiſh Zool. i. 42.

CHASE, in the ſea-language, is to purſue a ſhip; which is alſo called *giving chaſe*.

Stern CHASE, is when the chaſer follows the chaſed aſtern directly upon the ſame point of the compaſs.

To lie with a ſhip's fore-foot in a CHASE, is to ſail and meet with her by the neareſt diſtance; and ſo to croſs her in her way, or to come acroſs her fore-foot.

A ſhip is ſaid to have a *good chaſe*, when ſhe is ſo built foreward on, or a-ſtern, that ſhe can carry many guns to ſhoot forwards or backwards; according to which ſhe is ſaid to have a *good foreward*, or *good ſtern chaſe*.

CHASE-Guns, are ſuch whoſe ports are either in the head (and then they are uſed in chaſing of others); or in the ſtern, which are only uſeful when they are purſued or chaſed by any other ſhip.

CHASE of a Gun, is the whole bore or length of a piece taken within-ſide.

Wild-gooſe CHACE, a term uſed to expreſs a ſort of racing on horſeback uſed formerly, which reſembled the flying of wild-geeſe; thoſe birds generally going in a train one after another, not in confuſed flocks as other birds do. In this ſort of race the two horſes, after running twelve ſcore yards, had liberty, which horſe ſoever could take the leading, to ride what ground the jockey pleaſed, the hindmoſt horſe being bound to follow him within a certain diſtance agreed on by the articles, or elſe to be whipped in by the tryers and judges who rode by; and whichever horſe could diſtance the other, won the race. This ſort of racing was not long in common uſe; for it was found inhuman, and deſtructive to good horſes, when two ſuch were matched together. For in this caſe neither was able to diſtance the other till they were both ready to ſink under their riders; and often two very good horſes were both ſpoiled, and the wagers forced to be drawn at laſt. The miſchief of this ſort of racing ſoon brought in the method now in uſe, of running only for a certain quantity of ground, and determining the plate or wager by the coming in firſt at the poſt.

CHASING of Gold, Silver, &c. See ENCHASING.

CHASTE-TREE. See Vitex.

CHASTITY; purity of the body, or freedom from obſcenity.—The Roman law juſtifies homicide in defence of the chaſtity either of one's ſelf or relations; and ſo alſo, according to Selden, ſtood the law in the Jewiſh republic. Our law likewiſe juſtifies a woman for killing a man who attempts to raviſh her. So the huſband or father may juſtify killing a man who attempts a rape upon his wife or daughter; but not if he takes them in adultery by conſent: for the one is forcible and felonious, but not the other.

Chaſtity is a virtue univerſally celebrated. There is indeed no charm in the female ſex that can ſupply its place. Without it, beauty is unlovely, and rank is contemptible; good breeding degenerates into wantonneſs, and wit into impudence. Out of the numerous inſtances of eminent chaſtity recorded by authors, the two following are ſelected on account of the leſſon afforded by the different modes of conduct which they exhibit.

Lucretia was a lady of great beauty and noble extraction: ſhe married Collatinus, a relation of Tarquinius Superbus, king of Rome. During the ſiege of Ardea, which laſted much longer than was expected, the young princes paſſed their time in entertainments and diverſions. One day as they were at ſupper,* at Sextus Tarquin's the king's eldeſt ſon, with Collatinus, Lucretia's huſband, the converſation turned to the merit of their wives: every one gave his own the preference. "What ſignify ſo many words?" ſays Collatinus; "you may in a few hours, if you pleaſe, be convinced by your own eyes, how much my Lucretia excels the reſt. We are young: let us mount our horſes, and go and ſurpriſe them. Nothing can better decide our diſpute than the ſtate we ſhall find them in at a time when moſt certainly they will not expect us." They were a little warmed with wine: "Come on, let us go," they all cried together. They quickly galloped to Rome, which was about twenty miles from Ardea, where they find the princeſſes, wives of the young Tarquins, ſurrounded with company, and every circumſtance of the higheſt mirth and pleaſure. From thence they rode to Collatia, where they ſaw Lucretia in a very different ſituation. With her maids about her, ſhe was at work in the inner part of her houſe, talking on the dangers to which her huſband was expoſed. The victory was adjudged to her unanimouſly. She received her gueſts with all poſſible politeneſs and civility. Lucretia's virtue, which ſhould have commanded reſpect, was the very thing which kindled in the breaſt of Sextus Tarquin a ſtrong and deteſtable paſſion. Within a few days he returned to Collatia; and upon the plauſible excuſe he made for his viſit, he was received with all the politeneſs due to a near relation, and the eldeſt ſon of a king. Watching the fitteſt opportunity, he declares the paſſion ſhe had excited at his laſt viſit, and employed the moſt tender entreaties, and all the artifices poſſible, to touch a woman's heart; but all to no purpoſe. He then endeavoured to extort her compliance by the moſt terrible threatenings. It was in vain. She ſtill perſiſted in her reſolution; nor could ſhe be moved, even by the fear of death. But when the monſter told her that he would firſt diſpatch her, and then having murdered a ſlave, would lay him by her ſide, after which he would ſpread a report, that having caught them in the act of adultery, he had puniſhed them as they deſerved; this ſeemed to ſhake her reſolution. She heſitated, not knowing which of theſe dreadful alternatives to take, whether, by conſenting, to diſhonour the bed of her huſband, whom ſhe tenderly loved; or, by refuſing, to die under the odious character of having proſtituted her perſon to the luſt of a ſlave. He ſaw the ſtruggle of her ſoul; and ſeized the unlucky moment, obtained an inglorious conqueſt. Thus Lucretia's virtue, which had been proof againſt the fear of death, could not hold out againſt the fear of infamy. The young prince, having gratified his paſſion, returned home as in triumph. On the morrow, Lucretia, overwhelmed with grief and deſpair, ſent early in the morning to deſire her father and her huſband to come to her, and bring with them each a truſty friend, aſſuring them there was no time to loſe. They came with all ſpeed, the one accompanied with Valerius (ſo famous after under the name of Publicola), and the other with Brutus. The moment ſhe ſaw them come, ſhe could not command her tears; and when her huſband aſked her if all was well? "By no means," ſaid ſhe, "it cannot be well with a woman after ſhe has loſt her honour. Yes, Collatinus, thy bed has been defiled by a ſtranger: but my body only is polluted; my mind is innocent, as my death ſhall witneſs. Promiſe me only not to ſuffer the adulterer to go unpuniſhed: it is Sextus Tarquinius, who laſt night, treacherous gueſt, or rather cruel foe, offered me violence, and reaped a joy fatal to me; but, if you are men, it will be ſtill more fatal to him." All promiſed to revenge her; and, at the ſame time, tried to comfort her with repreſenting, "That the mind only ſins, not the body; and where the conſent is wanting, there can be no guilt." "What Sextus deſerves," replies Lucretia, "I leave you to judge; but for me, though I declare myſelf innocent of the crime, I exempt not myſelf from puniſhment. No immodeſt woman ſhall plead Lucretia's example to outlive her diſhonour." Thus ſaying, ſhe plunged into her breaſt a dagger ſhe had concealed under her robe, and expired at their feet. Lucretia's tragical death has been praiſed and extolled by Pagan writers, as the higheſt and moſt noble act of heroiſm. The goſpel thinks not ſo: it is murder, even according to Lucretia's own principles, ſince ſhe puniſhed with death an innocent perſon, at leaſt acknowledged as ſuch by herſelf. She was ignorant that our life is not in our own power, but in his diſpoſal from whom we receive it. St Auſtin, who carefully examines, in his book *De Civitate Dei*, what we are to think of Lucretia's death, conſiders it not as a courageous action, flowing from

* *Liv.* l. i. c. 56—60. *Dionyſ.* l. iv. p. 261—277. *Flor.* l. iii. 9.

a true love of chaſtity, but as an infirmity of a woman too ſenſible of worldly fame and glory; and who, from a dread of appearing in the eyes of men an accomplice of the violence ſhe abhorred, and of a crime to which ſhe was entirely a ſtranger, commits a real crime upon herſelf voluntarily and deſignedly. But what cannot be ſufficienly admired in this Roman lady is her abhorrence of adultery, which ſhe ſeems to hold ſo deteſtable as not to bear the thoughts of it. In this ſenſe, ſhe is a noble example for all her ſex.

Chiomara, the wife of Ortiagon, a Gauliſh prince, was equally admirable for her beauty and chaſtity. During the war between the Romans and the Gauls, A. R. 563, the latter were totally defeated on Mount Olympus. Chiomara, among many other ladies, was taken priſoner, and committed to the care of a centurion, no leſs paſſionate for money than women. He, at firſt, endeavoured to gain her conſent to his infamous deſires; but not being able to prevail upon her, and ſubvert her conſtancy, he thought he might employ force with a woman whom misfortune had reduced to ſlavery. Afterwards, to make her amends for that treatment, he offered to reſtore her liberty; but not without ranſom. He agreed with her for a certain ſum, and to conceal this deſign from the other Romans, he permitted her to ſend any of the priſoners ſhe ſhould choſe to her relations, and aſſigned a place near the river where the lady ſhould be exchanged for gold. By accident there was one of her own ſlaves amongſt the priſoners. Upon him ſhe fixed; and the centurion ſoon after carried her beyond the advanced poſts, under cover of a dark night. The next evening two of the relations of the princeſs came to the place appointed, whether the centurion alſo carried his captive. When they had delivered him the Attic talent they had brought, which was the ſum they had agreed on, the lady, in her own language, ordered thoſe who came to receive her to draw their ſwords and kill the centurion, who was then amuſing himſelf with weighing the gold. Then, charmed with having revenged the injury done her chaſtity, ſhe took the head of the officer, which ſhe had cut off with her own hands, and hiding it under her robe, went to her huſband Ortiagon, who had returned home after the defeat of his troops. As ſoon as ſhe came into his preſence, ſhe threw the centurion's head at his feet. He was ſtrangely ſurpriſed at ſuch a ſight; and aſked her whoſe head it was, and what had induced her to do an act ſo uncommon to her ſex? With a face covered with a ſudden bluſh, and at the ſame time expreſſing her fierce indignation, ſhe declared the outrage which had been done her, and the revenge ſhe had taken for it. During the reſt of her life, ſhe ſtedfaſtly retained the ſame attachment for the purity of manners which conſtitutes the principal glory of the ſex, and nobly ſuſtained the honour of ſo glorious, bold, and heroic an action.—This lady was much more prudent than Lucretia, in revenging her injured honour by the death of her raviſher, rather than by her own. Plutarch relates this fact, in his treatiſe upon the virtue and great actions of women; and it is from him we have the name of this, which is well worthy of being tranſmitted to poſterity.

The above virtue in men is termed *continence*. See CONTINENCE.

CHATEAU-BRIANT, a town of France in Brittany, with an old caſtle. W. Long. 1. 20. N. Lat. 47. 40.

CHATEAU-Chinon, a town of France in Nivernois, and capital of Morvant, with a conſiderable manufacture of cloth. E. Long. 3. 48. N. Lat. 47. 2.

CHATEAU-Dauphin, a very ſtrong caſtle of Piedmont in Italy, and in the marquiſate of Saluces, belonging to the king of Sardinia. It was taken by the combined army of France and Spain in 1744, and was reſtored by the treaty of Aix-la-Chapelle.

CHATEAU-du-Loir, a town of France in the Maine, famous for ſuſtaining a ſiege of ſeven years againſt the Count of Mans. It is ſeated on the river Loir, in E. Long. 0. 25. N. Lat. 47. 40.

CHATEAU-Dun, an ancient town of France, and capital of the Dunois, with a caſtle and rich monaſtery; ſeated on an eminence near the river Loir, in E. Long 1. 26. N. Lat. 48. 4.

CHATEAU-Neuf, the name of ſeveral towns of France, *viz.* one in Perche; another in Angumois, on the river Charente, near Anguoſeline; a third in Berry, ſeated on the river Cher; and ſeveral other ſmall places.

CHATEAU-Portien, a town of France, in Champagne, and in a diſtrict called Portien, with a caſtle built on a rock, near the river Aine. E. Long. 4. 23. N. Lat. 49. 35.

CHATEAU-Renaud, a town of France, in the Gatenois, where clothes are made for the army, and where there is a trade in ſaffron. E. Long. 2. 25. N. Lat. 48. 0. This is alſo the name of a town of Touraine, in France, with the title of a marquiſate. E. Long. 2. 41. N. Lat. 47. 22.

CHATEAU-Roux, a town of France, in Berry, with the title of a duchy. It has a cloth-manufacture, and is ſeated in a very large pleaſant plain on the river Indre. in E. Long. 1. 47. N. Lat. 46. 49.

CHATEAU-Thierra, a town of France, in Champagne, with the title of a duchy, and a handſome caſtle on an eminence, ſeated on the river Maine, in E. Long. 3. 23. N. Lat. 49. 12.

CHATEAU-Vilain, a town of France, in Champagne, with a caſtle, and the title of a duchy; ſeated on the river Anjou. E. Long. 2. 59. N. Lat. 48. 0.

CHATEL, or CHATE, a town of Lorrain, in the Voſque, ſeated on the river Moſelle, eight miles from Mirecourt.

CHATEL-Aillon, a maritime town of France, in Saintonge, five miles from Rochelle; formerly very conſiderable, but is now greatly decayed.

CHATEL-Chalon, a town of France, in Franche Compte, remarkable for its abbey of benedictine nuns. E. Long. 5. 25. N. Lat. 46. 50.

CHATELET, a town of the Netherlands, in Namur, ſeated on the Sambre, in the biſhopric of Leige. E. Long. 4. 28. N. Lat. 50. 25.

CHATELET, the name of certain courts of juſtice eſtabliſhed in ſeveral cities in France. The grand chatelet at Paris is the place where the preſidial or ordinary court of juſtice of the provoſt of Paris is kept; conſiſting of a preſidial, a civil chamber, a criminal chamber, and a chamber of policy. The little chatelet is an old fort, now ſerving as a priſon.

CHATELLERAULT, a town of France, in Poitou, ton, with the title of a duchy; ſeated in a fertile and pleaſant country, on the river Vienne, over which there is a handſome ſtone-bridge. E. Long. 0. 40. N. Lat. 46. 34.

CHATHAM, a town of Kent, in England, adjoining to Rocheſter, and ſeated on the river Medway. It is the principal ſtation of the royal navy; and the yards and magazines are furniſhed with all kinds of naval ſtores, as well as materials for building and rigging the largeſt men of war. The entrance into the river Medway is defended by Sheerneſs and other forts; notwithſtanding which, the Dutch fleet burnt ſeveral ſhips of war here in the reign of Charles II. after the peace of Breda had been agreed upon. In the year 1757, by direction of the Duke of Cumberland, ſeveral additional fortifications were begun at Chatham; ſo that now the ſhips are in no danger of an inſult either by land or water. It has a church, a chapel of eaſe, and a ſhip uſed as a church for the ſailors. It has likewiſe about 500 houſes, moſtly low, and built with brick; the ſtreets are narrow, and paved; and it contains about 3000 inhabitants. The principal employment of the labouring hands is ſhip-building in the king's yard and private docks. This town gave title of Earl to that great ſtateſman William Pitt in the reigns of George II. and III. E. Long. 0. 40. N. Lat. 51. 20.

CHATIGAN, a town of Aſia, in the kingdom of Bengal, on the moſt eaſterly branch of the river Ganges. It is but a poor place, though it was the firſt the Portugueſe ſettled at in theſe parts, and who ſtill keep a ſort of poſſeſſion. It has but a few cotton manufactures; but affords the beſt timber for building of any place about it. The inhabitants are ſo ſuſpicious of each other, that they always go armed with a ſword, piſtol, and blunderbuſs, not excepting the prieſts. It is ſubject to the great Mogul. E. Long. 91. 10. N. Lat. 23. 0.

CHATILLON-SUR-SEINE, a town of France, in Burgundy, divided into two by the river Seine. It is 32 miles from Langres, and 40 from Dijon; and has iron works in its neigbourhood. E. Long. 4. 33. N. Lat. 47. 45.

CHATRE, a town of France, in Berry, ſeated on the river Indres, 37 miles from Bourges. It carries on a conſiderable trade in cattle. E. Long. 1. 55. N. Lat. 46. 35.

CHATTELS, a Norman term, under which were anciently comprehended all moveable goods; thoſe immoveable being termed *fief*, or *fee*.

CHATTELS, in the modern ſenſe of the word, are all ſorts of goods, moveable or immoveable, except ſuch as are in the nature of freehold.

CHATTERER, in ornithology. See AMPELIS.

CHATTERTON, (Thomas) a late unfortunate poet, whoſe fate and performances have excited in no ſmall degree the public attention, as well as given riſe to much literary controverſy. He was born at Briſtol, Nov. 20, 1752; and educated at a charity-ſchool on St Auguſtin's Back, where nothing more was taught than reading, writing, and accounts. At 14 years of age, he was articled clerk to an attorney at Briſtol, with whom he continued about three years; yet, though his education was thus confined, he diſcovered an early turn towards poetry and Engliſh antiquities, and particularly towards heraldry. How ſoon he began to be an author is not known. In the Town and Country Magazine for March 1769, are two letters, probably from him, as they are dated from Briſtol, and ſubſcribed with his uſually ſignature, D. B. that is, *Dunhelmus Briſtolienſis*. The former contains ſhort extracts from two MSS. "written 300 years ago by one Rowley a monk," concerning dreſs in the age of Henry II.; the latter, "Ethelgar, a Saxon poem," in bombaſt proſe. In the ſame magazine for May 1769, are three communications from Briſtol, with the ſame ſignature D. B. one of them intitled "Obſervations upon Saxon Heraldry,' with drawings of Saxon Atchievements;" and in the ſubſequent months of 1769 and 1770, there are ſeveral other pieces in the ſame magazine, which are undoubtedly of his compoſition.

In April 1770, he left Briſtol, diſguſted with his profeſſion, and irreconcileable to the line of life in which he was placed; and going to London in hopes of advancing his fortune by his pen, he ſunk at once from the ſublimity of his views to an abſolute dependence on the patronage of bookſellers. Things, however, ſeem ſoon to have brightened up a little with him; for, May 14, he writes to his mother, in high ſpirits, upon the change of his ſituation, with the following ſarcaſtic reflection upon his former patrons at Briſtol. "As to Mr ——, Mr ——, Mr ——, &c. &c. they rate literary lumber ſo low, that I believe an author, in their eſtimation, muſt be poor indeed, but here matters are otherwiſe. Had Rowley been a Londoner inſtead of a Briſtowyan, I could have lived by copying his works." In a letter to his ſiſter, May 30, he informs her that he is to be employed in writing a voluminous Hiſtory of London, to appear in numbers the beginning of next winter. Meanwhile, he had written ſomething in praiſe of Beckford, then lord mayor, which had procured him the honour of being preſented to his lordſhip; and, in the letter juſt mentioned, he gives the following account of his reception, with certain obſervations upon political writing. "The lord mayor received me as politely as a citizen could: but the devil of the matter is, there is no money to be got on this ſide of the queſtion.—However, he is a poor author who cannot write on both ſides.—Eſſays on the patriotic ſide will fetch no more than what the copy is ſold for. As the patriots themſelves are ſearching for places, they have no gratuity to ſpare.—On the other hand, unpopular eſſays will not even be accepted, and you muſt pay to have them printed: but then you ſeldom loſe by it, as courtiers are ſo ſenſible of their deficiency in merit, that they generouſly reward all who know how to daub them with the appearance of it."

He continued to write inceſſantly in various periodical publications. July 11th, he tells his ſiſter that he had pieces laſt month in ſeveral magazines; in The Goſpel Magazine, The Town and country, The Court and City, The London, The Political Regiſter, &c. But all theſe exertions of his genius brought in ſo little profit, that he was ſoon reduced to the extremeſt indigence; ſo that at laſt, oppreſſed with poverty and alſo diſeaſe, in a fit of deſpair he put an end to his exiſtence, Aug. 1770, with a doſe of poiſon. This unfortunate perſon, though certainly a moſt extraordinary genius, ſeems yet to have been a moſt ungracious compoſition. He was violent and impetuous to a ſtrange degree. From the firſt of the above-cited letters, he ſeems to have had a portion of ill-humour and ſpleen more than enough for a lad of 17; and the editor of his Miſcellanies records, “that he poſſeſſed all the vices and irregularities of youth, and that his profligacy was at leaſt as conſpicuous as his abilities.”

In 1777 were publiſhed, in one volume 8vo, “Poems, ſuppoſed to have been written at Briſtol, by Thomas Rowley and others, in the 15th century: the greateſt part now firſt publiſhed from the moſt authentic copies, with an engraved ſpecimen of one of the MSS. To which are added, a Preface, an introductory Account of the ſeveral Pieces, and a Gloſſary.” And, in 1778, were publiſhed, in one volume 8vo, “Miſcellanies in Proſe and Verſe, by Thomas Chatterton, the ſuppoſed author of the Poems publiſhed under the names of Rowley, &c.”

Of Rowely's Poems, we have the following account in the preface, given in the words of Mr George Catcot of Briſtol, to whom, it is ſaid, the public is indebted for them. “The firſt diſcovery of certain MSS. having been depoſited in Redclift church above three centuries ago, was made in the year 1768, at the time of opening the new bridge at Briſtol; and was owing to a publication in Farley's Weekly Journal, Oct. 1ſt, containing an account of the ceremonies obſerved at the opening of the old bridge, taken, as it was ſaid, from a very ancient MS. This excited the curioſity of ſome perſons to enquire after the original. The printer, Mr Farley, could give no account of it, or of the perſon who brought the copy; but after much inquiry it was diſcovered, that this perſon was a youth between 15 and 16 years of age, whoſe name was Thomas Chatterton, and whoſe family had been ſextons of Redclift church for near 150 years. His father, who was now dead, had alſo been maſter of the free-ſchool in Pile-ſtreet. The young man was at firſt very unwilling to diſcover from whence he had the original: but, after many promiſes made to him, was at laſt prevailed on to acknowledge that he had received this, together with many other MSS. from his father, who had found them in a large cheſt in an upper room over the chapel, on the north ſide of Redclift church.” It is added, that ſoon after this Mr Catcot commenced an acquaintance with Chatterton, and partly as preſents, partly as purchaſes, procured from him copies of many of his MSS. in proſe and verſe; as other copies were diſpoſed of in like manner to others. It is concluded, however, that whatever may have been Chatterton's part in this very extraordinary tranſaction, whether he was the author, or only (as he conſtantly aſſerted) the copier of all theſe productions, he appears to have kept the ſecret entirely himſelf, and not to have put it in any one's power to bear certain teſtimony either of his fraud or of his veracity.

This affair, however, hath ſince become the foundation of a mighty controverſy among the critics, which hath yet ſcarcely ſubſided. The poems in queſtion, publiſhed in 1777, were republiſhed in 1778, with an “Appendix, containing ſome obſervations upon their language; tending to prove that they were written, not by any ancient author, but entirely by Chatterton.” Mr Warton, in the third volume of his Hiſtory of Engliſh poetry, hath eſpouſed the ſame ſide of the queſtion. Mr Walpole alſo obliged the world with a Letter on Chatterton, from his preſs at ſtrawberry-hill. On the other hand have appeared, “Obſervations” upon theſe poems, “in which their authenticity is aſcertained,” by Jacob Bryant, Eſq. 1781, 2 vols 8vo; and another edition of the “Poems, with a comment, in which their Antiquity is conſidered and defended, by Jeremiah Milles, D. D. Dean of Exeter, 1782,” 4to. In anſwer to theſe two works, we have had three pamphlets: 1. “Curſory Obſervations on the Poems, and Remarks on the Commentaries of Mr Bryant and Dr Milles; with a ſalutary propoſal addreſſed to the friends of thoſe gentlemen.” 2. “An Archæological Epiſtle to Dean Milles, editor of a ſuperb edition of Rowley's Poems, &c.” 3. “An Inquiry into the Authenticity of the Poems attributed to Thomas Rowley, in which the Arguments of the Dean of Exeter and Mr Bryant are examined, by Thomas Warton; and other pieces in the public prints and magazines: All preparatory to the complete ſettlement of the buſineſs in “A Vindication of the Appendix to the Poems called Rowley's, in reply to the Anſwers of the Dean of Exeter, by Jacob Bryant, Eſq; and a third Anonymous Writer; with ſome further Obſervations upon thoſe Poems, and an Examination of the Evidence which has been produced in ſupport of their Authenticity. By Thomas Tyrwhitt, 1782,” 8vo.

CHAUCER, (Sir Geofrey) an eminent Engliſh poet in the 14th century, born at London in 1328. After he left the univerſity, he travelled into Holland, France, and other countries. Upon his return he entered himſelf in the Inner-temple, where he ſtudied the municipal laws of England. His firſt ſtation at court was page to Edward III. and he had a penſion granted him by that prince till he could otherwiſe provide for him. Soon after we find him gentleman of the king's privy chamber; next year, ſhield-bearer to the king. Eſteemed and honoured, he ſpent his younger days in a conſtant attendance at court, or for the moſt part living near it, in a ſquare ſtone-houſe near the park-gate at Woodſtock, ſtill called *Chaucer's Houſe*.

Soon after, having got the Duke of Lancaſter for his patron, Chaucer began every day to riſe in greatneſs. In 1373, he was ſent, with other perſons, to the republic of Genoa to hire ſhips for the king's navy (their want of ſhipping in thoſe times being uſually ſupplied by ſuch means); and the king was ſo well ſatisfied with his negociation, that, on his return, he obtained a grant of a pitcher of wine daily in the port of London, to be delivered by the butler of England; and ſoon after was made comptroller of the cuſtoms for wool, wool-fells, and hides; an office which he diſcharged with great diligence and integrity. At this period, Chaucer's income was about L. 1000 a-year; a ſum which in thoſe days might well enable him to live, as he ſays he did, with dignity in office, and hoſpitality among his friends. It was in this meridian blaze of proſperity, in perfect health of body and peace of mind, that he wrote his moſt humorous poems. His ſatires againſt the prieſts were probably written to oblige his patron the Duke of Lancaſter, who favoured the cauſe of Wickliff, and endeavoured to expoſe the clergy to the indignation of the people. In the laſt year of Edward III. our poet was employed in a commiſſion to treat with the French ; and in the beginning of King Richard's reign, he was in ſome degree of favour at court.

The Duke of Lancaſter at laſt finding his views checked, began to abandon Wickliff's party : upon which Chaucer likewiſe, how much ſoever he had eſpouſed that divine's opinions, thought it prudent to conceal them more than he had done. With the Duke's intereſt that of Chaucer entirely ſunk ; and the former paſſing over ſea, his friends felt all the malice of the oppoſite party. Theſe misfortunes occaſioned his writing that excellent treatiſe *The Teſtament of Love*, in imitation of Boethius on the conſolation of philoſophy. Being much reduced he retired to Woodſtock, to comfort himſelf with ſtudy, which produced his admirable treatiſe of the *Aſtrolabe*.

The Duke of Lancaſter at laſt ſurmounting his troubles, married Lady Catherine Swynford, ſiſter to Chaucer's wife ; ſo that Thomas Chaucer, our poet's ſon, became allied to moſt of the nobility, and to ſeveral of the king's of England. Now the ſun began to ſhine upon Chaucer with an evening ray ; for by the influence of the Duke's marriage, he again grew to a conſiderable ſhare of wealth. But being now 70, he retired to Dunnington-caſtle near Newbury. He had not enjoyed this retirement long before Henry IV. ſon of the Duke of Lancaſter, aſſumed the crown, and in the firſt year of his reign gave our poet marks of his favour. But however pleaſing the change of affairs might be to him at firſt, he afterwards found no ſmall inconveniences from it. The meaſures and grants of the late king were annulled ; and Chaucer, in order to procure freſh grants of his penſions, left his retirement, and applied to court, where, though he gained a confirmation of ſome grants, yet the fatigue of attendence, and his great age, prevented him from enjoying them. He fell ſick at London ; and ended his days in the 72d year of his age, leaving the world as though he deſpiſed it, as appears from his ſong of *Flie from the Preſe*. The year before his death he had the happineſs, if at his time of life it might be ſo called, to ſee the ſon of his brother-in-law (Hen. IV.) ſeated on the throne. He was interred in Weſtminſter abbey ; and in 1556, Mr Nicholas Bingham, a gentleman of Oxford, at his own charge, erected a handſome monument for him there. Caxton firſt printed the Canterbury Tales ; but his works were firſt collected and publiſhed in one volume folio, by William Thynne, London, 1542. They were afterwards reprinted in 1561, 1598, 1602. Oxford, 1721.

Chaucer was not only the firſt, but one of the beſt poets which Britain ever produced. He was equally great in every ſpecies of poetry which he attempted ; and his poems in general poſſeſs every kind of excellence, even to a modern reader, except melody and accuracy of meaſure ; defects which are to be attributed to the imperfect ſtate of the Engliſh language, and the infancy of the art in that kingdom at the time when he wrote. "As he is the father of Engliſh poetry (ſays Mr Dryden), ſo I hold him in the ſame degree of veneration as the Grecians held Homer, or the Romans Virgil. He is a perpetual fountain of good ſenſe, learned in all ſciences, and therefore ſpeaks properly on all ſubjects. As he knew what to ſay, ſo he knows alſo when to leave off ; a continence which is practiſed by few writers, and ſcarcely by any of the ancients, except Virgil and Horace." This character Chaucer certainly deſerved. He had read a great deal ; and was a man of the world, and of ſound judgment. He was the firſt Engliſh poet who wrote *poetically*, as Dr Johnſon obſerves in his preface to his Dictionary, and (he might have added) who wrote like a gentleman. He had alſo the merit of improving the language conſiderably, by the introduction and naturalization of words from the Provençal, at that time the moſt poliſhed dialect in Europe.

CHAUCIS, (anc. geog.) the country of the Chauci, a people of Germany : divided into the *Minores*, now *Eaſt Frieſeland* and the county of *Oldenburg* ; and into the *Majores*, now the duchy of *Bremen* and a part of *Lunenburg*.

CHAUD-MEDLEY, in law, is of much the ſame import with *CHANCE-Medley*. The former in its etymology ſignifies an affray in the heat of blood or paſſion ; the latter, a caſual affray. The latter is in common ſpeech too often erroneouſly applied to any manner of homicide by miſadventure ; whereas it appears by the ſtat. 24 Hen. VIII. c. 5. and ancient books (Staundf. P. C. 16.), that it is properly applied to ſuch killing as happens in ſelf-defence upon ſudden encounter.

CHAL, a town of the Eaſt Indies, on the coaſt of Malabar, in the province of Blagana, and kingdom of Viſapour. Its river affords a good harbour for ſmall veſſels. The town is fortified, and ſo is the iſland on the ſouth ſide of the harbour. It had formerly a good trade, but is now miſerably poor. It was taken by the Portugueſe in 1507, to whom it ſtill belongs. It is 15 miles ſouth of Bombay, and five miles from the ſea. E. Long. 72. 45. N. Lat. 18. 30.

CHAULIEU, (William Amfry de) abbé d'Amale, one of the moſt polite and ingenious of the French poets, was born in 1639, and died at the age of 84. The moſt complete edition of his poems is that printed in 2 vols 8vo in 1733.

CHAUMONT, a town of France, in Champagne, and in the diſtrict of Baſſigni, of which it is the capital. It is ſeated on a mountain near the river Marne. E. Long. 5. 15. N. Lat. 48. 6.

CHAUNE, a town of France, in Picardy, and in the diſtrict of Sanſterre, with the title of a duchy. E. Long. 2. 55. N. Lat. 49. 45.

CHAUNTRY See CHANTRY.

CHAUNY, a town of France, in Picardy, ſeated on the river Oiſe, in Chantry. E. Long. 3. 17. N. Lat. 49. 37.

CHAUVIN, (Stephen) a celebrated miniſter of the reformed religion, born at Niſmes, left France at the revocation of the edict of Nantz, and retired to Rotterdam, where he began a new *Journal des Sçavans* ; and afterwards removing to Berlin, continued it there three years. At this laſt place, he was made profeſſor of philoſophy, and diſcharged that office with much honour and reputation. His principal work is a philoſophical dictionary, in Latin, which he publiſhed at Rotterdam in 1692 ; and gave a new edition of it much augmented, at Lewarden, in 1713, folio. He died in 1725, aged 85.

CHAVEZ, a ſtrong town of Tralos-Montes in Portugal, is ſeated at the foot of a mountain on the river Tamega. It has two ſuburbs, and as many forts ;

one of which looks like a citadel. Between the town and ſuburb of Magdalena, is an old Roman ſtone-bridge about 92 geometrical paces long. W. Long. 7. 1. N. L. 41. 45.

CHAZELLES, (John Matthew) a celebrated French mathematician and engineer, was born at Lyons in 1657. M. du Hamel, with whom he got acquainted, finding his genius incline towards aſtronomy, preſented him to M. Caſſini, who employed him in his obſervatory. In 1684, the Duke of Mortemar made uſe of Chazelles to teach him mathematics; and, the year after, procured him the preferment of hydrography profeſſor for the galleys of Marſeilles, where he ſet up a ſchool for young pilots deſigned to ſerve aboard the galleys. In 1686, the galleys made four little campaigns, or rather four courſes, purely for exerciſe, Chazelles went on board every time with them; kept his ſchool upon the ſea, and ſhowed the practice of what he taught. In the year 1687 and 1688, he made two other ſea-campaigns, in which he drew a great many plans of ports, roads, towns, and forts, which were lodged with the miniſters of ſtate. At the beginning of the war, which ended with the peace of Ryſwick, ſome marine officers, and Chazelles among the reſt, fancied the galleys might be ſo contrived as to live upon the ocean; that they might ſerve to tow the men of war when the wind failed or proved contrary, and alſo help to ſecure the coaſt of France upon the ocean. Chazelles was ſent to the weſt coaſts in July 1689, to examine the practicableneſs of this ſcheme; and in 1690, fifteen galleys new built ſet ſail from Rochefort, and cruiſed as far as Torbay in England, and proved ſerviceable at the deſcent upon Tinmouth. After this, he digeſted into order the obſervations he had made on the coaſts of the ocean; and drew diſtinct maps with a portulan to them, *viz.* a large deſcription of every haven, of the depth, the tides, the dangers and advantages diſcovered, &c. Theſe maps were inſerted in the *Neptune Françoiſe*, publiſhed in 1692, in which year Chazelles was engineer at the deſcent at Oneille. In 1693, Monſieur de Pontchartrain, then ſecretary of ſtate for the marine, and afterwards chancellor of France, reſolved to get the *Neptune Françoiſe* carried on to a ſecond volume, which was alſo to take in the Mediterranean. Chazelles deſired that he might have a year's voyage on this ſea, for making aſtronomical obſervations; and the requeſt being granted, he paſſed by Greece, Egypt, and the other parts of Turkey, with his quadrant and teleſcope in his hand. When he was in Egypt he meaſured the pyramids; and finding the ſides of the largeſt preciſely facing the four cardinal points, naturally concluded this poſition to have been intended, and alſo that the poles of the earth and meridians had not ſince deviated. Chazelles likewiſe made a report of his voyage in the Levant, and gave the academy all the ſatisfaction they wanted concerning the poſition of Alexandria: upon which he was made a member of the academy in 1695. He died in 1710.

CHAZINZARIANS, a ſect of heretics who roſe in Armenia in the ſeventh century. The word is formed of the Armenian *chazus*, "croſs," They are alſo called *ſtaurolatræ*, which in Greek ſignifies the ſame as *Chazinzarians* in Armenian, *viz. adorers of the croſs*; they being charged with paying adoration to the croſs alone. In other reſpects they were Neſtorians; and admitted two perſons in Jeſus Chriſt. Nicephorus aſcribes other ſingularities to them; particularly their holding an annual feaſt in memory of the dog of their falſe prophet Sergius, which they called *artzibartzes*.

CHEASAPEAK BAY, in North America, the entrance between Cape Henry and Cape Charles, running up 300 miles between Virginia and Maryland. It is navigable almoſt all the way for large ſhips, and has ſeveral navigable rivers that fall into it, by means of which ſhips go up to the very doors of the planters, to take in their lading of goods.—Here was a ſea-engagement in 1781 between the Britiſh fleet under Admiral Graves conſiſting of 19 ſhips of the line, and the French fleet of 24 line-of-battle ſhips under the Count de Graſſe, which ended in the Count's keeping poſſeſſion of the Bay, by which Lord Cornwallis and his whole army were made priſoners of war at Yorktown, being inveſted both by ſea and land by very ſuperior numbers.

CHEATS, are deceitful practices in defrauding, or endeavouring to defraud, another of his known right, by means of ſome artful device, contrary to the plain rules of common honeſty: as by playing with falſe dice, or by cauſing an illiterate perſon to execute a deed to his prejudice, by reading it over to him in words different from thoſe in which it was written, &c.—In England if any perſon deceitfully get into his hands or poſſeſſion any money or other things of any other perſon's by colour of any falſe token, &c. being convicted, he ſhall have ſuch puniſhment by impriſonment, ſetting upon the pillory, or by any corporeal pain except pains of death, as ſhall be adjudged by the perſons before whom he ſhall be convicted.—As there are frauds which may be relieved civilly, and not puniſhed criminally; ſo there are other frauds which in a ſpecial caſe may not be helped civilly, and yet ſhall be puniſhed criminally. Thus if a minor goes about the town, and, pretending to be of age, defrauds many perſons by taking credit for a conſiderable quantity of goods, and then inſiſting on his nonage, the perſons injured cannot recover the value of their goods, but they may indict and puniſh him for a common cheat. Perſons convicted of obtaining money or goods by falſe pretences, or of ſending threatening letters in order to extort money or goods, may be puniſhed with fine or impriſonment, or by pillory, whipping, or tranſportation.

CHEBRECHIN, a town of Poland, in the province of Ruſſia and Palatinate of Belſkow. It is ſeated on the declivity of a hill, and the river Wierpi waters its walls, and afterwards falls into the river Bog. The Jews there are very rich. E. Long. 23. 51. N. Lat. 50. 35.

CHECAYA, in Turkiſh affairs, the ſecond officer of the Janiſaries, who commands them under the aga, and is otherwiſe called *protogero*.

There is alſo a checaya of the treaſury, ſtables, kitchen, &c. the word ſignifying as much as lieutenant, or the ſecond in any office.

CHECK, or *Check-Roll*, a roll or book, wherein are contained the names of ſuch perſons as are attendants and in the pay of kings, or other great perſonages, as their houſhold ſervants.

Clerk of the CHECK *in the king's houſehold*, in Britain, has the check and controlment of the yeomen of the guard, and all the uſhers belonging to the royal family, allowing their abſence or defects in attendance, or diminiſhing their wages for the ſame, &c. He alſo, by himſelf or deputy, takes the view of thoſe that are to watch in the court, and has the ſetting of the watch, &c.

Clerk of the CHECK *in the royal dock-yards*, in Britain, an officer who keeps a muſter or regiſter of all the men employed aboard his majeſty's ſhips and veſſels, and alſo all the artificers and others in the ſervice of the navy at the port where he is ſettled.

CHECK, in falconry, a term uſed of a hawk, when ſhe forſakes her proper game, to fly at pyes, crows, rooks, or the like, that croſs her in her flight.

CHECKY, in heraldry, is when the ſhield, or a bordure, &c. is chequered, or divided in chequers or ſquares, in the manner of a cheſs-board.

This is one of the moſt noble and moſt ancient figures uſed in armoury; and a certain author ſaith, that it ought to be given to none but great warriors, in token of their bravery: for the cheſs-board repreſents a field of battle; and the pawns placed on both ſides repreſent the ſoldiers of the two armies, which move, attack, advance, or retire, according to the will of the gameſters, who are generals.

This figure is always compoſed of metal and colour. But ſome authors would have it reckoned among the ſeveral ſorts of furs.

CHEEK, in anatomy, that part of the face ſituated below the eyes on each ſide.

CHEEKS, a general name among mechanics, for almoſt all thoſe pieces of their machines and inſtruments, that are double, and perfectly alike. Thus, the cheeks of a printing-preſs are its two principal pieces: they are placed perpendicular, and parallel to each other; ſerving to ſuſtain the three ſommers, viz. the head, ſhelves, and winter, which bear the ſpindle, and other parts of the machine. See PRINTING-*Preſs*.

The *cheeks of a turner's lathe*, are two long pieces of wood, between which are placed the puppets, which are either pointed or otherwiſe, ſerving to ſupport the work and the mandrils of the workman. Theſe two pieces are placed parallel to the horizon, ſeparated from one another by the thickneſs of the tail of the puppets, and joined with tenons to two other pieces of wood placed perpendicularly, called the *legs of the lathe*.

Cheeks of the glazier's vice, are two pieces of iron joined parallel at top and bottom; in which are the axis, or ſpindles, little wheel, cuſhions, &c. whereof the machine is compoſed.

The cheeks of a mortar, or the *brackets*, in artillery, are made of ſtrong planks of wood, bound with thick plates of iron, and are fixed to the bed by four bolts; they riſe on each ſide of the mortar, and to ſerve to keep her at what elevation is given her, by the help of ſtrong bolts of iron which go through both cheeks, both under and behind the mortar, betwixt which are driven coins of wood; theſe bolts are called the *bracket bolts*, and the bolts which are put one in each end of the bed, are the traverſe-bolts, becauſe with handſpikes the mortar is by theſe traverſed to the right or left.

CHEEKS, in ſhip-building, are two pieces of timber, fitted on each ſide of the maſt at the top, ſerving to ſtrengthen the maſts there. The uppermoſt bail or piece of timber in the beak of a ſhip, is called the *cheek*. The knees which faſten the beak-head to the ſhip, are called *cheeks*; and the ſides of any block, or the ſides of a ſhip's carriage of a gun, are called *cheeks*.

CHEESE, a ſort of food prepared of curdled milk purged from the ſerum or whey, and afterwards dried for uſe.

Cheeſe differs in quality according as it is made from new or ſkimmed milk, from the curd which ſeparates ſpontaneouſly upon ſtanding, or that which is more ſpeedily produced by the addition of runnet. Cream alſo affords a kind of cheeſe, but quite fat and butyraceous, and which does not keep long. Analyzed chemically, cheeſe appears to partake much more of an animal nature than butter, or the milk from which it was made. It is inſoluble in every liquid except ſpirit of nitre, and cauſtic alkaline ley. Shaved thin, and properly treated with hot water, it forms a very ſtrong cement if mixed with quicklime.* When prepared with hot water, it is recommended in the Swediſh memoirs to be uſed by anglers as a bait: it may be made into any form, is not ſoftened by the cold water, and the fiſhes are fond of it. As a food, phyſicians condemn the too free uſe of cheeſe. When new, it is extremely difficult of digeſtion: when old, it becomes acrid and hot; and, from Dr Percival's experiments, is evidently of a ſceptic nature. It is a common opinion that old cheeſe digeſts every thing, yet is left undigeſted itſelf; but this is without any ſolid foundation. Cheeſe made from the milk of ſheep digeſts ſooner than that from the milk of cows, but is leſs nouriſhing; that from the milk of goats digeſts ſooner than either, but is alſo the leaſt nouriſhing. In general, it is a kind of food fit only for the laborious, or thoſe whoſe organs of digeſtion are ſtrong.

Every country has places noted for this commodity: thus Cheſter and Glouceſter cheeſe are famous in England; and the Parmeſan cheeſe is in no leſs repute abroad, eſpecially in France. This ſort of cheeſe is entirely made of ſweet cow-milk: but at Rochefort in Languedoc, they make it of ewe's milk; and in other places it is uſual to add goat or ewe's milk in a certain proportion to that of the cow. There is likewiſe a kind of medicated cheeſe made by intimately mixing the expreſſed juice of certain herbs, as ſage, baum, mint, &c. with the curd before it is faſhioned into a cheeſe.—The Laplanders make a ſort of cheeſe of the milk of their rein-deer; which is not only of great ſervice to them as food, but on many other occaſions. It is a very common thing in theſe climates to have a limb numbed and frozen with the cold: their remedy for this is the heating an iron red hot, and thruſting it through the middle of one of theſe cheeſes; they catch what drops out, and with this anoint the limb, which ſoon recovers. They are ſubject alſo to coughs and diſeaſes of the lungs, and theſe they cure by the ſame ſort of medicine: they boil a large quantity of the cheeſe in the freſh deer's milk, and drink the decoction in large draughts warm ſeveral times a-day. They make a leſs ſtrong decoction of the ſame kind alſo, which they uſe as their common drink, for three or four days together, at ſeveral times of the year. They

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* See *Cement*.

do this to prevent the miſchiefs they are liable to from their water, which is otherwiſe their conſtant drink, and is not good.

The hundred weight of cheeſe pays on importation into Britain 1s. $3\frac{4}{10}$d. and draws back on exportation 1s. $1\frac{1}{2}$d. at the rate of 6s. 8d.

Beſt methods of making cheeſe in England. The double Glouceſter is a cheeſe that pleaſes almoſt every palate. The beſt of this kind is made from new, or (as it is called in that and the adjoining counties) *covered milk.* An inferior ſort is made from what is called *half-covered milk;* though when any of theſe cheeſes turn out to be good, people are deceived, and often purchaſe them for the beſt *covered milk cheeſe:* but farmers who are honeſt have them ſtamped with a piece of wood made in the ſhape of a heart, ſo that any perſon may know them.

It will be every farmer's intereſt (if he has a ſufficient number of cows) to make a large cheeſe from one meal's milk. This, when brought in warm, will be eaſily changed or turned with the rennet; but if the morning or night's milk be to be mixed with that which is freſh from the cow, it will be a longer time before it turns, nor will it change ſometimes without being heated over the fire, by which it often gets duſt or ſoot, or ſmoke, which will give the cheeſe a very diſagreeable flavour.

When the milk is turned, the whey ſhould be carefully ſtrained from the curd. The curd ſhould be broken ſmall with the hands; and when it is equally broken, it muſt be put by little at a time into the vat, carefully breaking it as it is put in. The vat ſhould be filled an inch or more above the brim, that when the whey is preſſed out it may not ſhrink below the brim; if it does, the cheeſe will be worth very little. But firſt, before the curd is put in, a cheeſe-cloth or ſtrainer ſhould be laid at the bottom of the vat; and this ſhould be ſo large, that when the vat is filled with the curd, the the ends of the cloth may turn again over the top of it. When this is done, it ſhould be taken to the preſs, and there remain for the ſpace of two hours; when it ſhould be turned and have a clean cloth put under it, and turned over as before. It muſt then be preſſed again, and remain in the preſs ſix or eight hours; when it ſhould again be turned and rubbed on each ſide with ſalt. After this it muſt be preſſed again for the ſpace of 12 or 14 hours more; when, if any of the edges project, they ſhould be pared off: it may then be put on a dry board, where it ſhould be regularly turned every day. It is a good way to have three or four holes bored round the lower part of the vat, that the whey may drain ſo perfectly from the cheeſe as not the leaſt particle of it may remain.

The prevailing opinion of the people of Glouceſterſhire and the neighbouring counties is, that the cheeſes will ſpoil if they do not ſcrape and waſh them when they are found to be mouldy. But others think that ſuffering the mould to remain, mellows them, provided they are turned every day. Thoſe, however, who will have the mould off, ſhould cauſe it to be removed with a clean dry flannel, as the waſhing the cheeſes is only a means of making the mould (which is a ſpecies of fungus rooted in the coat) grow again immediately.

Some people ſcald the curd: but this is a bad and mercenary practice; it robs the cheeſe of its fatneſs, and can only be done with a view to raiſe a greater quantity of whey butter, or to bring the cheeſes forward for ſale, by making them appear older than they really are.

As moſt people like to purchaſe high-coloured cheeſe, it may be right to mix a little annatto with the milk before it is turned. No cheeſe will look yellow without it; and though it does not in the leaſt add to the goodneſs, it is perfectly innocent in its nature and effects.

It is not in the power of any perſon to make good cheeſe with bad rennet; therefore the following receipt ſhould be attended to. Lethe *vell*, *maw*, *rennet-bag* (or by whatever name it is called), be perfectly ſweet; for if it be the leaſt tainted, the cheeſe will never be good. When this is fit for the purpoſe, three pints or two quarts of ſoft water (clean and ſweet) ſhould be mixed with ſalt, wherein ſhould be put ſweet-briar, roſe leaves and flowers, cinnamon, mace, cloves, and, in ſhort, almoſt every ſort of ſpice and aromatic that can be procured; and if theſe are put into two quarts of water, they muſt boil gently till the liquor is reduced to three pints, and care ſhould be taken that this liquor is not ſmoked. It ſhould be ſtrained clean from the ſpices, &c. and when found to be not warmer than milk from the cow, it ſhould be poured upon the vell or maw. A lemon may then be ſliced into it; when it may remain a day or two: After which it ſhould be ſtrained again, and put in a bottle; where, if well corked, it will keep good for twelve months or more. It will ſmell like a perfume; and a ſmall quantity of it will turn the milk, and give the cheeſe a pleaſing flavour. After this, if the vell be ſalted, and dried for a week or two near the fire, it will do for the purpoſe again almoſt as well as before.

Chedder cheeſe is held in high eſteem; but its goodneſs is ſaid to be chiefly owing to the land whereon the cows feed, as the method of making it is the ſame as is purſued throughout Somerſetſhire, and the adjoining counties.

Cheſhire cheeſe is much admired; yet no people take leſs pains with the rennet than the Cheſhire farmers. But their cheeſes are ſo large as often to exceed one hundred pounds weight each; to this (and the age they are kept, the richneſs of the land, and the keeping ſuch a number of cows as to make ſuch a cheeſe without adding a ſecond meal's milk) their excellence may be attributed. Indeed they ſalt the curd (which may make a difference), and keep the cheeſes in a damp place after they are made, and are very careful to turn them daily.

But of all the cheeſe England produces, none is more highly eſteemed than the Stilton, which is called the *Parmeſan* of England, and (except faulty) is never ſold for leſs than 1s. or 1s. 2d. per pound.

The Stilton Cheeſes are uſually made in ſquare vats, and weigh from ſix to twelve pounds each cheeſe. Immediately after they are made, it is neceſſary to put them into ſquare boxes made exactly to fit them; they being ſo extremely rich, that except this precaution be taken they are apt to bulge out and break aſunder. They ſhould be continually and daily turned in theſe boxes, and muſt be kept two years before they are properly mellowed for ſale.

Some make them in a net, ſomewhat like a cabbage net; ſo that they appear, when made, not unlike an a-corn. But theſe are never ſo good as the other, having a thicker coat, and wanting all that rich flavour and mellowneſs which make them ſo pleaſing.

It is proper to mention that the making of theſe cheeſes is not confined to the Stilton farmers, as many others in Huntingdonſhire (not forgetting Rutland and Northamptonſhires) make a ſimilar ſort, ſell them for the ſame price, and give all of them the name of *Stilton Cheeſes*.

Though theſe farmers are remarked for cleanlineſs, they take very little pains with the rennet, as they in general only cut pieces from the vell or maw, which they put into the milk, and move gently about with the hand, by which means it breaks or turns ſo, that they eaſily obtain the curd. But if the method above deſcribed for making rennet were put in practice, they would make their cheeſe ſtill better; at leaſt they would not have ſo many faulty and unſound cheeſes; for notwithſtanding their cheeſes bear ſuch a name and price, they often find them ſo bad as not to be ſaleable; which is probably owing to their being ſo careleſs about the rennet.

It has been alleged, that as good cheeſe might be made in other counties, if people would adhere to the Stilton plan, which is this—They make a cheeſe every morning; and to this meal of new milk they add the cream taken from that which is milked the night before. This, and the age of their cheeſes, have been ſuppoſed the only reaſons why they are preferred to others; for from the niceſt obſervation, it does not appear that their land is in any reſpect ſuperior to that of other counties.

Excellent cream cheeſes are made in Lincolnſhire, by adding the cream of one meal's milk to milk which comes immediately from the cow; theſe are preſſed gently two or three times, turned for a few days, and are then diſpoſed of at the rate of 1s. per pound, to be eaten while new with radiſhes, ſallad, &c.

Many people give ſkimmed milk to pigs, but the whey will do equally as well after cheeſes are made from this milk; ſuch cheeſes will always ſell for at leaſt 2d. per pound, which will amount to a large ſum annually where they make much butter. The peaſants and many of the farmers in the north of England never eat any better cheeſe; and though they appear harder, experience hath proved them to be much eaſier of digeſtion than any new milk cheeſes. A good market may always be found for the ſale of them at Briſtol.

Account of the making of Parmeſan Cheeſe: by Mr Zappa of Milan, in anſwer to queries from Arthur Young, Eſq.

" Are the cows regularly fed in ſtables?"—From the middle of April, or ſooner if poſſible, the cows are ſent to paſture in the meadows till the end of November uſually.

" Or only fed in ſtables in winter?"—When the ſeaſon is paſt, and ſnow comes, they are put into ſtables for the whole winter, and fed with hay.

" Do they remain in the paſture from morning till night? or only in hot weather?"—Between nine and ten in the morning the cows are ſent to water, and then to the paſtures, where they remain four or five hours at moſt, and at three or four o'clock are driven to the ſtables if the ſeaſon is freſh, or under porticos if hot; where, for the night, a convenient quantity of hay is given them.

" In what months are they kept at paſture the whole day?"—Moſtly anſwered already; but it might be ſaid, that no owner will leave his cattle, without great cauſe, in uncovered places at night. It happens only to the ſhepherds from the Alps, when they paſs, becauſe it is impoſſible to find ſtables for all their cattle.

" What is the opinion in the Lodeſan, on the beſt conduct for profit in the management of meadows?"—For a dairy farm of 100 cows, which yields daily a cheeſe weighing 70 to 75 lb. of 28 ounces, are wanted 1000 perticas of land. Of theſe about 800 are ſtanding meadows, the other 200 are in the cultivation for corn and graſs fields in rotation.

" Do you milk the cows morning and evening?"—Thoſe that are in milk are milked morning and evening, with exception of ſuch as are near calving.

" One hundred cows being wanted to make a Lodeſan each day, it is ſuppoſed that it is made with the milk of the evening and the following morning; or of the morning and evening of the ſame day: how is it?"—The 100 cows form a dairy farm of a good large cheeſe; it is reckoned that 80 are in milk, and 20 with calves ſuckling, or near calving. They reckon one with the other about 32 boccalis of 32 oz. of milk. Such is the quantity for a cheeſe about 70 lb. of 28 ounces. They join the evening with the morning milk, becauſe ſo it is freſher than if it was that of the morning and evening of the ſame day. The morning milk would be 24 hours old when the next morning the cheeſe ſhould be made.

" Do they ſkim or not the milk to make butter before they make the cheeſe?"—From the evening milk all the cream poſſible is taken away for butter, maſcarponi (cream-cheeſe), &c. The milk of the morning ought to be ſkimmed ſlightly; but every one ſkims as much cream as he can. The butter is ſold on the ſpot immediately at 24 ſous; the cheeſe at about 28 ſous. The butter loſes nothing in weight; the cheeſe loſes one-third of it, is ſubject to heat, and requires expences of ſervice, attention, warehouſes, &c. before it is ſold; and a man in two hours makes 45 to 50 lb. of butter that is ſold directly. However, it is not poſſible to leave much cream in the milk to make Lodeſan cheeſe, called *grained cheeſe*; becauſe if it is too rich, it does not laſt long, and it is neceſſary to conſume it while young and ſound.

" Is Parmeſan or Lodeſan cheeſe made every day in the year or not?"—With 100 cows it is. In winter, however, the milk being leſs in quantity, the cheeſe is of leſſer weight, but certainly more delicate.

" After gathering or uniting the milk, either ſkimmed or not, what is exactly the whole operation?"—The morning of the 3d of March 1786, I have ſeen the whole operation, having gone on purpoſe to the ſpot to ſee the whole work from beginning to end. At 16 Italian hours, or ten in the morning, according to the northern way to account hours, the ſkimming of that morning's milk, gathered only two hours before, was finiſhed. I did, meanwhile, examine the boiler or pot. At the top it was eight feet (Engliſh) diameter, or thereabout; and about five feet three inches deep, made

made like a bell, and narrowing towards the bottom to about two one-half feet. They joined the cream produced that morning with the other produced by the milk of the evening before. That produced by this laſt milk was double in quantity to that of the morning milk, becauſe it had the whole night to unite, and that of the morning had only two hours to do it, in which it could not ſeparate much. Of the cream ſome was deſtined to make maſcarponies (cream-cheeſe), and they put the reſt into the machine for making butter. Out of the milk of the evening before and of that morning that was all put together after ſkimming, they took and put into the boiler 272 boccali, and they put under it two faggots of wood; which being burnt, were ſufficient to give the milk a warmth a little ſuperior to lukewarm. Then the boiler being withdrawn from the fire, the foreman put into it the rennet, which they prepare in ſmall balls of one ounce each, turning the ball in his hand always kept in the milk entirely covered; and after it was perfectly diſſolved, he covered the boiler to keep the milk defended, that it might not ſuffer from the coldneſs of the ſeaſon, in particular as it was a windy day. I went then to look on the man that was making maſcarponies, &c. and then we went twice to examine if the milk was ſufficiently coagulated. At the 18 hours, according to the Italian clocks, or noon, the true manufactory of cheeſe began. The milk was coagulated in a manner to be taken from the boiler in pieces from the ſurface. The foreman, with a ſtick that had 18 points, or rather nine ſmall pieces of wood fixed by their middle in the end of it, and forming nine points in each ſide, began to break exactly all the coagulated milk, and did continue to do ſo for more than half an hour, from time to time examining it to ſee its ſtate. He ordered to renew the fire, and four faggots of willow branches were uſed all at once: he turned the boiler that the fire might act; and then the underman began to work in the milk with a ſtick like the above, but with only four ſmaller ſticks at the top, forming eight points, four at each ſide, a ſpan long each point. In a quarter of an hour the foreman mixed in the boiler the proper quantity of ſaffron, and the milk was all in knobs, and finer grained than before, by the effect of turning and breaking the coagulation, or curd, continually. Every moment the fire was renewed or fed; but with a faggot only at a time, to continue it regular. The milk was never heated much, nor does it hinder to keep the hand in it to know the fineneſs of the grain, which refines continually by the ſtick-work of the underman. It is of the greateſt conſequence to mind when the grain begins to take a conſiſtence. When it comes to this ſtate, the boiler is turned from the fire, and the underman immediately takes out the whey, putting it into proper receivers. In that manner the grain ſubſides to the bottom of the boiler; and leaving only in it whey enough to keep the grain covered a little, the foreman extending himſelf as much as he can over and in the boiler, unites with his hands the grained milk, making like a body of paſte of it. Then a large piece of linen is run by him under that paſte, while another man keeps the four corners of it, and the whey is directly put again into the boiler, by which is facilitated the means of raiſing that paſte that is taken out of the boiler, and put for one quarter of an hour into the receiver where the whey was put before, in the ſame linen it was taken from the boiler; which boiler is turned again directly on the fire, to extract the maſcarpa (whey-cheeſe); and is a ſecond product, eaten by poor people. After the paſte remained for a quarter of an hour in that receiver, it was taken out and turned into the wooden form called *faſſera*, without any thing elſe made than the rotundity, having neither top or bottom. Immediately after having turned it into that round wooden form, they put a piece of wood like a cheeſe on it, putting and increaſing gradually weights on it, which ſerve to force out the remnant of whey; and in the evening the cheeſe ſo formed is carried into the warehouſe, where, after 24 hours, they begin to give the ſalt. It remains in that warehouſe for 15 or 20 days; but in ſummer only from 8 to 12 days. Meanwhile the air and ſalt form the cruſt to it; and then it is carried into another warehouſe for a different ſervice. In the ſecond warehouſe they turn every day all the cheeſes that are not older than ſix months; and afterwards it is enough if they are only turned every 48 or 60 hours, keeping them clean, in particular of that bloom which is inevitable to them, and which, if neglected, turns muſty, and cauſes the cheeſe to acquire a bad ſmell. The Lodeſan, becauſe it is a province watered, has a great deal of meadows, and abounds with cows, its product being moſtly in cheeſe, butter, &c. However, the province of Pavia makes a great deal of that cheeſe; and we Milaneſe do likewiſe the ſame from the ſide of Porte Toſa, Romana, Ticineſe, and Vercillina, becauſe we have fine meadows and dairy farms.

Cheese-Rennet. See Gallium and Runnet.

CHEGOE, or Nigua, the Indian name of an inſect common in Mexico, and alſo found in other hot countries where it is called *pique*, is an exceeding ſmall animal, not very unlike a flea, and is bred in the duſt. It fixes upon the feet, and breaking inſenſibly the cuticle, it neſtles betwixt that and the true ſkin, which alſo, unleſs it is immediately taken out, it breaks, and pierces at laſt to the fleſh, multiplying with a rapidity almoſt incredible. It is ſeldom diſcovered until it pierces the true ſkin, when it cauſes an intolerable itching. Theſe inſects, with their aſtoniſhing multiplication, would ſoon diſpeople thoſe countries, were it leſs eaſy to avoid them, or were the inhabitants leſs dexterous in getting them out before they begin to ſpread. On the other hand, nature, in order to leſſen the evil, has not only denied them wings, but even that conformation of the legs and thoſe ſtrong muſcles which are given to the flea for leaping. The poor, however, who are in ſome meaſure doomed to live in the duſt, and to a habitual neglect of their perſons, ſuffer theſe inſects ſometimes to multiply ſo far as to make large holes in their fleſh, and even to occaſion dangerous wounds.

CHEIRANTHUS, stock-gilliflower, or *Wall-flower*: A genus of the 39th natural order, *Siliquoſæ*; and belonging to the tetradynamia claſs of plants. The germen is marked with a glandulous denticle on each ſide; the calyx is cloſe, with two of its leaves gibbous at the baſe; the ſeeds plane. The ſpecies are 13; but the following three are moſt worthy of notice. 1. The cheiri, or common wall-flower, with ligneous, long, tough roots; an upright, woody, abiding ſtalk, divided into many erect angular branches, forming a buſhy head from one to two feet high, cloſely garniſhed with ſpear-ſhaped, acute, ſmooth leaves, and all the branches terminating in long erect ſpikes of numerous flowers, which in different varieties are yellow, bloody, white, *&c.* 2. The incanus, or hoary cheiranthus, with ligneous, long, naked, white roots; and upright, ſtrong, woody, abiding ſtem, from one to three feet high, branchy at top, adorned with long, ſpear-ſhaped, obtuſe, hoary leaves; and the top of the ſtalk and all the branches terminated by erect ſpikes of flowers from one to two or three feet long, of different colours in different varieties. 3. The annuus, or ten-weeks-ſtock, with an upright, woody, ſmooth ſtalk, divided into a branchy head, 12 or 15 inches high, garniſhed with ſpear-ſhaped, blunt, hoary leaves, a little indented, and all the branches terminated by long erect ſpikes of numerous flowers of different colours in different varieties.—The two firſt ſorts are very hardy evergreen biennials or perennials; but the laſt is an annual plant, ſo muſt be continued by ſeed ſown every year; and even the two firſt, notwithſtanding their being perennial, degenerate ſo much in their flowers after the firſt year, that it will be proper alſo to raiſe an annual ſupply of them. The ſeeds are to be ſaved only from the plants with ſingle flowers; for the double ones bring no ſeeds to perfection. The ſeeds are to be choſen from ſuch flowers as have five, ſix, or more petals, or from ſuch as grow near to the double ones. They may be ſown in the full ground in the ſpring, and may be afterwards tranſplanted. When fine doubles of the two firſt kinds are obtained, they may be multiplied by ſlips from the old plants.

CHEKAO, in natural hiſtory, the name of an earth found in many parts of the Eaſt Indies, and ſometimes uſed by the Chineſe in their porcelain manufactures. It is a hard and ſtony earth; and the manner of uſing it is this: they firſt calcine it in an open furnace, and then beat it to a fine powder. This powder they mix with large quantities of water: then ſtirring the whole together, they let the coarſer part ſubſide; and pouring off the reſt yet thick as cream, they leave it to ſettle, and uſe the matter which is found at the bottom in form of a ſoft paſte, and will retain that humidity a long time. This ſupplies the place of the earth called *hoache*, in the making of that elegant ſort of china-ware which is all white, and has flowers which ſeem formed by a mere vapour within its ſurface. The manner of their uſing it is this: they firſt make the veſſel of the common matter of the manufacture; when this is almoſt dry, they paint upon it the flowers, or whatever other figures they pleaſe, with a pencil dipt in this preparation of the chekao; when this is thoroughly dry, they cover the whole veſſel with the varniſh in the common way, and bake it as uſual. The conſequence is, that the whole is white: but the body of the veſſel, the figures, and the varniſh, being three different ſubſtances, each has its own particular white; and the flowers being painted in the fineſt white of all, are diſtinctly ſeen through the varniſh upon the veſſel, and ſeem as if traced by a vapour only. The hoache does this as well as the chekao; and has beſides this the quality of ſerving for making the porcelain ware either alone, or in the place of kaolin: the chekao has not this property, nor any other ſubſtance beſides this hoache, which appears to be the ſame with the ſteaties or ſoap-rock.

CHEKE, (Sir John) a celebrated ſtateſman, grammarian, and divine, of an ancient family in the iſle of Wight, was born at Cambridge in the year 1514, and educated at St John's college in that univerſity; where, after taking his degrees in arts, he was firſt choſen Greek lecturer, and in 1540 profeſſor of that language, with a ſtipend of 40l. a-year. In this ſtation he was principally inſtrumental in reforming the pronunciation of the Greek language, which, having been much neglected, was imperfectly underſtood. About the year 1543 he was incorporated maſter of arts at Oxford, where, we are told, he had ſtudied for ſome time. In the following year he was ſent to the court of king Henry VIII. and appointed tutor for the Latin language, jointly with Sir Anthony Cooke, to prince Edward, about which time he was made canon of the college newly founded in Oxford; wherefore he muſt have now been in orders. On the acceſſion of his royal pupil to the crown, Mr Cheke was firſt rewarded with a penſion of 100 merks, and afterwards obtained ſeveral conſiderable grants from the crown. In 1550 he was made chief gentleman of the privy-chamber, and was knighted the following year; in 1552, chamberlain of the exchequer for life; in 1553, clerk of the council; and ſoon after ſecretary of ſtate and privy-councillor. But theſe honours were of ſhort duration. Having concurred in the meaſures of the duke of Northumberland for ſettling the crown on the unfortunate Jane Grey, and acted as her ſecretary during the nine days of her reign, on the acceſſion of queen Mary, Sir John Cheke was ſent to the tower, and ſtript of the greateſt part of his poſſeſſions. In September 1554 he obtained his liberty, and a licence from her majeſty to travel abroad. He went firſt to Baſil, thence to Italy, and afterwards returned to Straſburg, where he was reduced to the neceſſity of reading Greek lectures for ſubſiſtence. In 1556 he ſet out in an evil hour to meet his wife at Bruſſels: but, before he reached that city, he was ſeized by order of king Philip II. hoodwinked, and thrown into a waggon; and thus ignominiouſly conducted to a ſhip, which brought him to the tower of London. He ſoon found that religion was the cauſe of his impriſonment; for he was immediately viſited by two Romiſh prieſts, who piouſly endeavoured to convert him, but without ſucceſs. However, he was at laſt viſited by Fleckenham; who told him from the queen, that he muſt either comply or burn. This powerful argument had the deſired effect; and Sir John Cheke accordingly complied in form, and his lands, upon certain conditions, were reſtored: but his remorſe ſoon put an end to his life. He died in September 1557, at the houſe of his friend Mr Peter Oſborne in Wood-ſtreet, London, and was buried in St Alban's church. He left three ſons, the eldeſt of whom, Henry, was knighted by queen Elizabeth. He wrote 1. A Latin tranſlation of two of St Chryſoſtom's homilies. Lond. 1543, 4to. 2. The Hurt of Sedition. Lond. 1549, 1576, 1641. 3. Latin Tranſlation of the Engliſh Communion Service. Printed among Bucer's opuſcula. 4. De pronunciatione Græcæ. Baſil, 1555, 8vo. 5. Several letters publiſhed in his life by Strype; and a great number of other books.

CHE-KYANG, or TCHE-KIANG, a maritime province of China, and one of the moſt conſiderable in the empire; is bounded on the ſouth by Fo-kien; on the north and weſt by Kiang-nan and Kiangſi; and on on the eaſt by the ſea. The air is pure and healthful, and the ſoil fertile, being watered by a number of rivers and canals, as well as ſprings and lakes. The chief produce is ſilk; a vaſt quantity of which is cultivated here, and for which the whole country is covered with mulberry trees. Theſe are purpoſely checked in their growth by the natives, experience having taught them, that the leaves of the ſmalleſt trees produce the beſt ſilk. The ſtuffs made in this province, which are embroidered with gold and ſilver, are reckoned the beſt in the empire: and notwithſtanding a vaſt exportation to the Japan and Philippine iſlands, as well as to every part of China, and to Europe, ſuch an abundance is left in the province, that a complete ſuit of ſilk may be bought here as cheap as one of the coarſeſt woollen in France.

This province is alſo remarkable for a particular ſpecies of muſhrooms, which is exported to every part of the empire. They are pickled, and then dried; when they will keep good for a whole year. When uſed they muſt be ſoaked in water, which renders them as freſh as at firſt. Here alſo the tallow tree is met with; and the province affords excellent hams, and thoſe ſmall gold-fiſhes with which the ponds are uſually ſtocked.

Che-kyang contains 11 cities of the firſt claſs, 72 of the third, and 18 fortreſſes, which, in Europe, would be accounted large cities. The principal of theſe are, 1. Hang-tcheou-fou, the metropolis, accounted by the Chineſe to be the paradiſe of the earth. It is four leagues in circumference, excluſive of the ſuburbs; and the number of its inhabitants are computed at more than a million, and 10,000 workmen are ſuppoſed to be employed within its walls in manufacturing of ſilk. Its principal beauty is a ſmall lake, cloſe to the walls on the weſtern ſide, the water of which is pure and limpid, and the banks almoſt every where covered with flowers. Its banks are likewiſe adorned with halls and open galleries ſupported by pillars, and paved with large flag-ſtones for the convenience of thoſe who are fond of walking; and the lake itſelf is interſected with cauſeways caſed with cut-ſtone, openings covered with bridges being left in them for the paſſage of boats. In the middle are two iſlands with a temple and ſeveral pleaſure-houſes, and the emperor has a ſmall palace in the neighbourhood. The city is garriſoned by 3000 Chineſe and as many Tartars, and has under its juriſdiction ſeven cities of the third claſs. 2. Hou-tcheou-fou is alſo ſituated on a lake, and manufactures an incredible quantity of ſilk, inſomuch, that the tribute of a city under its juriſdiction amounts to more than 500,000 ounces of ſilver. 3. Ning-po-fou, by Europeans called Liampo, is an excellent port, oppoſite to Japan. Eighteen or twenty leagues from it is an iſland called Tcheou-chan, where the Engliſh firſt landed on their arrival at China. 4. Ning-po is remarkable for the ſilk manufactured there, which is much eſteemed in foreign countries, eſpecially Japan, where it is exchanged for gold, ſilver, and copper. 5. Chao-hing-fou, ſituated in an extenſive and fertile plain, is remarkable for a tomb about half a league diſtant, which is ſaid to be that of *Yu*. The people of this province are ſaid to be the moſt verſed in chicanery of any in China. 6. Tchu-tcheou-fou, remarkable for having in its neighbourhood pines of an extraordinary ſize, capable of containing 40 men in their trunks. The inhabitants are ingenious, polite, and courteous to ſtrangers, but very ſuperſtitious.

CHELIDONIAS, according to Pliny, an anniverſary wind, blowing at the appearance of the ſwallows; otherwiſe the Favonius, or Zephyrus.

CHELIDONIUM, Celandine, and Horned or prickly poppy: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 27th order, *Rhœadeæ*. The corolla is tetrapetalous, the calyx diphyllous, the ſiliqua unilocular and linear. There are ſix ſpecies; none of which are remarkable for their beauty; but one of them, *viz.* the majus, is an article in the materia medica. It grows on old walls, among rubbiſh, and in waſte ſhady places. The herb is of a bluiſh green colour; the root of a deep red; and both contain a gold-coloured juice: their ſmell is diſagreeable, the taſte ſomewhat bitteriſh, very acrid, burning and biting the mouth; the root is the moſt acrid. The juice takes off warts; cures tetters, ring-worms, and the itch; and, diluted with milk, it conſumes opaque white ſpots on the eye.—Horſes, cows, goats, and ſwine, refuſe to eat the herb.

CHELIDONIUS lapis, in natural hiſtory, a ſtone ſaid by the ancients to be found in the ſtomachs of young ſwallows, and greatly cried up for its virtues in the falling-ſickneſs; but, from their deſcription, it appears to be only a ſpecies of lycodontes, or bufonitæ. See Lycodontes, and Bufonitæ.

CHELM, a town of Poland, capital of a palatinate of the ſame name. It is ſituated in the province of Red Ruſſia. E. Long. 23. 30. N. Lat. 51. 25.

CHELMSFORD, the county town of Eſſex, ſituated on the river Chelmer, in E. Long. 0. 30. N. Lat. 51. 40. It ſends two members to parliament.

CHELONE, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquepartite; the rudiment of a fifth filament among the higheſt ſtamina, the capſule bilocular. There are three ſpecies, *viz.* the Glabra, the Hirſuta, and the Penſtemon. They are natives of North America; and are herbaceous flowery perennials, with upright ſtalks two feet high, decorated with ſpear-ſhaped leaves, and beautiful ſpikes of monopetalous, ringent flowers, red, roſe-coloured, blue, and purple. They flower from September to November, and are ſometimes ſucceeded by ripe ſeeds in Britain. They are very hardy plants, and may be propagated by ſeeds ſown in any ſoil or ſituation; but the two firſt multiply ſo faſt by their creeping roots, that the ſeeds are ſeldom regarded.

CHELSEA, a fine village ſituated on the northern bank of the river Thames, a mile weſtward of Weſtminſter, remarkable for a magnificent hoſpital of invalids and old decrepit ſoldiers; and a pleaſure-houſe, called Ranelagh, to which a great deal of fine company reſort in ſummer; and a noble botanic garden belonging to the company of apothecaries. The royal hoſpital of invalids was begun by Charles II. carried on by James II. and finiſhed by king William. It conſiſts of a vaſt range of buildings, that form three large ſquares, in which there is an uncommon air of neatneſs and elegance obſerved. It is under the direction of commiſſioners, who conſiſt generally of the

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officers of ſtate and of war. There is a governor with 500 l. ſalary, a lieutenant governor with 400 l. and a major, with 250l. beſides inferior officers, ſerjeants, corporals and drums, with about 400 men, who all do garriſon duty; and there are above 10,000 out penſioners who receive an annuity of 7l. 12s. 6d. each; all which expence is defrayed by a poundage deducted from the army, deficiences being made good by parliament.—The botanic garden is very extenſive, enriched with a vaſt variety of domeſtic and exotic plants, the original ſtock of which was given to the apothecaries of London by Sir Hans Sloane.—At Ranelagh Garden and amphitheatre the entertainment is a fine band of muſic, with an organ and ſome of the beſt voices, and the regale is tea and coffee.

CHELTENHAM, or CHILTENHAM, a market town of Glouceſterſhire, ſeven miles north-eaſt of Glouceſter. W. Long. 2. 10. N. Lat. 51. 50. It is chiefly remarkable for its mineral waters, of the ſame kind with thoſe of Scarborough. See SCARBOROUGH.

CHEMISE, in fortification, the wall with which a baſtion, or any other bulwark of earth, is lined for its greater ſupport and ſtrength: or it is the ſolidity of the wall from the talus to the ſtone-row.

Fire-CHEMISE, a piece of linen cloth, ſteeped in a compoſition of oil of petrol, camphor, and other combuſtible matters, uſed at ſea, to ſet fire to an enemy's veſſel.

CHEMISTRY

1 Definition.

MAY be defined, The ſtudy of ſuch phenomena or properties of bodies as are diſcovered by variouſly mixing them together, and by expoſing them to different degrees of heat, alone, or in mixture, with a view to the enlargement of our knowledge in nature, and to the improvement of the uſeful arts: or, It is the ſtudy of the effects of heat and mixture upon all bodies, whether natural or artificial, with a view to the improvement of arts and natural knowledge.

2 Antiquity.

The ſcience of chemiſtry is undoubtedly of very high antiquity; and, like moſt other ſciences, its origin cannot be traced. In ſcripture, Tubal Cain, the 8th from Adam, is mentioned as the father or inſtructor of every artificer in braſs or iron. This, however, does not conſtitute him a chemiſt, any more than a founder or blackſmith among us has a right to that title. The name of chemiſt could only belong to him, whoever he was, who firſt diſcovered the method of extracting metals from their ores; and this perſon muſt neceſſarily have lived before Tubal Cain, as every blackſmith or founder muſt have metals ready prepared to his hand. Nevertheleſs, as Tubal Cain lived before the flood, and the ſcience of chemiſtry muſt have exiſted before his time, ſome have conjectured, that the metallurgic part, on account of its extreme uſefulneſs to mankind, was revealed to Adam by God himſelf.

3 Science founded.

Be this as it will, *Siphoas*, an Egyptian, is conſidered by the chemiſts as the founder of their ſcience. He was known by the Greeks under the name of *Hermes*, or *Mercurius Triſmegiſtus*; and is ſuppoſed to have lived more than 1900 years before the Chriſtian æra. A numerous liſt of this philoſopher's works is given by Clemens Alexandrinus; but none of them are now to be found, nor do any of them appear to have been written profeſſedly on chemiſtry.

Two illuſtrious Egyptians, of the name of Hermes, are recorded by ancient authors. The elder ſuppoſed to be the ſame with *Mizraim*, the grandſon of Noah, the *Hermes* of the Greeks, and *Mercury* of the Romans. The younger Hermes lived a thouſand years afterwards; and is ſuppoſed to have reſtored the ſciences after they had fallen into oblivion, in conſequence of an inundation of the Nile. No leſs than 36,000 books are ſaid to have been written under the name of Hermes; but, according to Jamblichus, a cuſtom prevailed of inſcribing all books of ſcience with the name of Hermes. Some authors deny the exiſtence of Hermes, and maintain that his hiſtory is allegorical.

4 Moſes ſuppoſed to be ſkilled in chemiſtry:

As the ſcience of chemiſtry is ſuppoſed to have been well known to the Egyptians, Moſes, who was ſkilled in their wiſdom, is thence ranked among the number of chemiſts; a proof of whoſe ſkill in this ſcience is thought to be, his diſſolving the golden calf made by the Iſraelites, ſo as to render it potable.

Of all the Greeks who travelled into Egypt in order to acquire knowledge, Democritus alone was admitted into their myſteries. The Egyptian prieſts are ſaid to have taught him many chemical operations; among which were the art of ſoftening ivory, of vitrifying flints, and of imitating precious ſtones. Dr Black, however, is of opinion, that Democritus knew nothing more of theſe arts than that of making a coarſe kind of glaſs, as no mention is particularly made of his imitating any other precious ſtone than the emerald, whoſe colour is green; and the coarſer the glaſs the greener it is.

After the time of Democritus, we may know that conſiderable improvements were made in chemiſtry, as phyſicians began to make uſe of metallic preparations, as ceruſe, verdegris, litharge, &c. Dioſcorides deſcribes the diſtillation of mercury from cinnabar by means of an *embic*, from which, by adding the Arabic *Al*, comes the term *Alembic*. The art of diſtillation, however, at that time was in a very rude ſtate; the operation being performed chiefly by ſeparating the air, and more ſubtle part of tar, from the reſt of the matter. This was done by putting the matter to be diſtilled into a veſſel, the mouth of which was covered with a wet cloth; and by this the ſteams of aſcending vapour were condenſed, which were afterwards procured by wringing out the cloth. No other diſtillation, beſides this kind, is mentioned by Galen, Oribaſius, Ælian, or Paulus Ægineta.

5 Derivation of the word Alembic.

6 Original method of diſtilling.

The preciſe time is not known when the three mineral acids were firſt diſcovered; though, as no mention is made of them by Geber, Avicenna, or Roger Bacon, it is probable that they were not known in the 12th century.

tury. Raymond Lully gives ſome hints of his being acquainted with the marine acid; whence it is probable, that it was diſcovered towards the end of the 13th, or beginning of the 14th century.

7 Pliny's account of the origin of glaſs-making.

Several chemical facts are related by Pliny, particularly the making of glaſs, which he aſcribes to the following accident. "Some merchants in the Levant, who had nitre on board their ſhip, having occaſion to land, lighted a fire on the ſand in order to prepare their food. To ſupport their veſſels they took ſome of the lumps of nitre with which their ſhip was loaded: and the fire acting on theſe, melted part of them along with the ſand, and thus formed the tranſparent ſubſtance called glaſs, to the great ſurpriſe of the beholders." But it is probable, that the art of glaſs-making was known long before; and it is by no means likely that it took its riſe from ſuch an accident.

8 Alchemy firſt mentioned by Firmicus Maternus.

9 Origin of the fable the Argonauts.

10 Alchemy firſt ſuppoſed to be derived from the Arabians.

The next traces we find of chemiſtry are to be extracted from the extravagant purſuits of the *Alchemiſts*, who imagined it poſſible to convert the baſer metals into gold or ſilver. The firſt mention we find of this ſtudy is by Julius Firmicus Maternus, who lived in the beginning of the fourth century, and ſpeaks of it as a well known purſuit in his time. Æneas Blaſius, who lived in the fifth century, likewiſe ſpeaks of it; and Suidas explains the term by telling us, that it is the art of making gold and ſilver. He tells us, that Diocleſian, when perſecuting the Chriſtians, forbad all chemical operations, leſt his ſubjects ſhould diſcover the art of making gold, and thus be induced to rebel againſt him. He ſuppoſes alſo, that the Argonautic expedition was only an attempt to procure a ſkin or parchment, on which was written the *recipe* for making gold. It is a common practice, however, in ſome places where gold is waſhed down in ſmall particles by brooks and rivulets from the mountains, to ſuſpend in the water the ſkins of animals having wool or hair upon them, in order to detain the heavier particles which contain the gold; and this probably gave riſe to the fable of the golden fleece. Suidas, however, who lived as late as the tenth century, deſerves very little credit, eſpecially as alchemy is not mentioned by any ancient author.—The Arabian phyſicians afford the moſt clear and diſtinct evidence concerning alchemy. Avicenna, who lived in the tenth century, is ſaid by a diſciple of his to have wrote upon alchemy; he mentions alſo roſe-water, and ſome other chemical preparations; and in the 12th century we find phyſicians adviſed to cultivate an acquaintance with the chemiſts; and another of the Arabian writers ſay, that the method of preparing roſe-water, &c. was then well known.—From this evidence of the exiſtence of alchemy among the Arabians, with the prefatory article *Al*, to denote the greatneſs of the ſcience, it has been conjectured, that the doctrine of the tranſmutation of metals firſt took its riſe among the Arabians, and was introduced into Europe by means of the Cruſades, and by the rapid conqueſts of the Arabians themſelves in Europe as well as in Aſia and Africa. Europe at that time had been in a ſtate of the greateſt barbarity from the incurſions of the northern nations; but the Arabians contributed to revive ſome of the ſciences, and introduced alchemy among the reſt, which continued till the middle of the 17th century; at which time the extravagance of its profeſſors roſe to the greateſt height.

11 No credit due to the doctrine of tranſmutation.

12 Quickſilver produced from lead.

Though the pretenſions of the alchemiſts are now univerſally refuted, yet from ſome of the diſcoveries which have been made in chemiſtry, we are even yet in danger of giving ſome credit to the poſſibility of the proceſs of tranſmutation. When we conſider that the metals are bodies compounded of parts which we can take away and reſtore, and that they are cloſely allied to one another in their external appearance, we may be inclined to think favourably even of the projects of the alchemiſts. The very ſeparation of the metals from their ores, the depriving them of their ductility and malleability, and the reſtoration of theſe properties to them at pleaſure, will appear very ſurpriſing to thoſe who are unacquainted with chemiſtry. There are alſo proceſſes of the more difficult kind, by which quickſilver may be produced from metals that are commonly ſolid, as from lead. Some of theſe we find in Boerhaave, Boyle, &c. authors of the greateſt credit, who both ſpeak of the operation and product as realities of which they were convinced by their own experience. Theſe have been urged, not without ſome plauſibility, in favour of the tranſmutation of the imperfect metals into gold; and hence the deluſions of alchemy were not confined to the vain, the ignorant, and the ambitious part of mankind; but many ingenious and learned men, who took pleaſure in the ſtudy of nature, have been ſeduced into this unhappy purſuit. This happened chiefly in Germany, where the variety of mines naturally turned the thoughts of chemiſts principally towards the metals, though the numerous failures of thoſe who had attempted this art ought to have taught them better.

About the beginning of the 16th century, the pretenders to alchemy were very numerous, and a multitude of knaves, who had beggared themſelves in the attempt, now went abont to enſnare others, performing legerdemain tricks, and cauſing people believe that they could actually make gold and ſilver. A number of the tricks they made uſe of are to be met with in Lemery. Many books, with the ſame deſign of impoſing upon mankind, were written upon the ſubject of alchemy. They aſſumed fictitious names of the greateſt antiquity, and contained rules for preparing the philoſopher's ſtone; a ſmall quantity of which thrown into a baſe metal ſhould convert the whole into gold. They are wrote in a myſterious ſtyle, without any diſtinct meaning; and though ſometimes proceſſes are clearly enough deſcribed, they are found to be falſe and deceitful upon trial, the products not anſwering the pretenſions of the authors. Their excuſe was, that it was vain to expect plain accounts of theſe matters, or that the books on theſe ſubjects ſhould be written diſtinctly and clearly; that the value of gold was in proportion to its ſcarcity, and that it might be employed to bad purpoſes: they wrote only for the laborious and judicious chemiſts, who would underſtand them provided they made themſelves acquainted with the metals by ſtudy and experience. But in fact, no diſtinct meaning has ever been obtained, and the books have only ſerved to delude and betray a great number of others into the loſs of their *lives*.

But though the alchemiſts failed in the execution of their

13 Chemiſtry derived ſome advantages from the labours of the alchemiſts.

their grand project, we muſt ſtill own ourſelves indebted to them for many diſcoveries brought to light during the time they vainly ſpent their labour in the expectation of making gold. Some of theſe are the methods of preparing ſpirit of wine, aquafortis, volatile alkali, vitriolic acid, and gun powder. Medicine too was indebted to them for ſeveral valuable remedies; whence alſo it appears that many, who had waſted their time in the vain purſuit of the philoſopher's ſtone, thought of trying ſome of their moſt elaborate preparations in the cure of diſeaſes; and meeting with ſome ſucceſs, they preſumed that diſeaſes were only to be cured by the aſſiſtance of chemiſtry; and that the moſt elaborate of all its preparations, the philoſophers ſtone, would cure all diſeaſes. Some cures they performed did indeed awaken the attention of phyſicians; and they introduced the uſe of opium, which had formerly been accounted poiſonous. They ſucceeded alſo in the cure of the venereal diſeaſe, which had lately made its appearance, and baffled the regular phyſicians; but the chemiſts, by giving mercury, put a ſtop to its ravages, and, thus introduced this valuable article into the materia medica.

14 Account of Paracelſus.

The moſt famous of the chemical profeſſors was Paracelſus, well known for his arrogance, abſurdity, and profligacy. He was bred to the ſtudy of medicine; but becoming acquainted with the alchemiſts, travelled about in the character of a phyſician, and was at great pains to collect powerful medicines from all quarters. Theſe he uſed with great freedom and boldneſs. His ſucceſs in ſome caſes operated ſo upon the natural arrogance and ſelf-ſufficiency of his diſpoſition, that he formed a deſign of overturning the whole ſyſtem of medicine, and ſupplying a new one from chemiſtry: and indeed he found but very weak adverſaries in the ſubtle theories of Galen with the refinements of the Arabian phyſicians, which only prevailed in his time; and he no doubt had ſome ſhare in baniſhing that veneration which had been ſo long entertained for theſe celebrated perſonages.

15 Hiſtory of chemiſtry ſince the time of Paracelſus.

16 The ſcience ſtudied by Lord Verulam;

From the time of Paracelſus, chemiſtry began every where to aſſume a new face. In Great Britain, Lord Verulam amuſed himſelf at his leiſure hours with forming plans for promoting the ſciences in general, eſpecially thoſe which related to the ſtudy of nature. He ſoon found that chemiſtry might turn out one of the moſt uſeful and comprehenſive branches of natural philoſophy, and pointed out the means of its improvement. A number of experiments were propoſed by him: but he obſerved, that the views of chemiſts were as yet only adapted to explain their particular operations on metals; and he obſerved, that, inſtead of the abſtruſe and barren philoſophy of the times, it was neceſſary to make a very large collection of facts, and to compare them with each other very maturely and cautiouſly, inorder to diſcover the common cauſes and circumſtances of connection upon which they all depend. He did not, however, make any conſiderable diſcoveries, and his works are tedious and diſagreeable to the reader.

17 And by Mr Boyle.

A ſuperior genius to Lord Verulam was Mr Boyle, who was born the very day that the former died. His circumſtances were opulent, his manners agreeable; he was endowed by nature with a goodneſs of heart; and his inclination led him entirely to the ſtudy of nature, which he was beſt pleaſed with cultivating in the way of experiment. He conſidered the weight, ſpring, and qualities of the air; and wrote on hydroſtatics and other ſubjects; and was poſſeſſed of that happy penetration and ingenuity ſo well ſuited to the making of experiments in philoſophy, which ſerves to deduce the moſt uſeful truths from the moſt ſimple and ſeemingly inſignificant facts. As chemiſtry was his favourite ſcience, he ſpared no pains to procure from chemiſts of greateſt note the knowledge of curious experiments, and entertained a number of operators conſtantly about him. His diſcoveries are related in an eaſy ſtyle; and though rather copious, ſuited to the taſte of the times in which he lived, and free from that abſurd and myſterious air which formerly prevailed in chemical writings: nor does he betray a deſign of concealing any thing except ſome particulars which were communicated to him under the notion of ſecrecy, or the knowledge of which might do more harm than good. It is objected indeed, that he betrays a good deal of credulity with regard to facts which were given on the faith of others, and which may ſeem incredible; but this proceeded from his candour, and his being little diſpoſed to ſuſpect others. He ſhowed the neceſſary connection between philoſophy and the arts; and ſaid, that by attending the ſhop of a workman, he learned more philoſophy than he had done in the ſchools for a long time. Thus his writings ſhowed an univerſal taſte for the ſtudy of nature, which had now made ſome advances in the other parts of the world.

18 Chemiſtry emerges from its obſcurity.

Agricola is one of the firſt and beſt authors on the ſubject of metallurgy. Being born in a village in Miſnia, a country abounding in mines and metallurgic works, he deſcribed them exactly and copiouſly. He was a phyſician, and cotemporary with Paracelſus, but of a character very different. His writings are clear and inſtructive, as thoſe of Paracelſus are obſcure and uſeleſs. Lazarus Erker, Schinder, Schlutter, Henkel, &c. have alſo written on metallurgy, and deſcribed the art of aſſaying metals. Anthony Neri, Dr Merret, and the famous Kunkel (who diſcovered the phoſphorus of urine), have deſcribed very fully the arts of making glaſs, enamels, imitations of precious ſtones, &c.: but their writings, as well as thoſe of ſucceeding chemiſts, are not free from the illuſions of alchemy: ſo true it is, that an obſtinate and inveterate malady never diſappears at once, without leaving traces behind. In a ſhort time, however the alchemical phrenzy was attacked by many powerful antagoniſts, who contributed to reſcue the ſcience of chemiſtry from an evil which at once diſgraced it and retarded its progreſs. Among theſe, the moſt diſtinguiſhed are Kircher a Jeſuit, and Conringius a phyſician, who wrote with much ſucceſs and reputation.

19 Royal Society how founded.

About the year 1650 the Royal Society was formed by a number of gentlemen who were unwilling to engage in the civil wars; and being ſtruck with the extenſive views of Lord Verulam and Mr Boyle, contributed to the expence of coſtly experiments. This example appeared ſo noble, and the deſign ſo good, that it has been followed by all the civilized ſtates of Europe, and has met with the protection of their reſpective ſovereigns; and from theſe chemiſtry has received conſiderable improvements. In France, Geoffroy, Lemery, Reaumur, &c. came to be diſtinguiſhed;

ed; and in Germany Margraaf, Pott, and others, have made a conſiderable figure in thoſe ſocieties. Kunckel, Begar, Stahl, and Hoffman, &c. have done great ſervice to ſociety, by introducing new arts, and the numerous improvements they have made.

20
Of the improvements made by different nations in chemiſtry.

The chemiſts who have made a figure in Germany and France are more in number than thoſe whom Britain has produced. In France, the ſociety was encouraged by the ſovereign; and in it they have diveſted themſelves of that myſterious air which was affected in former ages. In Germany, the richneſs of the country, and the great variety of mines, by turning the attention of chemiſts to the metals, have given that alchymiſtical air to their writings which we obſerve in them. The number of thoſe who have applied themſelves to chemiſtry is very ſmall in England, owing to the great improvements made by Sir Iſaac Newton in the ſciences of aſtronomy and optics; which, by turning the general attention that way, has occaſioned what may be called a neglect of chemiſtry. But if their number be inconſiderable, they are by no means inferior in merit and fame. The name of Boyle has always been held in the higheſt eſteem, as well as that of Hales, for the analyſis he has made of the air. Sir Iſaac Newton alone has done more to the eſtabliſhing a rational chemical theory than ever was done before. Of late, the taſte for the ſtudy has became more general, and many uſeful books have appeared; ſo that it is to be hoped they will ſoon excel in this branch of ſcience, as they have done in all the reſt.

PART I. THEORY OF CHEMISTRY.

21
Perfect Theory, what.

According to the definition we have given of this ſcience, the theory of it ought to conſiſt in a thorough knowledge of all the phenomena which reſult from every poſſible combination of its objects with one another, or from expoſing them in all poſſible ways to thoſe ſubſtances which chemiſts have found to be the moſt active in producing a change. So various, however, and ſo widely extended are the objects of chemiſtry (comprehending all terreſtrial bodies whatever), that a knowledge of this kind is utterly unattainable by man. The utmoſt that can be done in this caſe is, to give ſome account of the phenomena which accompany the mixtures of particular ſubſtances, or the appearances they put on when expoſed to heat; and theſe have been already ſo well aſcertained, that they may now be laid down as rules, whereby we may, with a good deal of certainty, judge of the event of our experiments, even before they are made.

22
Objects of Chemiſtry, what.

Here we muſt obſerve, that though the objects of chemiſtry are as various as there are different ſubſtances in the whole ſyſtem of nature, yet they cannot all be examined with equal eaſe. Some of theſe ſubſtances act upon others with great violence; and the greater their activity, the more difficultly are they themſelves ſubjected to a chemical examination. Thus, fire, which is the moſt active body in nature, is ſo little the ſubject of examination, that it hath hitherto baffled the ingenuity of the greateſt philoſophers to underſtand its compoſition. This ſubſtance, therefore, though it be the principal, if not the only *agent* in chemiſtry, is not properly an *object* of it, becauſe it cannot be made a ſubject of any chemical operation.

23
Suppoſition of elements the origin of alchemy.

It hath been cuſtomary to conſider all bodies as compoſed of certain permanent and unchangeable parts called *elements*; and that the end of chemiſtry was to reſolve bodies into theſe elements, and to recompoſe them again by a proper mixture of the elements when ſo ſeparated. Upon this ſuppoſition the alchemiſts went; who, ſuppoſing that all bodies were compoſed of ſalt, ſulphur, and mercury, endeavoured to find out the proportions in which theſe exiſted in gold, and then to form that metal by combining them in a ſimilar manner. Had they taken care to aſcertain the real exiſtence of their elements, and, by mixing them together, compoſed any one metal whatever, though but a grain of lead, the leaſt valuable of them all; their pretenſions would have been very rational and well founded; but as they never aſcertained the exiſtence of ſuch elementary bodies, it is no wonder that their labours were never attended with ſucceſs.

24
Mr Boyle's opinion.

Another ſet of elements which were as generally received, and indeed continue to be ſo in ſome meaſure to this day, are fire, air, earth, and water.—This doctrine of elements was ſtrenuouſly oppoſed by Mr Boyle; who endeavoured to prove, that fire was not an element *per ſe*, but generated merely from the motion of the particles of terreſtrial bodies among one another; that air was generally produced from the ſubſtance of ſolid bodies; and that water, by a great number of diſtillations, was converted into earth. His arguments, however, concerning fire were not at all concluſive; nor does the expulſion of air from fixed bodies prove that any of their ſolid parts were employed in the compoſition of that air; as later diſcoveries have ſhown that air may be abſorbed from the external atmoſphere, and fixed in a great number of ſolid ſubſtances. His aſſertion concerning water deſerves much conſideration, and the experiment is well worth repeating; but it does not appear that he, or any other perſon, ought to have relied upon the experiment which was intended to prove this tranſmutation. The fact was this. Having deſigned to try the poſſibility of reducing water to earth by repeated diſtillations, he diſtilled an ounce of water three times over himſelf, and found a ſmall quantity of earth always remaining. He then gave it to another, who diſtilled it 197 times. The amount of earth from the whole diſtillations was ſix drams, or $\frac{3}{4}$ths of the quantity of water employed; and this earth was fixed, white, and inſoluble in water.—Here it is evident, that great ſuſpicions muſt lie againſt the fidelity of the unknown operator, who no doubt would be wearied out with ſuch a number of diſtillations. The affair might appear trivial to him; and as he would perhaps know to which ſide Mr Boyle's opinion inclined, he might favour it, by mixing ſome white earth with the water. Had the experiment been tried by Mr Boyle's own hand, his known character would have put the matter beyond a doubt.

The decompoſition of water, however, in another way, by the combination of one part of it with the phlogiſtic, and another with the earthy part of a metal, is now well aſcertained, and the experiments which led to the diſcovery are treated of under the articles AEROLOGY and WATER.

25 Exiſtence of elements diſputed.

Even the exiſtence of earth as an element appears as dubious as that of the others; for it is certain that there is no ſpecies of earth whatever, from which we can produce two diſſimilar bodies, by adding their other component parts.—Thus, the earth of alum has all the characters of ſimplicity which we can deſire in any terreſtrial ſubſtance. It is white, inſipid, inodorous, and perfectly fixed in the fire; nevertheleſs, it ſeems to be only an element of that particular body called *alum*; for though alum is compoſed of a pure earth and vitriolic acid joined together, and Epſom ſalt and ſelenite are both compoſed of a pure earth combined with the ſame acid; yet by adding oil of vitriol to the earth of alum, in any poſſible way, we ſhall never be able to form either Epſom ſalt or ſelenite. In like manner, though all the imperfect metals are compoſed of inflammable matter joined with an earthy baſis; yet by adding to earth of alum any proportion we pleaſe of inflammable matter, we ſhall never produce a metal; and what is ſtill more mortifying, we can never make the earthy baſis of one metallic ſubſtance produce any other metal than that which it originally compoſed.

26 Elements neceſſarily inviſible.

A little conſideration upon the ſubject of elements will convince us, not only that no ſuch bodies have ever yet been diſcovered, but that they never will; and for this plain reaſon, that they muſt be in their own nature inviſible.—The component parts of any ſubſtance may with propriety enough be called the elements of that ſubſtance, as long as we propoſe carrying the decompoſition no farther; but theſe elements have not the leaſt property reſembling any ſubſtance which they compoſe. Thus, it is found that the compound ſalt called *ſal ammoniac*, is formed by the union of an acid and an alkali: we may therefore properly enough call theſe two the elements of ſal ammoniac; but, taken ſeparately, they have not the leaſt reſemblance to the compound, which is formed out of them. Both the acid and alkali are by themſelves ſo volatile as to be capable of diſſipation into an inviſible vapour by the heat of one's hand; whereas, when joined together, they are ſo fixed as almoſt to endure a red heat without going off. If, again, we were to ſeek for the elements of the acid and alkali, we muſt not expect to find them have any properties reſembling either an acid or an alkali, but others quite different. Any common element of all bodies muſt therefore be a ſubſtance which has no property ſimilar to any other in the whole ſyſtem of nature, and conſequently muſt be imperceptible.

27 Suppoſition concerning phlogiſton.

To the abovementioned four elements, viz. fire, air, earth, and water, a kind of *fifth* element has generally been added, but not uſually diſtinguiſhed by that name, though it has apparently an equal, if not a greater, right to the title of an *element* than any of the others. This ſubſtance is called the *phlogiſton*, or inflammable principle; on which the ignition of all bodies depends. The exiſtence of this element was firſt aſſerted by Stahl, and from him the opinion has been derived to other chemiſts: but of late a new doctrine was broached by M. Lavoiſier, who denies the exiſtence of phlogiſton altogether. Though none of theſe ſubſtances therefore are properly the objects of chemiſtry, yet as they have ſo much ingroſſed the attention of modern chemiſts, we ſhall here give an account of the moſt remarkable theories that have appeared concerning them.

Of the Element of Fire.

Sect. I. *Of the Element of Fire.*

28 Two general theories of heat.

The opinions concerning the element of fire may be divided into two general claſſes; the one conſidering it as an effect, the other as a cauſe. The former is maintained by Lord Bacon, Mr Boyle, and Sir Iſaac Newton; whoſe reſpectable names for a long time gave ſuch a ſanction to this theory, that it was generally looked upon as an eſtabliſhed truth. Some learned men, however, among whom was the great Dr Boerhaave, always diſſented, and inſiſted that fire was a fluid univerſally diffuſed, and equally preſent in the frozen regions of Nova Zembla as in a glaſs-houſe furnace, only that in the latter its motion made it conſpicuous; and by ſetting it in motion in the coldeſt parts of the world, its previous exiſtence there would be equally demonſtrable as in the furnace abovementioned.

29 Lord Bacon's definition of heat.

Lord Bacon defines heat, which he uſes as a ſynonymous term with fire, to be an expanſive undulatory motion in the particles of a body, whereby they tend with ſome rapidity towards the circumference, and alſo a little upwards. Hence, if in any natural body you can excite a motion whereby it ſhall expand or dilate itſelf, and can repreſs and direct this motion upon itſelf in ſuch a manner that the motion ſhall not proceed uniformly, but obtain in ſome parts and be checked in others, you will generate heat or fire.

30 Mr Boyle's opinion

The ſame opinion is ſupported by Mr Boyle in the following manner: "The production of heat diſcovers nothing, either in the agent or patient, but motion, and its natural effects. When a ſmith briſkly hammers a ſmall piece of iron, the metal thereby becomes exceedingly hot: yet there is nothing to make it ſo, except the motion of the hammer impreſſing a vehement and variouſly determined agitation on the ſmall parts of the iron; which, being a cold body before, grows hot by that ſuperinduced motion of its ſmall parts: firſt, in a more looſe acceptation of the word, with regard to ſome other bodies, in compariſon of which it was cold before; then ſenſibly hot, becauſe the motion in the parts of the iron is greater than that in the parts of our fingers; at the ſame time that the hammer and anvil, by which the percuſſion is communicated, may, on account of their magnitude, remain cold. It is not neceſſary, therefore, that a body ſhould itſelf be hot in order to communicate heat to another."

31 Sentiments of Sir Iſaac Newton.

The arguments made uſe of by Sir Iſaac Newton are not intended poſitively to eſtabliſh any kind of theory relating to fire, but are to be found in a conjecture, publiſhed at the end of his Treatiſe on Optics, concerning the nature of the ſun and ſtars. "Large bodies (he obſerves) preſerve their heat the longeſt, their parts heating one another; and why may not great, denſe, and fixed bodies, when heated beyond a certain degree, emit light ſo copiouſly, as, by the emiſſion and reaction of it, and the reflections and refractions within the pores, to grow continually hotter, till they arrive at ſuch a period of heat as is that of the ſun? Their

parts

parts may be further preſerved from fuming away, not only by their fixity, but by the vaſt weight and denſity of the atmoſphere incumbent on them, ſtrongly compreſſing them, and condenſing the vapours exhaled from them. Thus we ſee, that warm water, in an exhauſted receiver, ſhall boil as vehemently as the hotteſt water expoſed to the air: the weight of the incumbent atmoſphere in this latter caſe keeping down the vapours, and hindering the ebullition till it has received its utmoſt degree of heat. Thus alſo a mixture of tin and lead, put on a red hot iron *in vacuo*, emits a fume and flame: but the ſame mixture in the open air, by reaſon of the incumbent atmoſphere, does not emit the leaſt ſenſible flame." In conſequence of theſe experiments, Sir Iſaac conjectures, that there is no eſſential diſtinction betwixt fire and groſs bodies; but that they may be converted into one another. "Fire (he ſays) is a body heated ſo hot as to emit light copiouſly; for what (ſays he) is a red hot iron but fire?"

32
Fire now generally allowed to be an element *per ſe*.

33
Two other theories inſtituted.

34
In what they differ from the former.

The hypotheſes of theſe great men produced long and violent diſputes, which were never deciſively ſettled: The diſcoveries in electricity, however furniſhed ſuch additional ſtrength to the followers of Dr Boerhaave, that fire is now believed to be an element and fluid diſtinct from all others, by at leaſt as many as eſpouſe the contrary ſyſtem; but the queſtion is not decided, Whether the fire itſelf is to be conſidered as the agent? or, Whether its action is to be derived from the principles of attraction and repulſion, the natural agents ſuppoſed to influence other material ſubſtances? This has produced two other ſyſtems of a kind of mixed nature, in which heat or fire is conſidered as a ſubſtance diſtinct from all others, but which acts in other bodies according to its *quantity*. Theſe ſyſtems have been promulgated by Dr Black of Edinburgh and Dr Irvine of Glaſgow. They differ from the opinions of Mr Boyle, Lord Bacon, and Sir Iſaac Newton, in ſuppoſing heat to be a fluid diſtinct from all other material ſubſtances; and they alſo differ from the hypotheſis of Dr Boerhaave, Lemery, and others, in ſuppoſing different terreſtrial ſubſtances to be hot according to the *quantity* of fluid contained, and not according to the force with which it moves in them.

35
General account of Dr Black's and Dr Irvine's theories.

Dr Black is of opinion that *heat*, which he ſeems to make ſynonymous with fire, exiſts in two different ſtates; in one of which it affects our ſenſes and the thermometer, in the other it does not. The former therefore he calls *ſenſible* heat, the later *latent* heat. On theſe principles he gives the only ſatisfactory explanation of the phenomena of evaporation and fluidity that has yet appeared, as ſhall afterwards be more fully explained. At preſent we ſhall only obſerve, that, according to the theory of Dr Black, heat or fire itſelf ſeems to be the agent; but, according to that of Dr Irvine, as far as we can gather it from the treatiſes of Dr Crawford and others, the principles of attraction and repulſion are the agents by which heat, as well as other bodies, is influenced. Thus, on the principles of Dr Black, we ſay, that water is converted into vapour by a quantity of heat entering into it in a *latent* ſtate, and thereby rendering it ſpecifically lighter than the atmoſphere; according to the principles of Dr Irvine, we ſay, that water is converted into vapour by having its capacity for attracting heat from the atmoſphere increaſed. So that, according to the former, the abſorption of heat is the *cauſe*; according to the latter, the *effect*, of its converſion into vapour.

36
Dr Irvine's theory explained by Dr Crawford.

37
Abſolute heat defined.

83
Relative heat.

Dr Crawford, in his Treatiſe on Heat, publiſhed in 1788, informs us, that *heat*, in the philoſophical ſenſe of the word, has been uſed to expreſs what is frequently called the *element of fire*, in the abſtract, without regard to the peculiar effects which it may produce in relation to other bodies. This, with Dr Irvine, he calls *abſolute* heat; and the external cauſe, as having a relation to the effects it produces, he calls *relative* heat. "From this view of the matter (ſays he), it appears, that *abſolute heat* expreſſes, in the abſtract, that *power* or *element* which, when it is preſent to a *certain* degree, excites in all animals the ſenſation of heat; and *relative* heat expreſſes the ſame power, conſidered as having a relation to the effects by which it is known and meaſured.

39
How divided.

40
Comparative heat defined.

"The effects by which heat is known and meaſured are three; and therefore relative heat may admit of three ſubdiviſions. 1. This principle is known by the peculiar ſenſations which it excites in animals. Conſidered as exciting thoſe ſenſations, it is called *ſenſible* heat. 2. It is known by the effect which it produces upon an inſtrument that has been employed to meaſure it, termed a *thermometer*. This is called the *temperature of heat in bodies*. 3. It has been found by experiment, that in bodies of different kinds the quantities of abſolute heat may be unequal, though the temperatures and weights be the ſame. When the principle of heat is conſidered relatively to the whole quantity of it contained in bodies of different kinds, but which have equal weights and temperatures, I ſhall term it *comparative heat*. If, for example, the temperatures and weights being the ſame, the whole quantity of heat in water be four times as great as that of antimony, the comparative heats of theſe ſubſtances are ſaid to be as four to one."

41
Experiments by which Dr Black was led to the diſcovery of latent heat.

42
A quantity of heat loſt in the melting of ice.

In order to have a proper conception of what is meant by a difference in abſolute heat, when the temperatures are the ſame, it will be neceſſary to relate ſome experiments, by which Dr Black was firſt led to the diſcovery of latent heat. He obſerves, that when two equal maſſes of the ſame matter, heated to different degrees, are mixed together, the heat of the mixture ought to be an arithmetical mean betwixt the two extremes. This, however, only takes place on mixing hot and cold water together; but if inſtead of cold water we take ice, the caſe is remarkably different. Here the temperature of the mixture is much below the arthmetical mean, and a quantity of heat is apparently loſt. Now we know that the temperature of ice newly frozen is generally 32 degrees of Fahrenheit; ſuppoſing therefore the temperature of the water which diſſolves it to be 120, the arithmetical mean is 71; but if the mixture indicates a temperature only of 60°, then we muſt ſuppoſe that the ice contained 11° of heat leſs than was indicated by the thermometer; and conſequently, that water at 32° contains 11° more of abſolute heat than ice at 32°.

43
Great quantity of heat produced by the condenſation of vapour.

The ſame thing is made ſtill more evident from the condenſation of vapour. The fluid of water is not capable of ſuſtaining a great degree of heat; and 212° of Fahrenheit is the utmoſt it can be made to bear, without an extraordinary degree of preſſure, as in Papin's digeſter, or the admixture of ſaline ſubſtances: the temperature of the ſteam emitted by it therefore never can exceed 212°, except in the caſes juſt mentioned; and it is often capable of bearing a great degree of cold without being condenſed. When the condenſation takes place at laſt, however, a very conſiderable degree of heat is always produced; and Dr Black has ſhown, that, in the condenſation of ſteam by the refrigeratory of a common ſtill, as much heat is communicated to the water in the refrigeratory as would be ſufficient to make the water which comes over as hot as red hot-iron, were it all to exiſt in a ſenſible ſtate.

44 Dr Black's method of calculating it.

His method of making the calculation is very eaſy. For, ſuppoſing the refrigeratory to contain 100 pounds of water, and that one pound has been diſtilled; if the water in the refrigeratory has received 10 degrees of heat, we know that the diſtilled pound has parted with 1000. If in paſſing through the worm of the refrigeratory, it has been reduced to the temperature of 50° of Fahrenheit, having been at 212° when it entered it, then it has loſt only 162° of ſenſible heat; all the reſt communicated to the water of the refrigeratory amounting to more than 800°, having been contained in a latent ſtate, and ſuch as could not then affect the thermometer.

45 Mr Watt's experiment on the diſtillation of water *in vacuo*

This experiment was tried by Mr Watt in a manner ſtill more ſtriking, by a diſtillation of water *in vacuo*. Thus the ſteam, freed from the preſſure of the atmoſphere, could not conceive ſuch a degree of ſenſible heat as in the common method of diſtilling. It came over therefore with a very gentle warmth, ſcarce more than what the hand could bear; nevertheleſs it had abſorbed as much heat as though the diſtillation had been performed in the common way; for the refrigeratory had 1000 degrees of heat communicated to it.

46 Difference of abſolute heat in different fluids.

47 Thinneſt fluids contain the greateſt quantity of heat.

The difference of abſolute heat is likewiſe perceptible betwixt any two bodies of different denſity, water and mercury for inſtance: and in comparing theſe, it will always be found that the thinneſt fluids contain the greateſt quantity of abſolute heat; as water more than mercury, ſpirit of wine, more than water, ether more than ſpirit of wine, and air more than any of them. Dr Black having brought equal bulks of mercury and water, the former to a temperature of 50 degrees higher than the latter, found that, on mixture, there was a gain of only 20 degrees above the original; but on reverſing the experiment, and heating the water 50 degrees above the mercury, there was a gain of 30 degrees on the whole.

48 Great difference betwixt the calculations of Drs Cleghorn and Crawford.

“Hence (ſays Dr Cleghorn in his theſis *de Igne*) it appears, that the quantity of heat in water is to that in mercury, when both are of equal temperatures, as 3 to 2.” Dr Crawford, however, tells us, that “the ſame quantity of heat which raiſes a pound of water one degree, will raiſe a pound of mercury 28 degrees; whence it follows, that the comparative heat of water is to that of mercury as 28 to 1: and conſequently, the alterations which are produced in the temperatures of bodies by given quantities of abſolute heat, may properly be applied as a meaſure of their comparative heats; the alterations of temperature and the comparative heats being reciprocally proportional to one another.

49 Crawford's account of ſenſible heat.

“Senſible heat (continues Dr Crawford) depends partly on the ſtate of the temperature, and partly on that of the organ of feeling; and therefore if a variation be produced in the latter, the ſenſible heat will be different, though the temperature continue the ſame. Thus water at the temperature of 62° of Fahrenheit appears cold to a warm hand immerſed in it; but on the contrary, that fluid will appear warm if a hand be applied to it which has a lower degree of heat than 62°. For this reaſon, the thermometer is a much more accurate meaſure of heat than the ſenſes of animals. As long, however, as the organs remain unchanged, the ſenſible heat is in proportion to the temperature; and therefore thoſe terms have generally been conſidered as ſynonymous.

50 Dr Reid's obſervation concerning temperatures.

On this ſubject Dr Reid obſerves, that until the ratio between one temperature and another be aſcertained by experiment and induction, we ought to conſider temperature as a meaſure which admits of degrees, but not of ratios; and conſequently ought not to conclude, that the temperature of one body is double or triple to that of another, unleſs the ratio of different temperatures were determined. Nor ought we to uſe the expreſſions of a *double* or *triple* temperature, thoſe being expreſſions which convey no diſtinct meaning until the ratio of different temperatures be determined.”

51 Difference betwixt the calculations of Drs Crawford and Black.

In making experiments on the comparative quantities of heat in different bodies, our author chooſes rather to uſe equal *weights* than equal *bulks* of the ſubſtances to be compared. Thus he found the comparative heat of water to be to that of mercury as 28 to 1 by weight, and 2 to 1 by bulk; which differs very conſiderably from the concluſion of Dr Black, who makes it only as 3 to 2, as has been already mentioned.

52 Capacities for containing heat explained.

From the differences obſerved in the quantities of abſolute heat contained in different bodies, our author concludes, that “there muſt be certain eſſential differences in the nature of bodies; in conſequence of which, *ſome* have the power of collecting and retaining that element in greater quantity than *others*.” Theſe different powers he calls the *capacities* for containing heat. Thus, if we find by experiment that a pound of water contains four times as much abſolute heat as diaphoretic antimony, when at the ſame temperature, the capacity of water for containing heat is ſaid to be to that of animony as 4 to 1.

53 How the capacity, temperature, and abſolute heat, are to be diſtinguiſhed.

“The temperature, the capacity for containing heat, and the abſolute heat contained, may be diſtinguiſhed from each other in the following manner.

“The capacity for containing heat, and the abſolute heat contained, are diſtinguiſhed as a force diſtinct from the ſubject upon which it operates. When we ſpeak of the capacity, we mean a power inherent in the heated body; when we ſpeak of the abſolute heat, we mean an unknown principle which is retained in the body by the operation of this power; and when we ſpeak of the temperature, we conſider the unknown principle as producing certain effects upon the thermometer.

“The capacity for containing heat may continue unchanged, while the abſolute heat is varied without end. If a pound of ice, for example, be ſuppoſed to retain its ſolid form, the quantity of its abſolute heat will be altered by every increaſe or diminution of its ſenſible heat: but as long as its form continues the ſame, its capacity for receiving heat is not affected by an an alteration of temperature, and would remain unchanged though the body were wholly deprived of its heat."

54
Crawford's opinion concerning heat in the abſtract.

In the courſe of his work, Dr Crawford obſerves, that "he has not entered into the inquiry which has been ſo much agitated among the Engliſh, the French, and the German philoſophers, Whether heat be a *ſubſtance* or a *quality*? In ſome places indeed he has uſed expreſſions which ſeem to favour the former opinion; but his ſole motive for adopting theſe was, becauſe the language ſeemed to be more ſimple and natural, and more conſonant to the facts which had been eſtabliſhed by experiment. At the ſame time, he is perſuaded that it would be a very difficult matter to reconcile many of the phenomena with the ſuppoſition that heat is a *quality*. It is not eaſy to conceive, upon this hypotheſis, how heat can be abſorbed in the proceſſes of fuſion, evaporation, combuſtion; how the quantity of heat in the air can be diminiſhed, and that in the blood increaſed, by reſpiration, though no ſenſible heat or cold be produced.

"Whereas, if we adopt the opinion that heat is a diſtinct ſubſtance, or an element *ſui generis*, the phenomena will be found to admit of a ſimple and obvious interpretation.

55
Fire contained in bodies partly by its attraction to them, and partly by the preſſure of the external fluid.

"Fire will be conſidered as a principle; which is diſtributed in various proportions throughout the different kingdoms of nature. The mode of its union with bodies will reſemble that particular ſpecies of union, wherein the elements are combined by the joint forces of preſſure and attraction. Of this kind is the combination of fixed air and water; for fixed air is retained in water partly by its attraction for that fluid, and partly by the preſſure of the external air; and if either of theſe forces be diminiſhed, a portion of the fixed air eſcapes. In like manner, it may be conceived that elementary fire is retained in bodies, partly by its attraction to theſe bodies, and partly by the action of the ſurrounding heat; and in that caſe a portion of it will be diſengaged, either by diminiſhing the attractive force, or by leſſening the temperature of the circumambient medium. If, however, fire be a ſubſtance which is ſubject to the laws of attraction, the mode of its union with bodies ſeems to be different from that which takes place in chemical combination: for, in chemical combination, the elements acquire new properties, and either wholly or in part loſe thoſe by which they were formerly characterized. But we have no ſufficient evidence for believing that fire, in conſequence of its union with bodies, does, in any inſtance, loſe its diſtinguiſhing properties."

56
Dr Berkenhout's opinion concerning the nature of heat.

Dr Berkenhout, in his firſt Lines of the Theory and Practice of Philoſophical Chemiſtry, informs us, that "heat, or the *matter of heat*, is by Scheele and Bergman ſubſtituted for fire, which they believe to be the action of heat when increaſed to a certain degree. The firſt of theſe celebrated chemiſts believed this *matter of heat* to be a compound of phlogiſton and pure air. He was certainly miſtaken. It ſeems more philoſophical to conſider heat as an *effect*, of which fire is the ſole cauſe.

57
His diviſion of fire into fixed and volatile.

"Heat I conſider not as a diſtinct ſubſtance, but as an effect of fire, fixed or volatile; in both which ſtates fire ſeems to exiſt in all bodies, ſolid and fluid. Fixed fire I believe to be a conſtituent part of all bodies, and their ſpecific heat to depend on the quantity of fixed fire in each. This fixed, this latent fire, cannot be ſeparated from the other conſtituent parts of bodies but by their decompoſition: it then becomes volatile and incoercible. If this hypotheſis be true, fire exiſts, in all natural bodies that contain phlogiſton, in three different ſtates: 1. In that volatile ſtate in which it perpetually fluctuates between one body and another. 2. Combined with an acid, probably in the form of fixed inflammable air or phlogiſton. 3. Uncombined and fixed, as a conſtituent principle, determining the ſpecific heat of bodies.

58
Pure or volatile fire defined.

"Pure (or volatile) fire is diſtinguiſhed by the following properties. 1. It is eſſentially fluid, inviſible, and without weight. 2. It is the immediate cauſe of all fluidity. 3. It penetrates and pervades all bodies on the ſurface of the earth, and as far beneath the ſurface as hath hitherto been explored. Water hath never been found in a congealed ſtate in the deepeſt mines. 4. It has a conſtant tendency to diffuſe itſelf equally through all bodies, howſoever different in point of denſity. A marble ſlab, a plate of iron, a decanter of water, and a lady's muff, at the ſame diſtance from the fire, and other external circumſtances, being equal, poſſeſs an equal degree of heat, which is preciſely that of the atmoſphere in which they ſtand. 5. It is perpetually in motion from one body to another, and from different parts of the ſame body, becauſe external circumſtances are continually varying. 6. In fluctuating from one body to another, it produces a conſtant vibration of their conſtituent parts; for all bodies expand and contract in proportion to the quantity of fire they contain. 7. Accumulated beyond a certain quantity, it effects the diſſolution of bodies, by forcing their conſtituent parts beyond the ſphere of mutual attraction, called the *attraction of coheſion*, which is the cauſe of ſolidity. Hence the ſoveriegn agency of fire in chemical operations."

59
Dr Crawford's definition of fire.

Dr Crawford, beſides the opinions already quoted, tells us, that fire, in the vulgar acceptation of the word, expreſſes a certain degree of heat accompanied with light; and is particularly applied to that heat and light which are produced by the inflammation of combuſtible bodies. But as heat, when accumulated in a ſufficient quantity, is conſtantly accompanied with light; or, in other words, as fire is always produced by the increaſe of heat, philoſophers have generally conſidered theſe phenomena as proceeding from the ſame cauſe: and have therefore uſed the word *fire* to expreſs that unknown principle, which, when it is preſent to a certain degree, excites the ſenſation of heat alone; but, when accumulated to a greater degree, renders itſelf obvious both to the ſight and touch, or produces heat accompanied with light. In this ſenſe, the element of fire ſignifies the ſame thing with *abſolute heat*.

Having premiſed theſe general definitions and remarks, he gives the properties of heat in the following words:

60
Heat has a tendency to diffuſe itſelf equally over bodies.

"I. Heat has a conſtant tendency to diffuſe itſelf over all bodies till they are brought to the ſame temperature. Thus it is found by the thermometer, that if two bodies of different temperatures are mixed together, or placed contiguous, the heat paſſes from the one to the other till their temperatures become equal;

and

and that all inanimate bodies, when heated and placed in a cold medium, continually loſe heat, till in proceſs of time they are brought to the ſtate of the ſurrounding medium.

" From this property of heat it follows, that the various claſſes of bodies throughout the earth, if they were not acted upon by external cauſes, would at length, arrive at a common temperature when the heat would become quieſcent; in like manner as the waters of the ocean, if not prevented by the winds and by the attractions of the ſun and moon, would come to an equilibrium, and would remain in a ſtate of reſt. But as cauſes continually occur in nature to diſturb the balance of heat as well as that of the waters of the ocean, thoſe elements are kept in a conſtant fluctuation.

61
It is contained in conſiderable quantity in all bodies.

" II. Heat is contained in conſiderable quantities in all bodies when at the common temperature of the atmoſphere.

62
Great degree of cold at Glaſgow,

" From the intereſting experiments which were made on cold by Mr Wilſon, we learn, that at Glaſgow, in the winter of the year 1780, the thermometer on the ſurface of ſnow ſunk 25 degrees below the beginning of Fahrenheit's ſcale.

63
In Siberia, and at Hudſon's bay.

" We are told by Dr Pallas, that in the deſerts of Siberia, during a very intenſe froſt, the mercury was found congealed in thermometers expoſed to the atmoſphere, and a quantity of that fluid in an open bowl placed in a ſimilar ſituation, at the ſame time became ſolid. The deciſive experiments of Mr Hutchins at Hudſon's Bay prove, that the freezing point of mercury is very nearly 40° below the *zero* (or 0°) of Fahrenheit. From which it follows, that at the time of Dr Pallas's obſervation, the atmoſphere in Siberia muſt have been cooled to minus 40. By a paper lately tranſmitted to the Royal Society we are informed, that the ſpirit-of-wine thermometer in the open air at Hudſon's Bay fell to — 42 in the winter of 1785; and from the ſame communication we learn, that by a mixture of ſnow and vitriolic acid, the heat was ſo much diminiſhed, that the ſpirit of wine ſunk to — 80, which is 112 below the freezing point of water.

64
Quantity of heat limited in all bodies.

" Hence it is manifeſt, that heat is contained in conſiderable quantities in all bodies when at the common temperature of the atmoſphere. It is plain, however, that the quantity inherent in each individual body is limited. This, I think, muſt be admitted, whatever be the hypotheſis which we adopt concerning the nature of heat; whether we conceive it to be a force or power belonging to bodies, or an elementary principle contained in them. For thoſe who conſider heat as an element, will not ſuppoſe that an unlimited quantity of it can be contained in a finite body; and if heat be conſidered as a force or power, the ſuppoſition that finite bodies are actuated by forces or powers which are infinite is equally inadmiſſible.

65
Bodies univerſally expanded by heat.

" To place this in another light, we know that bodies are univerſally expanded by heat, excepting in a very few inſtances, which do not afford a juſt objection to the general fact; becauſe, in thoſe inſtances, by the action of heat a fluid is extricated that previouſly ſeparated the particles from each other. Since, therefore, heat is found to expand bodies in the temperatures which fall within the reach of our obſervation, we may conclude that the ſame thing takes place in all temperatures."

66
Expanſion of mercury, &c. proportionable to the degrees of heat.

Our author, by a ſet of very accurate and laborious experiments, determines that the expanſions in mercury and ſome other fluids are proportionable to the quantities of heat applied; " from which (ſays he) it is manifeſt, that the quantities of heat in bodies are limited, becauſe an infinite heat would produce an infinite expanſion.

" It is manifeſt, that the number of degrees of ſenſible heat, as meaſured by the thermometer, and eſtimated from the beginning of the ſcale, muſt be the ſame in all bodies which have a common temperature; for by the firſt general fact it is proved, that heat has a conſtant tendency to diffuſe itſelf uniformly over bodies till their temperatures become equal. From which it may be inferred, that if a quantity of heat were added to bodies abſolutely cold, the ſame uniform diffuſion would take place; and that if a thermometer, altogether deprived of its heat, were applied to ſuch bodies, it would be equally expanded by them, the whole of the ſenſible heat which they had acquired being indicated by that expanſion.

67
Homogeneous bodies of the ſame temperature, contain quantities of heat proportionable to thoſe of their matter.

" III. If the parts of the ſame homogeneous ſubſtance have a common temperature, the quantity of abſolute heat will be proportional to the bulk or quantity of matter. Thus the quantity of abſolute heat in two pounds of water is double that which is contained in one pound when at the ſame temperature.

" IV. The dilatations and contractions of the fluid in the mercurial thermometer are nearly proportional to the quantities of abſolute heat which are communicated to the ſame homogeneous bodies, or ſeparated from them, as long as they retain the ſame form. Thus the quantity of heat required to raiſe a body four degrees in temperature by the mercurial thermometer, is nearly double that which is required to raiſe it two degrees, four times that required to raiſe it one degree, and ſo in proportion."

68
Mr Kirwan's opinion concerning fire.

69
Mr Cavendiſh's opinion that it is not a diſtinct ſubſtance.

70
Difficulty in defining the phraſe *quantity of heat*.

Thus we find, that Dr Black, Dr Irvine, Dr Crawford, and Dr Berkenhout, agree in ſpeaking of fire or heat as a fluid ſubſtance diſtinct from all other bodies. Mr Kirwan, in his Treatiſe of Phlogiſton, agrees in the ſame opinion. " Some (ſays he) have thought, that I ſhould have included the matter of heat, or elementary fire, in the definition of inflammable air; but as fire is contained in all corporeal ſubſtances, to mention it is perfectly needleſs, except where bodies differ from each other in the quantity of it they contain." On the other hand, Mr Cavendiſh, Phil. Tranſ. lxxiv. P. 141. tells us, that " he thinks it more likely that there is no ſuch thing as elementary heat:" but, as he gives no reaſon for this opinion, it ſeems probable that the greater part of philoſophers either poſitively believe that heat is an elementary fluid diſtinct from all others, or find themſelves obliged to adopt a language which neceſſarily implies it. The only difficulty which now remains therefore is, to affix a proper idea to the phraſe *quantity of heat*, which we find univerſally made uſe of, without any thing to determine our opinions concerning it.

71
This phraſe cannot be uſed in the common acceptation of the word with regard to fire.

That we cannot ſpeak of a *quantity* of fire or heat in the ſame ſenſe as we ſpeak of a quantity of water or any other fluid is evident, becauſe we can take away the quantity of water which any ſubſtance contains, but cannot do ſo with heat. Nay, in many caſes we are ſure, that a ſubſtance very cold to the touch does yet

yet contain a very conſiderable quantity of heat. The vapour of water, for inſtance, may be made much colder than the uſual temperature of the atmoſphere without being condenſed, when at the ſame time we are certain that it contains a great quantity of heat; and the ſame may be ſaid of water, which, in the act of freezing, throws out a great quantity of heat without becoming colder; and in the act of melting abſorbs as much without becoming warmer. It is not therefore by the mere preſence or abſence of this fluid that we can determine the real quantity of this fluid; nor does it appear that the word *quantity* can be at all accurately applied to the element itſelf, becauſe we have no method of meaſuring it.

72
Dr Cleghorn's opinion.

Dr Cleghorn, in his inaugural diſſertation *De Igne* throws ſome light on this ſubject, by obſerving, that "the thermometer ſhows only the quantity of heat *going out* of a body, not that which is really contained in it:" and he alſo inſiſts, that "we can neither aſſent to the opinion of Dr Boerhaave, who ſuppoſed that heat was diſtributed among bodies in proportion to their bulks; nor to the hypotheſis of others, who imagined that they were heated in proportion to their denſities." But in what proportion, then, are they heated; or how are we to meaſure the *quantity* which they really contain, ſeeing the thermometer informs us only of what they part with?

73
The latent heat of bodies cannot be meaſured.

As this point is by no means aſcertained, we cannot form a direct idea concerning the abſolute quantity of heat contained in any body; and therefore when we ſpeak of quantities of this fluid, we muſt in fact, if we mean any thing, think of the ſenſible quantity flowing out of them; and though we ſhould ſuppoſe the whole of this ſenſible heat to be removed, it would ſtill be impoſſible for us to know how much remained in a latent ſtate, and could not be diſſipated.

74
Dr Cleghorn's hypotheſis concerning fire.

This difficulty will ſtill appear the greater, if with Dr Cleghorn and others we ſuppoſe the fluid of heat to be ſubject to the laws of attraction and repulſion. This gentleman ſuppoſes, that the particles of heat (like the particles of electric fluid according to the Franklinian hypotheſis) are repulſive of one another, but attracted by all other ſubſtances. "If any body (ſays he), heated beyond the common temperature of the air, is expoſed to it, the heat flows out from it into the atmoſphere, and diffuſes itſelf equally all around till the air becomes of the ſame temperature with itſelf. The ſame happens to bodies ſuſpended *in vacuo*. Hence it is juſtly concluded, that there exiſts between the particles of heat a repulſive power, by which they mutually recede from each other. Notwithſtanding this repulſive power, however, the quantities of heat contained in different ſubſtances, even of the ſame temperature, are found to be altogether different; and from Dr Black's experiments it now appears, that the quantity of heat is ſcarce ever the ſame in any two different bodies: and hence we may conclude, that terreſtrial bodies have a power of attracting heat, and that this power is different in different ſubſtances.—From theſe principles it evidently follows, that heat is diſtributed among bodies directly in proportion to their attracting powers, and inverſely according to the repulſive power between the particles of heat themſelves.

75
Equilibrium of heat defined.

Such is the diſtribution of heat among bodies in the neighbourhood of each other; and which is called the *equilibrium of heat*, becauſe the thermometer ſhows no difference of temperature among them. For ſeeing the heat is diſtributed according to the attracting power of each, the thermometer having alſo a proper attraction of its own, can ſhow no difference in the attracting power of each; for which reaſon all bodies in the neighbourhood of each other are ſoon reduced to the ſame temperature."

76
The quantity of heat cannot be determind by this hypotheſis.

If we aſſent to Dr Cleghorn's hypotheſis, the quantity of heat contained in any ſubſtance depends, in the firſt place, on the attracting power of that ſubſtance, which is altogether unknown; and, in the ſecond place, on the repulſive powers of the particles of heat themſelves, which are equally unknown. To determine the *quantity*, therefore, muſt be impoſſible. Neither will the mixture of two different fluids, as in Dr Black's experiments, aſſiſt us in the leaſt; for though water, heated more than mercury, communicates a greater heat to that fluid than the latter does to water; this only ſhows that water more readily parts with ſome part of the heat it contains than mercury does, but has not the leaſt tendency to diſcover the quantity contained in either.

77
Dr Crawford's method of determining the proportional quantities of heat.

Dr Crawford, as we have already ſeen, calls the *degree*, or, if we may vary the phraſe, the *quantity of power* or *element (fluid*, if we may ſubſtitute a ſynonymous word) exiſting or preſent in any body, its *abſolute heat*; and lays down a rule for determining the proportional quantities of heat in different bodies. "It will appear (ſays he) from the experiments afterwards recited, that if a pound of water and a pound of diaphoretic antimony have a common temperature, the quantity of abſolute heat contained in the former is nearly four times that contained in the latter."—The manner in which he illuſtrates this is as follows.

"If four pounds of diaphoretic antimony at 20 be mixed with one pound of ice at 32, the temperature will be nearly 26: the ice will be cooled ſix degrees, and the antimony heated ſix. If we reverſe the experiment, the effect will be the ſame. That is, if we take ſix degrees of heat from four pounds of antimony, and add it to a pound of ice, the latter will be heated ſix degrees. The ſame quantity of heat, therefore, which raiſes a pound of ice ſix degrees, will raiſe four pounds of antimony ſix degrees.

"If this experiment be made at different temperatures, we ſhall have a ſimilar reſult. If, for example, the antimony at 15, or at any given degree below the freezing point, be mixed with the ice at 32, the heat of the mixture will be the arithmetical mean between that of the warmer and colder ſubſtance. And ſince the capacities of bodies are permanent as long as they retain the ſame form, we infer, that the reſult would be the ſame if the antimony were deprived of all its heat, and were mixed with the ice at 32. But it is evident, that in this caſe the ice would communicate to the antimony the half of its abſolute heat. For if 200 below froſt be conceived to be the point of total privation, the antimony will be wholly deprived of its heat when cooled to 200 degrees below 32, and the heat contained in the ice when at 32 will be 200 degrees. If we now ſuppoſe them to be mixed together, the temperature of the mixture will be half the exceſs of the hotter above the colder, or the ice will be cooled 100 degrees and the antimony heated 100. The one half of the heat, therefore, which was contained in the ice previous to the mixture will be communicated to the antimony; from which it is manifeſt, that after the mixture the ice and antimony muſt contain equal quantities of abſolute heat.

"To place this in another light, it has been proved, that the ſame quantity of heat which raiſes a pound of ice ſix degrees will raiſe four pound of antimony ſix degrees. And as the capacities of bodies, while they retain the ſame form, are not altered by a change of temperature; it follows, that the ſame quantity of heat which raiſes the ice 200 degrees, or any given number of degrees, will raiſe the antimony an equal number of degrees.

"A pound of ice, therefore, and four pounds of antimony, when at the ſame temperature, contain equal quantities of abſolute heat. But it appears from the third general fact (n° 67.), that four pounds of antimony contain four times as much abſolute heat as one pound of antimony; and hence the quantity of abſolute heat in a pound of ice is to that in a pound of antimony as four to one."

78 His method inſufficient.

From this quotation it is evident, that, notwithſtanding all the diſtinctions which Dr Crawford has laid down betwixt abſolute heat and temperature, it is only the *quantity* of the latter that can be meaſured; and all that we can ſay concerning the matter is, that when certain bodies are mixed together, ſome of them part with a greater quantity of heat than others; but how much they *contain* muſt remain for ever unknown, unleſs we can fall on ſome method of meaſuring the quantity of heat as we do that of any other fluid.

79 Nicholſon's account of the theories of heat.

Mr Nicholſon, who has collected the principal opinions on the ſubject of heat, ſeems undetermined whether to believe the doctrine of Boyle or of Boerhave on the ſubject. "There are two opinions (ſays he) concerning heat. According to one opinion, heat conſiſts in a vibratory motion of the parts of bodies among each other, whoſe greater or leſs intenſity occaſions the increaſe or diminution of temperature. According to the other opinion, heat is a ſubtile fluid that eaſily pervades the pores of all bodies, cauſing them to expand by means of its elaſticity or otherwiſe. Each of theſe opinions is attended with its peculiar difficulties. The phenomena of heat may be accounted for by either of them, provided certain ſuppoſitions be allowed to each reſpectively; but the want of proof of the truth of ſuch ſuppoſitions renders it very difficult, if not impoſſible, to decide as yet whether heat conſiſts merely in motion or in ſome peculiar matter. The word *quantity*, applied to heat, will therefore denote either motion or matter, according to the opinion made uſe of, and may be uſed indefinitely without determining which.

80 Advantages of the doctrine that heat is cauſed by vibration,

"The chief advantage which the opinion that heat is cauſed by mere vibration poſſeſſes, is its great ſimplicity. It is highly probable, that all heated bodies have an inteſtine motion, or vibration of their parts; and it is certain that percuſſion, friction, and other methods of agitating the minute parts of bodies, will likewiſe increaſe their temperature. Why, then, it is demanded, ſhould we multiply cauſes, by ſuppoſing the exiſtence of an unknown fluid, when the mere vibration of parts which is known to obtain may be applied to explain the phenomena?"

81 Anſwer to Mr Nicholſon's argument.

To this the reply is obvious, that the vibration of parts is an *effect*; for matter will not begin to move of itſelf: and if it is an effect, we muſt ſuppoſe a cauſe for it; which, though we ſhould not call it a fluid, would be equally unknown and inexplicable with that whoſe exiſtence is aſſerted by thoſe who maintain that fire is a fluid *per ſe*. Dr Cleghorn, however, in the diſſertation already quoted, aſſerts, that "heat is occaſioned by a certain fluid, and not by motion alone, as ſome eminent writers have imagined: becauſe, 1. Thoſe who have adopted the hypotheſis of motion could never even prove the exiſtence of that motion for which they contended; and though it ſhould be granted, the phenomena could not be explained by it. 2. If heat depended on motion, it would inſtantaneouſly paſs through an elaſtic body; but we ſee that heat paſſes through bodies ſlowly like a fluid. 3. If heat depended on vibration, it ought to be communicated from a given vibration in proportion to the quantity of matter; which is found not to hold true in fact. On the other hand, there are numberleſs arguments in favour of the opinion that heat proceeds from elementary fire. 1. Mr Locke hath obſerved, that when we perceive a number of qualities always exiſting together, we may gather from thence that there really is ſome ſubſtance which produces theſe qualities. 2. The hypotheſis of elementary fire is ſimple and agreeable to the phenomena. 3. From ſome experiments made by Sir Iſaac Newton, it appears, that bodies acquire heat and cold *in vacuo*, until they become of the ſame temperature with the atmoſphere; ſo that heat exiſts in the abſence of all other matter, and is therefore a ſubſtance by itſelf."

82 Dr Cleghorn's proof that heat is occaſioned by a fluid.

83 Difficulties concerning the nature and properties of Fire.

But though theſe and other arguments ſeem clearly to eſtabliſh the point that fire or heat is a diſtinct fluid, we are ſtill involved in very great difficulties concerning its nature and properties. If it be ſuppoſed a fluid, it is impoſſible to aſſign any limits to its extent; and we muſt of neceſſity likewiſe ſuppoſe that it pervades the whole creation, and conſequently conſtitutes an abſolute plenum, contrary to a fundamental principle of the received ſyſtem of natural philoſophy. But if this is the caſe, it is vain to talk of its being abſorbed, accumulated, collected, or attracted by different bodies, ſince it is already preſent in all points of ſpace; and we can conceive of terreſtrial bodies no otherwiſe than as ſponges thrown into the ocean, each of which will be as full of fluid as it can hold. The different capacities will then be ſimilar to the differences between bits of wood, ſponge, porous ſtones, &c. for containing water; all of which depend entirely on the ſtructure of the bodies themſelves, and which, unleſs we could ſeparate the water by preſſure, or by evaporation, would be for ever unknown. Suppoſing it were impoſſible to collect this water in the manner we ſpeak of, we could only judge of the quantity they contained by the degree to which they ſwelled by being immerſed in it. It is eaſy to ſee, however, that ſuch a method of judging would be very inadequate to the purpoſe, as ſubſtances might contain internal cavities or pores in which water could lodge without augmenting the external bulk. This would ſuggeſt another method of judging of the quantity, namely, the ſpecific gravity;

vity ; and we might reaſonably ſuppoſe, that ſubſtances of the greateſt ſpecific gravity would contain the ſmalleſt quantity of water, though ſtill we could by no means determine what quantity they did contain, unleſs we could lay hold of the element itſelf.

This ſeems to be very much the caſe with elementary fire, if we ſuppoſe it to be a fluid *per ſe*. We judge of its preſence by the degree of expanſion which one heated body communicates to another : but this is only ſimilar to the calculation of the quantity of moiſture a ſponge or any other body contains, by what it communicates to wood when it comes into contact with it ; which never could be ſuppoſed to carry the leaſt pretenſions to accuracy, though we ſhould aſcertain it with all imaginable exactneſs. It is likewiſe probable, that the moſt denſe bodies contain the ſmalleſt quantity of fire, as they generally communicate leſs when heated to an equal temperature than thoſe which are more rare, though we are far from having any perfect knowledge in this reſpect.

84
Difficulty ariſing from the ſuppoſition that heat diffuſes itſelf equally.

But the greateſt difficulty of all will be, on the ſuppoſition that heat is a fluid, and an omnipreſent one (which it muſt be, or there would be ſome places where bodies could not be heated), to anſwer the queſtion, Why are not all bodies of an equal temperature, excepting only the differences ariſing from their ſpecific denſities, which render ſome capable of containing a greater quantity than others ?—The difficulty will not be leſſened, though the omnipreſence of the fluid ſhould be given up, if we ſuppoſe, as is generally done, that heat has a tendency to diffuſe itſelf equably every way. If it has this tendency, what hinders it from doing ſo ? Why doth not the heat from the burning regions of the torrid zone diffuſe itſelf equally all over the globe, and reduce the earth to one common temperature ? This indeed might require time ; but the experience of all ages has ſhown that there is not the leaſt advance towards an equality of temperature. The middle regions of the earth continue as hot, and the polar ones as cold, as we have any reaſon to believe they were at the creation of the world, or as we have any reaſon to believe they will be while the world remains. This indeed is one of the many inſtances of the impropriety of eſtabliſhing general laws from the trifling experiments we are capable of making, and which hold good only on the narrow ſcales on which we can make them, but are utterly inſufficient to ſolve the phenomena of the great ſyſtem of nature, and which can be ſolved only by obſerving other phenomena of the ſame ſyſtem undiſturbed by any manoeuvres of our own.

85
Another from the ſeeming diſappearance of the heat.

86
Dr Crawford's ſolution.

Again, ſuppoſing the objection already made could be got over, and ſatisfactory reaſons ſhould be given why an equilibrium of temperature in the earth and its atmoſphere ſhould never be obtained, it will by no means be eaſy to tell what becomes of the heat which is communicated to the earth at certain times of the year. This difficulty, or ſomething ſimilar, Dr Crawford ſeems to have had in view when treating of the effects of the evolution and abſorption of heat. Thus, ſays he, “ the Deity has guarded againſt ſudden viciſſitudes of heat and cold upon the ſurface of the earth.

“ For if heat were not evolved by the proceſs of congelation, all the waters which were expoſed to the influence of the external air, when its temperature was reduced below 32°, would ſpeedily become ſolid ; and, at the moment of congelation, the progreſs of cooling would be as rapid at it was before the air had arrived at its freezing point.

“ This is manifeſt from what was formerly obſerved reſpecting the congelation of different fluids. It was ſhown, that if the velocities of the ſeparation of heat were equal, the times of the congelation would be in proportion to the quantities of heat which the fluids gave off from an internal ſource in the freezing proceſs. Whence it follows, that if no heat were evolved, the congelation ſhould be inſtantaneous.

“ In the preſent ſtate of things, as ſoon as the atmoſphere is cooled below 32°, the waters begin to freeze, and at the ſame time to evolve heat ; in conſequence of which, whatever may be the degree of cold in the external air, the freezing maſs remains at 32°, until the whole is congealed ; and as the quantity of heat extricated in the freezing of water is conſiderable, the progreſs of congelation in large maſſes is very ſlow.—That the abſorption and extrication of heat in the melting and freezing of bodies has a tendency to retard the progreſs of theſe proceſſes, is remarked by Mr Wilkie in his eſſay on latent Heat.—The ſame doctrine is likewiſe taught by Dr Black in his lectures.

87
Severity of the cold in the northern regions mitigated by the production of ice.

“ In the northern and ſouthern regions, therefore, upon the approach of winter, a quantity of elementary fire is extricated from the waters, proportional to the degree of cold that prevails in the atmoſphere. Thus the ſeverity of the froſt is mitigated, and its progreſs retarded ; and it would ſeem that, during this retardation of the cooling proceſs, the various tribes of animals and vegetables which inhabit the circumpolar regions gradually acquire power of reſiſting its influence.

88
Inundations prevented by the ſlowneſs with which congealed water melts.

“ On the contrary, if, in the melting of ice, a quantity of heat were not abſorbed, and rendered inſenſible, that ſubſtance, when it was expoſed to a medium warmer than 32°, would ſpeedily become fluid, and the proceſs of heating would be as rapid as if no alteration in its form had taken place. If things were thus conſtituted, the vaſt maſſes of ice and ſnow which are collected in the frigid zones would, upon the approach of ſummer, ſuddenly diſſolve, and great inundations would annually overflow the regions near to the poles.

“ But by the operation of the law of the abſorption of heat, when the ice and ſnow upon the return of ſpring have arrived at 32°, they begin to melt, and at the ſame time to imbibe heat : during this proceſs, a large quantity of elementary fire becomes inſenſible ; in conſequence of which the earth is ſlowly heated, and thoſe gradual changes are produced which are eſſential to the preſervation of the animal and vegetable kingdoms.

89
Equal diſtribution of heat promoted by its abſorption and evolution.

“ We may remark, in the laſt place, that this law not only reſiſts ſudden changes of temperature, but that it likewiſe contributes to a more equal diſtribution of the principle of heat throughout the various parts of the earth, in different ſeaſons and climates. Thus the diurnal heats are moderated by the evaporation of the waters on the earth's ſurface, a portion of the fire derived from the ſun being abſorbed and extinguiſhed by the vapours at the moment of their aſcent. On the approach of night the vapours are again condenſed, and falling in the form of dew, communicate to the air and to the earth the fire which they had imbibed during the day.

"It was before ſhown, that, in the regions near to the poles, when the vernal and ſummer heats prevail, proviſion is made for tempering the ſeverity of the winter cold, a quantity of elementary fire, upon the diſſolution of the ice and ſnow, being abſorbed by the waters, and depoſited, as it were, in a great magazine for the purpoſe of mitigating the intenſity of the cold when the froſt returns.

90 Heat of the torrid zone thus mitigated.

"From the experiments of Hales, Halley, and Watſon, it appears, that vaſt quantities of water are continually converted into vapour by the action of the ſolar rays upon the portion of the earth's ſurface which is expoſed to the light; and by the celebrated diſcovery of Dr Black, it is proved, that, in the proceſs of evaporation, much elementary fire is abſorbed. It is manifeſt, that this cauſe will have a powerful influence in mitigating the intenſity of the heat in the torrid zone, and in promoting a more equal diffuſion of it through the earth. For a conſiderable portion of the heat, which is excited by the action of the ſolar rays upon the earth's ſurface within the tropics, is abſorbed by the aqueous vapours, which being collected in the form of clouds, are ſpread like a canopy over the horizon, to defend the ſubjacent regions from the direct rays of the ſun. A great quantity of elementary fire is thus rendered inſenſible in the torrid zone, and is carried by the diſperſion of the vapours to the north and to the ſouth, where it is gradually communicated to the earth when the vapours are condenſed."

91 This ſolution totally inſufficient to remove the difficulty.

That all this takes place, as the Doctor has advanced, cannot be denied; but, by allowing it, the difficulty is not removed in the ſmalleſt degree, as will appear from a due conſideration of the phenomena which he himſelf has mentioned. He owns that the ſun communicates fire to the earth: the queſtion is, What becomes of it, ſeeing the emiſſion is continual? In ſummer, the air, the earth, and the water, are heated to a certain degree. On the ſun's declining ſouthward, the air firſt loſes its heat. Whither does it go? It does not aſcend into the higher regions of the atmoſphere, for theſe are conſtantly found colder than the parts below. It does not deſcend to the earth and water; for theſe give out the quantity they had abſorbed, as Dr Crawford obſerves. Neither does it go laterally to the ſouthern regions; for they are conſtantly very hot, and ought to impart their heat to thoſe farther north, inſtead of receiving any from them. How comes it then, that the atmoſphere ſeems perpetually to receive heat without ever being ſatiated? or if the heat cannot be found going off either upwards, downwards, or ſideways, how are we to account for its diſappearance?

92 Heat moſt probably the action of an omnipreſent fluid.

This queſtion ſeems to be altogether unanſwerable on the ſuppoſition that heat is occaſioned by the mere preſence of a fluid; but if we ſuppoſe it to be only a particular mode of action of an omnipreſent fluid, the whole difficulty vaniſhes at once.—On this ſuppoſition indeed the queſtion will naturally ariſe, Whence does this motion proceed, or by what is its action in general determined? Dr Berkenhout, in enumerating the properties of matter, exempts fire from two of thoſe uſually aſcribed to other material ſubſtances, viz gravitation and the *vis intertiæ*. "According to the philoſophers (ſays he), matter cannot move without being either impelled or attracted. I doubt much whether this be true of fire, and whether, when uncombined, motion be not one of its eſſential properties.—Gravitation ſeems alſo to be no property of fire, which moves with equal facility in all directions, and may be accumulated in hard bodies to any degree without increaſing their weight. Fire, being the cauſe of volatility, ſeems rather to be in conſtant counteraction to gravity."

93 Fire ſeems deſtitute of gravity and *vis inertiæ*.

But however eſſential we may ſuppoſe the motion of fire to be to it, there cannot be any ſelf-exiſtent mobility in its parts, otherwiſe it would ſoon be diffuſed equally throughout the univerſe, and the temperature of the whole reduced to an equilibrium. According to the preſent conſtitution of nature, we ſee that the diſtribution of heat is principally owing to the ſun; and what we call its *quantity*, depends on the poſition of the ſun with regard to terreſtrial objects and the length of time they are expoſed to his rays. Heat is not produced while the rays have a direct paſſage; and therefore fluids through which they paſs eaſily, as air, are not heated by the rays of the ſun. But when the rays are impeded in their courſe, and reflected in conſiderable quantity, a degree of heat takes place, which is always greater or leſs in proportion to the intenſity of the rays.—In the reflecting ſubſtance, the heat will be comparatively greater in proportion to the quantity of rays which are abſorbed or ſtopped in their courſe by it: but in any ſubſtance interpoſed betwixt the ſun and the reflecting body, the heat is proportional to the quantity of rays reflected.—Now it is plain, that when the particles of light fall upon any opaque ſubſtance, and enter its pores, which by their extreme ſubtilty they are well calculated to do, they muſt make an attempt to paſs directly through it in their natural courſe; but as this cannot be done, they will puſh laterally, and in all directions, in conſequence of being perpetually urged by the impulſe of the light coming from the ſun: and thus an action will be propagated in all directions as radii from a centre towards a circumference, which when it takes place in that ſubtile fluid always produces what we call *heat*.

94 Diſtribution of heat owing to the ſun.

95 How heat is produced by the ſun's rays.

96 Proofs of the identity of fire, light, and electricity.

In completing the ſyſtem of nature, we perceive three kinds of fluids of extreme ſubtilty, and very much reſembling one another, viz. fire, light, and electricity. That it ſhould be agreeable to vulgar conceptions to ſuppoſe theſe all to be ultimately the ſame, is not ſurpriſing; and on examining the evidence of their identity, it will certainly be found exceedingly ſtrong. They all agree in the property of exciting the ſenſation of heat in certain circumſtances, and in not doing ſo in others. Fire, we know, in the common acceptation of the word, always does ſo; but when it aſſumes the latent and inviſible ſtate, as in the formation of vapour, it lays aſide this ſeemingly eſſential property, and the vapour is cold to the touch.—Light, when collected in a focus by a burning glaſs, i. e. when its rays converge towards a centre, and diverge or attempt to diverge from one, produces heat alſo: and ſo does the electric fluid; for it has been found that the aura converging from a very large conductor to the point of a needle, is capable of ſetting on fire a ſmall cartridge of gunpowder, or a quantity of tinder ſurrouding it*. There ſeems alſo to be a connection betwixt

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* See *Electricity*.

Element of Fire.

97 Connection between fire or heat and electricity.

fire and electricity in another way; for in proportion as heat is diminiſhed, or the bodies are cooled, electricity ſucceeds in its place. Thus all electric bodies by heat become conductors of electricity, and cannot be excited or made to ſhow any ſigns of containing that fluid; but as ſoon as the heat is removed, their electric property returns. Water is naturally a conducting ſubſtance: by being frozen its conducting power is leſſened, which ſhows an approach to electricity; and, by being cooled down to 20° below 0 of Fahrenheit, the ice actually becomes electric, and will emit ſparks by friction like glaſs*. The atmoſphere is a natural electric: but by a certain degree of heat it loſes this property, and becomes a conductor; nor is there any doubt that its electric properties are increaſed in proportion to the degree of cold imparted to it. In the winter time, therefore, we muſt conſider the frozen ſurface of the earth, the water, and the atmoſphere of the polar regions, as forming one electrical machine of enormous magnitude; for the natural cold of theſe countries is often ſufficient to cool the water to more than 20° below 0, and conſequently to render it an electric. That this is really the caſe, appears from the exceſſively bright aurora borealis and other electric appearances, far exceeding any thing obſerved in this country. In the ſummer time, however, no ſuch appearances are to be ſeen, nor any thing remarkable except an exceſſive heat from the long continuance of the ſun above the horizon. This quantity of heat then being ſucceeded by a proportionable quantity of electricity in winter, it is impoſſible to avoid concluding that the heat in ſummer becomes electric fluid in winter, which, going off through the celeſtial expanſe, returns again to the grand ſource of light and heat from which it originally came; thus making room for the ſucceeding quantities which are to enliven the earth during the following ſummer.

98 Exceſſive electricity of the polar regions in winter.

99 Heat in ſummer becomes electric fluid in winter.

100 Why thunder and lightning take place in ſummer and not in winter.

Thus the diſappearance of heat in winter, and of electricity in ſummer, in theſe countries, will be very naturally and eaſily accounted for. It is true, that the phenomena of thunder and lightning ſhow the exiſtence of this fluid in vaſt quantities during the ſummer ſeaſon: but theſe phenomena are only partial, and though formidable to us, are trifling in compariſon with the vaſt quantities of electric matter diſcharged by the continual flaſhing of the aurora borealis, not to mention the fire-balls and meteors called *falling ſtars*, which are very often to be ſeen in the northern countries. In the ſummer-time, the air which is an electric, heated by the rays of the ſun, is excited or made to part with the fluid to the vapours contained in it; and it is the unequal or oppoſite electricity of the clouds to one another, or to the earth, which produces the lightning. But in winter, when the air, earth, and vapours, all become electric, they cannot diſcharge ſparks from one to another as before; but the whole, as one connected and vaſt electrified apparatus, diſcharges the matter almoſt in a continued ſtream for many months.

101 Heat, light, cold, and electricity, the effects of one univerſal fluid.

From a conſideration of theſe and other phenomena of nature, as well as of the beſt experiments which have hitherto been made, we muſt conſider fire in the abſtract as an omnipreſent fluid, of ſuch ſubtilty as to prevade all terreſtrial ſubſtances. When by any means it is made to diverge every way as from a centre, there it operates as heat; expands, rarefies, or burns, according to the intenſity of its action. Proceeding in ſtraight and parallel lines, or ſuch as diverge but little, it acts as light, and ſhows none of that power diſcoverable in the former caſe, though this is eaſily diſcoverable by making it converge into a focus. In a quieſcent ſtate, or where the motion is but little, it preſſes on the ſurfaces of bodies, contracts and diminiſhes them every way in bulk, forces out the expanding fluid within their pores, and then acts as cold. In this caſe alſo, being obliged to ſuſtain the vehement action of that part of the fluid which is in motion, it flies with violence to every place where the preſſure is leſſened, and produces all the phenomena of ELECTRICITY.

Nature of Heat.

§ 1. *Of the Nature of Heat.*

102 Particular ſolution of the phenomena of heat.

The manner in which the phenomena of heat may be ſolved, and its nature underſtood, will appear from the following propoſitions.

1. It is in all caſes obſerved, that when light proceeds in conſiderable quantity from a point, diverging as the radii of a circle from its centre, there a conſiderable degree of heat is found to exiſt, if an opaque body, having no great reflective power, is brought near that point.

2. This action of the light, therefore, may be accounted the ultimate cauſe of heat, without having recourſe to any farther ſuppoſitions; becauſe nothing elſe beſides this action is evident to our ſenſes.

3. If the point from which the rays are emitted is placed in a tranſparent medium, ſuch as air or water, that medium, without the preſence of an opaque body, will not be heated.

4. Another cauſe of heat, therefore, is the reſiſtance of the parts of that body on which the light falls, to the action mentioned in Prop. 1. Where this reſiſtance is weak, as in the caſes juſt mentioned, the heat is either nothing, or very little.

5. If a body capable of reflecting light very copiouſly is brought near the lucid point, it will not be heated*.

6. A penetration of the light, therefore, into the ſubſtance of the body, and likewiſe a conſiderable degree of reſiſtance on the part of that body to the action of the light, are the requiſites to produce heat.

7. Thoſe bodies ought to conceive the greateſt degrees of heat into whoſe ſubſtance the light can beſt penetrate, *i. e.* which have the leaſt reflective power, and which moſt ſtrongly reſiſt its action; which is evidently the caſe with black and ſolid ſubſtances.

8. By heat all bodies are expanded in their dimenſions every way, and that in proportion to their bulk and the quantity of heat communicated to them.

9. This expanſion takes place not only by an addition of *ſenſible* heat, but likewiſe of that which is *latent*. Of this laſt we have a remarkable inſtance in the caſe of ſnow mixed with ſpirit of nitre. The ſpirit of nitre contains a certain quantity of latent heat, which cannot be ſeparated from it without effecting a change on the ſpirit itſelf; ſo that, if deprived of this heat, it would no longer be ſpirit of nitre.—Beſides this, it contains a quantity of ſenſible heat, of a great part of which it may be deprived, and yet retain its characteriſtic properties as nitrous acid. When it is poured upon ſnow, the latter is immediately melted by the action of the latent heat in the acid. The ſnow cannot be

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* See *Electricity*.

* See the article *Burning-Glaſs*.

Nature of Heat.

be melted or converted into water, without imbibing a quantity of latent heat, which it receives immediately from the acid which melts it. But the acid cannot part with the heat without decompoſition; to prevent which, its ſenſible heat occupies the place of that which has entered the ſnow and liquefied it. The mixture then becomes exceedingly cold, and the heat forces into it from all the bodies in the neighbourhood; ſo that, by the time it has recovered that quantity of ſenſible heat which was loſt, or arrived at the temperature of the atmoſphere around it, it will contain a conſiderably larger quantity of heat than it originally did, and is therefore obſerved to be expanded in bulk. Another inſtance of this expanſive power of latent heat is in the caſe of ſteam, which always occupies a much larger ſpace than the ſubſtance from which it was produced; and this whether its temperature is greater or leſs than the ſurrounding atmoſphere.

10. The difference between latent and ſenſible heat, then, as far as we can conceive, is, that the expanſive power of the former is directed only againſt the particles of which the body is compoſed; but that of the latter is directed alſo againſt other bodies. Neither doth there ſeem to be any difference at all between them farther than in quantity. If water, for inſtance, hath but a ſmall quantity of heat, its parts are brought near each other, it contracts in bulk, and feels cold. Still, however, ſome part of the heat is detained among the aqueous particles, which prevents the fluid from congealing into a ſolid maſs. But, by a continuation of the contracting power of the cold, the particles of water are at laſt brought ſo near each other that the internal or *latent* heat is forced out. By this diſcharge a quantity of air is alſo produced, the water is congealed, and the ice occupies a greater ſpace than the water did; but then it is full of air-bubbles, which are evidently the cauſe of its expanſion. The heat then becomes *ſenſible*, or, as it were, lies on the outſide of the matter; and conſequently is eaſily diſſipated into the air, or communicated to other bodies. Another way in which the latent heat may be extricated is by a conſtant addition of ſenſible heat. In this caſe the body is firſt raiſed into vapour, which for ſome time carries off the redundant quantity of heat. But as the quantity of this heat is continually increaſed, the texture of the vapour itſelf is at laſt totally deſtroyed. It becomes too much expanded to contain the heat, which is therefore violently thrown out on all ſides into the atmoſphere, and the body is ſaid to burn, or be on fire. See Combustion, Flame, and Ignition.

11. Hence it follows, that thoſe bodies which have the leaſt ſhare of latent heat, appear to have the greateſt quantity of ſenſible heat; but this is only in appearance, for the great quantity they ſeem to contain is owing really to their inability to contain it. Thus, if we can ſuppoſe a ſubſtance capable of tranſmitting heat through it as faſt as it received it; if ſuch a ſubſtance was ſet over a fire, it would be as hot as the fire itſelf, and yet the moment it was taken off, it would be perfectly cool, on account of its incapacity to detain the heat among the particles of which it was compoſed.

12. The heat, therefore, in all bodies conſiſts in a certain violent action of the elementary fire within them tending from a centre to a circumference, and thus making an effort to ſeparate the particles of the body from each other, and thereby to change its form or mode of exiſtence. When this change is effected, bodies are ſaid to be diſſipated in vapour, calcined, vitrified, or burnt, according to their different natures.

Nature of Heat.

13. Inflammable bodies are ſuch as are eaſily raiſed in vapours; that is, the fire eaſily penetrates their parts, and combines with them in ſuch quantity, that, becoming exceedingly light, they are carried up by the atmoſphere. Every ſucceeding addition of heat to the body increaſes alſo the quantity of latent heat in the vapour, till at laſt, being unable to reſiſt its action, the heat breaks out all at once, the vapour is converted into flame, and is totally decompoſed. See the article Flame, and Prop. 10.

14. Uninflammable bodies are thoſe which have their parts more firmly connected, or otherwiſe diſpoſed in ſuch a manner, that the particles of heat cannot eaſily combine with them or raiſe them into vapour.

15. Heat therefore being only a certain mode of the action of elementary fire, it follows, that the capacity of a body for containing it, is only a certain conſtitution of the body itſelf, or a diſpoſition of its parts, which can allow the elementary fire contained in it to exert its expanſive power upon them without being diſſipated on other bodies. Thoſe ſubſtances which allow the expanſive power of the fire to operate on their own particles are ſaid to contain a great deal of heat; but thoſe which throw it away from themſelves upon other bodies, though they feel very hot, yet philoſophically ſpeaking they contain very little heat.

16. What is called the *quantity* of heat contained in any ſubſtance, if we would ſpeak with the ſtricteſt propriety, is only the apparent force of its action, either upon the parts of the body itſelf, or upon other bodies in its neighbourhood. The expanſive force of the elementary fire contained in any body upon the parts of that body, is the *quantity of latent heat* contained in it; and the expanſive force of the fire exerted upon other bodies which touch or come near it, is the *quantity of ſenſible heat* it contains.

17. If what we call *heat* conſiſts only in a certain action of that fluid called *elementary fire*, namely, its expanſion, or acting from a centre to a circumference, it follows, that if the ſame fluid act in a manner directly oppoſite to the former, or preſs upon the particles of a body as from a circumference to a centre, it will then produce effects directly oppoſite to thoſe of heat, i. e. it will then be abſolute *cold*, and produce all the effects already attributed to Cold. See that article.

18. If heat and cold then are only two different modifications of the ſame fluid, it follows, that if a hot body and a cold one are ſuddenly brought near each other, the heat of the one ought to drive before it a part of the cold contained in the other, *i. e.* the two portions of elementary fire acting in two oppoſite ways, ought in ſome meaſure to operate upon one another as any two different bodies would when driven againſt each other. When a hot and a cold body therefore are brought near each other, that part of the cold body fartheſt from the hot one ought to become colder than before, and that part of the hot body fartheſt from the cold one ought to become hotter than before.

19. For the ſame reaſon, the greateſt degree of cold in any body ought to be no obſtacle, or at leaſt very little, to its conceiving heat, when put in a proper ſituation. Cold air, cold fuel, &c. ought to become as intenſely heated, and nearly as ſoon, as that which is hotter.

The two laſt propoſitions are of great importance. When the firſt of them is thoroughly eſtabliſhed, it will confirm beyond a doubt, that cold is a *poſitive*, as well as heat; and that each of them has a ſeparate and diſtinct power, of which the action of its antagoniſt is the only proper limit; *i. e.* that heat can only limit the power of cold, and *vice verſa*. A ſtrong confirmation of this propoſition is the experiment related by M. Geoffroy; an account of which is given under the article COLD. Another, but not ſo well authenticated, is related under the article CONGELATION. —De Luc's obſervation alſo, mentioned by Dr Cleghorn, affords a pretty ſtrong proof of it; for if the lower parts of the atmoſphere are cooled by the paſſage of the ſun's rays at ſome diſtance above, and it hath been already ſhown that they do not *attract* the heat from the lower parts, it follows, that they muſt *expel* part of the cold from the upper regions.—The other propoſition, when fully eſtabliſhed, will prove, that heat and cold are really convertible into one another; which indeed ſeems not improbable, as we ſee that fires will burn with the greateſt fierceneſs during the time of intenſe froſts, when the coldeſt air is admitted to them; and even in thoſe diſmal regions of Siberia, when the intenſe cold of the atmoſphere is ſufficient to congeal quickſilver, it cannot be doubted that fires will burn as well as in this country; which could not happen if heat was a fluid *per ſe*, and capable of being carried off, or abſolutely diminiſhed in quantity, either in any part of the atmoſphere itſelf, or in ſuch terreſtrial bodies as are uſed for fuel.

§ 2. *Of the general Effects of Heat.*

HAVING ſaid thus much concerning the nature of heat in general, we come now to a particular explanation of its ſeveral effects, which indeed conſtitute the whole of the active part of chemiſtry.—Theſe are,

103 Inſtruments for meaſuring the expanſions of bodies.

I. *Expanſion*, or increaſe of bulk in every direction. This is a neceſſary conſequence of the endeavour which the fluid makes to eſcape in all directions, when made to converge into a focus. The degree of expanſion is unequal in different bodies, but in the ſame body is always proportionable to the degree of heat applied. There are two different inſtruments in uſe for aſcertaining the degrees of expanſion; and as we have already ſhown, that the degree of heat can only be known by the expanſion, theſe effects of heat upon the inſtrument are uſually taken for the degrees of heat themſelves. Theſe inſtruments are called the THERMOMETER and PYROMETER. The former is compoſed of a glaſs tube, with a globe or rather oval tube at one end, and exactly cloſed at the other: it is moſt uſually filled with mercury or ſpirit of wine; but mercury is generally preferred on account of its expanſions being more equable than thoſe of any other fluid. It has the diſadvantage, however, of being ſubject to congelation; which is not the caſe with ſpirit of wine, when very highly rectified. Spirit-of-wine thermometers, therefore ought not to be entirely diſuſed, but ſeem rather a neceſſary part of the chemical apparatus, as well as thoſe made of mercury.

104 Wedgewood's improvement of the thermometer.

As no thermometer made with any fluid can meaſure either the degrees of heat about the point at which it boils, or the degree of cold below which it congeals, inſtruments have been contrived by which the expanſion of ſolid bodies, though much leſs than what is occaſioned by an equal degree of heat in a fluid, may become viſible. Theſe were uſually called *Pyrometers*; but Mr Wedgewood has lately contrived a method of connecting the two together, in which the higheſt degree of heat, exceeding even that of a glaſs-houſe furnace, may be meaſured as accurately as the more moderate degrees by the common mercurial thermometer. See THERMOMETER.

105 Inſtances of bodies expanding by cold.

106 Prodigious force exerted by water in freezing.

Expanſion in ſome caſes does not appear to be the effect of heat, of which we have two remarkable inſtances, viz. of iron, which always expands in cooling after it has been melted; and of water, which expands with prodigious force in the act of freezing. The power with which iron expands in the act of paſſing from a fluid to a ſolid ſtate, has never been meaſured, nor indeed does it ſeem eaſy to do ſo; but that of freezing water has been accurately computed. This was done by the Florentine Academicians, who having filled an hollow braſs ball of an inch diameter, with water, expoſed it to a mixture of ſnow and ſalt, in order to congeal the water, and try whether its force was ſufficient to burſt the ball or not. The ball, being made very ſtrong, reſiſted the expanding force of the water twice, even though a conſiderable part of its thickneſs had been pared off when it was perceived too ſtrong at firſt. At the third time it burſt; and by a calculation founded on the thickneſs of the globe and the tenacity of the metal, it was found that the expanſive power of a ſpherule of water only one inch in diameter, was ſufficient to overcome a reſiſtance of more than 27,000 pounds, or 13 tons and an half.

107 Uſed as an argument for the exiſtence of cold as a poſitive ſubſtance.

108 Explained by Dr Black's theory of latent heat.

109 The expanſion produced by the extrication of air-bubbles.

A power of expanſion ſo prodigious, little leſs than double that of the moſt powerful ſteam-engines, and exerted in ſo ſmall a body, ſeemingly by the force of cold, was thought to be a very powerful argument in favour of thoſe who ſuppoſe cold to be a poſitive ſubſtance as well as heat; and indeed contributed not a little to embarraſs the oppoſite party. Dr Black's diſcovery of latent heat, however, has now afforded a very eaſy and natural explication of this phenomenon. He has ſhown, that, in the act of congelation, water is not cooled more than it was before, but rather grows warmer: that as much heat is diſcharged, and paſſes from a latent to a ſenſible ſtate, as, had it been applied to water in its fluid ſtate, would have heated it to 135°. In this proceſs the expanſion is occaſioned by a great number of minute bubbles ſuddenly produced. Theſe were formerly ſuppoſed to be formed of *cold* in the abſtract; and to be ſo ſubtile, that, inſinuating themſelves into the ſubſtances of the fluid, they augmented its bulk, at the ſame time that, by impeding the motion of its particles upon each other, they changed it from a fluid to a ſolid. Dr Black, however, has demonſtrated, that theſe are only air extricated during the congelation; and to the extrication of this air he very juſtly attributes the prodigious expanſive force exerted by freezing water. The

110 This air extricated by part of the heat contained in the water.

only queſtion, therefore, which now remains is, By what means this air comes to be extricated, and to take up more room than it naturally does in the fluid? To this we can ſcarce give any other anſwer, than that part of the heat which is diſcharged from the freezing water combines with the air in its unelaſtic ſtate, and, by reſtoring its elaſticity, gives it that extraordinary force, as we ſee alſo in the caſe of air ſuddenly extricated in the exploſion of gunpowder. Thus expanſion, even in the caſe of freezing, is properly an effect of heat; and muſt therefore be conſidered as a phenomenon uniformly and certainly attending the action of heat, and in all caſes to be aſcribed to it.

111 Capacity of a body for containing heat, the ſame with the action of heat upon that body.

112 Impoſſibility of determining the quantity of heat any body contains.

The only way in which the element or fluid of fire can be ſuppoſed to act, and the way in which we can have a rational idea of its being able to produce both heat and cold according to the diverſity of its action, has been already explained ſo fully, that it is needleſs at preſent to enter into any further diſcuſſion of the ſubject. It will eaſily appear, that the *capacity* for containing heat is nothing different from the action of heat upon that body in expanding, and at laſt altering its form in ſuch a manner, as either to be able to inſinuate itſelf among the particles in much greater quantity than before, ſtill retaining its internal action, though the external one becomes imperceptible; or ſcattering them in ſuch a manner, that it breaks forth in great quantity in its peculiar appearances of fire and light; in the former caſe producing vapour or ſmoke, and in the latter flame, as ſhall afterwards be more fully explained. It muſt likewiſe appear, that to determine the quantity of heat in any body is altogether impoſſible: and with regard to the loweſt degree of heat, or total expulſion of that fluid, ſo far from being able to determine what it is, the probability muſt be, that nature does not admit of any ſuch thing; for if heat conſiſts in the expanſive action of a certain fluid, and cold in its oppoſite or contractile action, there is very little reaſon to ſuppoſe that the conſtitution of nature will allow any one of theſe actions intirely to ceaſe, as it does not appear by what means it could again be renewed. Cold, as we have already ſeen, always tends to produce electricity; and the connexion betwixt that and fire is ſo ſtrong, that we cannot ſuppoſe the former to be carried to any great extreme without producing the latter. Whatever we may therefore ſuppoſe concerning the capacities of different bodies for containing heat, or concerning the point of total privation of heat, muſt be altogether void of foundation. A rule, however, has been given by Mr Kirwan for finding the point of total privation, which, together with its demonſtration, we ſhall ſubjoin; and as it is neceſſary for the better underſtanding of this, to call to remembrance what has been ſaid concerning the difference between the temperatures and ſpecific heats of bodies, we ſhall inſert an epitome of the doctrine from Mr Nicholſon.

113 Mr Nicholſon's account of the capacities of bodies for containing heat, &c.

“If two equal bodies of different kinds and temperatures be brought into contact, the common temperature will ſeldom, if ever, be the mean betwixt the two original temperatures; that is to ſay, the ſurplus of heat in the hotter body will be unequally divided between them, and the proportions of this ſurplus retained by each body will expreſs their reſpective diſpoſitions, affinities, or capacities for heat.—If, therefore, a given ſubſtance, as for example fluid water, be taken as the ſtandard of compariſon, and its capacity for heat be called one, or unity, the reſpective capacities of their bodies may be determined by experiment, and expreſſed in numbers in the ſame manner as ſpecific gravities uſually are. And becauſe it is eſtabliſhed as well from reaſon as experiment, that the ſame capacity for heat obtains in all temperatures of a given body, ſo long as its ſtate of ſolidity, fluidity, or vapour is not changed, it will follow, that the whole quantities of heat in equal bodies of a given temperature will be as thoſe capacities. And as the reſpective quantities of matter, in bodies of equal volume, give the proportions of their ſpecific gravities, ſo the reſpective quantities of heat in bodies of equal weight and temperature give the proportions of their ſpecific heats.

“A greater capacity for heat, or greater ſpecific heat, in a given body, anſwers the ſame purpoſe with reſpect to temperature as an increaſe of the maſs; or the quantity of heat required to be added or ſubducted, in order to bring a body to a given temperature, will be as its capacity or ſpecific heat.

“The capacities not only differ in various bodies, but alſo in the ſame body, according as it is either in a ſolid, fluid, or vaporous ſtate. All the experiments hitherto made conſpire to ſhow, that the capacity, and conſequently the ſpecific heat, is greateſt in the vaporous, leſs in the fluid, and leaſt in the ſolid ſtate.

“The quantity of heat that conſtitutes the difference between the ſeveral ſtates, may be found in degrees of the thermometer. Thus if equal quantities of water at 162° and ice at 32° of temperature be mixed, the ice melts, and the common temperature becomes 32°; or otherwiſe, if equal quantities of frozen or fluid water, both at 32°, be placed in a like ſituation to acquire heat from a fire, the water will become heated to 162°, while the ice melts without acquiring any increaſe of temperature. In either caſe the ice acquires 130° of heat, which produces no other effect than rendering it fluid. Fluid water, therefore, contains not only as much more heat than ice, as is indicated by the thermometer, but alſo 130°, that is in ſome manner or other employed in giving it fluidity. And as fluid water cannot become ice without parting with 130° of heat beſides what it had above 32° in its temperature; ſo alſo ſteam cannot become condenſed into water without imparting much more heat to the matters it is cooled by, than water at the ſame temperature would have done.

“The heat employed in maintaining the fluid or vaporous form of a body, has been called latent heat, becauſe it does not affect the thermometer.

114 Mr Kirwan's theorem for finding the point of total privation of heat.

“From the conſideration of the ſpecific heats of the ſame body in the two ſtates of fluidity and ſolidity, and the difference between thoſe ſpecific heats, is deduced a method of finding the number of degrees which denote the temperature of any body immediately after congelation, reckoned from the natural zero, or abſolute privation of heat. The rule is; multiply the degrees of heat required to reduce any ſolid to a fluid ſtate, by the number expreſſing the ſpecific heat of the fluid: divide this product by the difference between the numbers expreſſing the ſpecific heat of the body in each ſtate: the quotient will be the number

of

General Effects of Heat.

of degrees of temperature, reckoned from an abſolute privation of heat.

"This theorem is Mr Kirwan's, and may be proved thus. Let s repreſent the required temperature of the body juſt congealed, $l =$ the number of degrees that expreſs the heat required to reduce it to fluidity, $n =$ the ſpecific heat of the ſolid, and $m =$ the ſpecific heat of the fluid. Then $s+l : s :: m : n$. Whence $s = \frac{ln}{m-n} =$ the temperature from the natural zero in thermometrical degrees of the fluid. But becauſe the actual fall of the thermometer is to be produced by cooling the ſolid, we muſt pay attention to its capacity. The quantity of heat required to produce a given change of temperature in a body is as its capacity; and conſequently the changes of temperature, when the quantity of heat is given, will be inverſely as the capacities: therefore, $n : m :: \frac{ln}{m-n} : \frac{ln}{m-n} = s$. which is the rule abovementioned.

"If the data l, m, and n, be accurately obtained by experiment, in any one inſtance, and the difference between the zero of Fahrenheit's ſcale and the natural zero be thence found in degrees of that ſcale, this difference will ſerve to reduce all temperatures to the numeration which commences at the natural *o*. So that s being known in all caſes, if any two of the quantities l, m, or n, be given in any body, the other may be likewiſe had. For $l = \frac{sm-sn}{m}$; and $m = \frac{sn}{s-l}$ and $n = \frac{sm-lm}{s}$.

"To give an example of this curious rule, let it be required to determine how many degrees of refrigeration would abſolutely deprive ice of all its heat? The degrees of heat neceſſary to melt ice are 130; and the ſpecific heats of ice and water are as 9 to 10. The number 130 multiplied by 10, produces 1300, and divided by the difference between 9 and 10 quotes 1300: therefore if ice were cooled 1300 degrees below 32°, or to—1268 of Fahrenheit's ſcale, it would retain no more heat."

115 Fluidity to be aſcribed to the abſorption of heat.

II. *Fluidity* is another effect of heat, and is capable of taking place in all bodies hitherto known, when the fire is carried to a certain pitch. Theories have been invented, by which fluidity was aſcribed to the ſmoothneſs and round figure of the particles whereof bodies were compoſed, and ſolidity to an angular or irregular figure. It has alſo been aſcribed to a ſtronger degree of attraction between the parts of ſolids than of fluids. Dr Black, however, has ſhown, that in the caſe of melting ice, we are certainly to aſcribe the acquired fluidity of the water to the abſorption of heat. This was determined by a deciſive experiment, in which he expoſed a Florence-flaſk full of water to the atmoſphere in a warm room, when he found that the heat in the air evidently left it, to flow into the ice in the bottle, and reduced it to fluidity. The air thus deprived of its heat, he felt ſenſibly deſcending like a cold blaſt from the bottle, and continuing to do ſo as long as any of the ice remained unthawed; yet after it was all melted, the temperature of the fluid was no more than 32°. Different degrees of heat are requiſite for converting different ſolids into fluids, for which ſee the *Table of Degrees of* HEAT.

General Effect of Heat.

116 Senſible heat produced by the converſion of a fluid into a ſolid.

This theory receives an additional confirmation from the quantity of heat which is always known to be produced by the converſion of a fluid into a ſolid. And that this is really the caſe appears, 1. From what happens in the congelation of waters, it appears that ice is formed very ſlowly, and with ſeveral circumſtances which ſupport the theory.—Thus, if we ſuppoſe equal quantities of water to the air, which is perhaps 10 below froſt, and add to one of theſe a ſmall quantity of ſalt or ſpirit of wine, and obſerve the cooling of each, we ſhall find them both grow gradually colder, until they arrive at the temperature of froſt: after which the water containing the ſalt will continue to grow colder, until it has arrived at the temperature of the air, at the ſame time that only a ſmall quantity of the other water is converted into ice. Yet were the common opinion juſt, it ought all to have been congealed by this time; inſtead of which, it is ſcarce grown a degree colder during the whole time. Its remaining at the ſame temperature for ſo long a time, ſhows that it has been communicating heat to the atmoſphere; for it is impoſſible that any body can remain in contact with another that is colder, without communicating heat to it. Whence then comes this heat? There muſt be ſome ſource adding to the ſenſible heat of the water, ſo as to keep its temperature to the freezing point: and this ſource of heat muſt be very conſiderable; for it will continue to act for a very long time before the water is changed into ice; during all which time, even to the laſt drop, the water is not a degree colder than 32° of Fahrenheit's thermometer. This, therefore, is the *latent heat* of the water, which had formerly entered into it during its tranſition from ice to a fluid ſtate.

117 Argument in ſupport of the theory from water remaining fluid tho' cooled below 32°.

A ſtill ſtronger argument is derived from the following experiment; which evinces that the fluidity of water really depends upon its latent heat, and that the ſenſible heat is only a mean or condition to its containing the latent heat. This experiment conſiſts in expoſing water contained in a covered beer-glaſs to the air of a cold froſty night; and when the atmoſphere is at the temperature of perhaps 10° or 12° below froſt, the water will acquire that temperature without freezing: ſo that the fluidity of the water does not altogether depend on the quantity of ſenſible heat contained in it. The congelation, however, may be brought on by touching it with a bit of ice, with the extremity of a wire, by a ſhock upon the board, or otherwiſe diſturbing it; and we then find the temperature ſuddenly raiſed up to 32°. This ſhows plainly, that the water has a diſpoſition to retain the quantity of latent heat, upon which its fluidity muſt immediately and neceſſarily depend; and it retains it with a certain degree of force, ſo as to keep the water fluid in a temperature below that in which it uſually parts with the latent heat and congeals. By diſturbing it, however, we inſtantly bring on the congelation, which cannot take place without an extrication of the latent heat; which then, being changed into the ordinary or moveable heat, raiſes the thermometer as uſual. The quantity of heat diſcharged from the firſt ſmall portion of ice formed in the water is ſufficient to prevent any more latent heat from ſeparating, and conſequently from any more ice being produced till more of the ſenſible heat is abſtracted.

This doctrine extends not only to ſuch bodies as are actually converted from a ſolid to a fluid, or from a fluid to a ſolid ſtate, but to ſuch as are in a kind of middle ſtate betwixt ſolidity and fluidity; for every degree of ſoftneſs depends on a certain degree of heat contained in the body. Thus, for inſtance, melted wax, allowed to cool ſlowly, ſoon becomes opaque and conſiſtent; but it muſt be colder ſtill before it attains its utmoſt degree of hardneſs. There is therefore a certain degree of heat below which every body is ſolid, and above which every one is fluid; the former being called the *congealing*, and the latter the *melting*, point of bodies.

118 Heat the cauſe of the ſoftneſs of bodies approaching to fluidity.

119 Abſorption of heat the univerſal cauſe of fluidity.

By making experiments upon different ſubſtances, the Doctor was convinced that latent heat is the univerſal cauſe of fluidity; and the doctrine holds good in all the experiments that have hitherto been made upon ſpermaceti, bees-wax, and ſome of the metals. If they are melted, allowed to cool ſlowly, and a thermometer be immerſed into them, we find, that as long as they continue fluid, their ſenſible heat diminiſhes very faſt; but as ſoon as they begin to grow ſolid, the ſenſible heat continues greater than that of the air to which they are expoſed; and during all this time it is communicating heat to the air, without having its ſenſible heat diminiſhed; for the latent heat within the fluid gradually receives a ſenſible form, and keeps up the temperature, proving a ſource of ſenſible heat, which is communicated to the neighbouring bodies as well as the ſurrounding air. The ſoftneſs and ductility of bodies depend on this alſo.

120 Vapour formed by the abſorption of latent heat.

III. *Evaporation.* A third effect of the action of heat is that of converting bodies into vapour, by which they are rendered ſpecifically lighter than the ſurrounding atmoſphere, and enabled to riſe in it. To account for this, many theories have been invented; but that of Dr Black, who accounts for it, as well as fluidity from the abſorption of latent heat, is now univerſally received. The circumſtances by which he proves and illuſtrates his doctrine are the following:

121 Experiments by Dr Black on the converſion of water into vapour.

1. When we attend to the phenomena of boiling water, in a tea kettle for inſtance, it may, when firſt put upon the fire, be about the temperature of 48° or 50°. In a quarter of an hour it will become heated to 212°. It then begins to boil, and has gained 162° of vapour in that time. Now, if the converſion of it into vapour depended on the quantity of ſenſible heat introduced, we may aſk how long it will be neceſſary to raiſe it all in vapour? Surely another quarter of an hour ſhould be ſufficient; but this is far from being the caſe. Dr Black made ſome experiments upon this ſubject in conjunction with another gentleman. Having the opportunity of what is called a kitchen-table or a thick plate of caſt iron, one end of which was made ſenſibly red-hot, they ſet upon this ſome iron veſſels with circular flat bottoms, of about four inches diameter, and which contained a quantity of water. The temperature of the water was noted, as alſo when it began to boil; and when the whole of it was boiled away, it was found, that when ſet on the table its temperature had been 54°; in four minutes it began to boil, and in that ſpace of time received 158° degrees of heat. Had the evaporation, therefore, depended merely on the quantity of ſenſible heat introduced, it ought to have been diſſipated entirely in a ſingle minute more. It was, however, 18 minutes in diſſipating; and therefore had received 807 degrees of heat before it was all evaporated. All this time, therefore, while the water continued to boil, it was receiving a great quantity of heat, which muſt have been flowing equally faſt out of it; for the veſſel was no hotter, and the iron plate continued equally hot, the whole time. The veſſels were of different ſhapes, ſome of them cylindrical, ſome conical, others widening upwards; one of the deſigns of the experiment being to ſhow how far the evaporation was retarded by the particular form of the veſſels. By ſuſpending a thermometer in the mouth of one of the evaporating veſſels, the heat of the ſteam was found to be exactly 212°; ſo that as the great quantity of heat abſorbed was found neither to have remained in the water, nor to have been carried away by the ſteam in a ſenſible manner, we have nothing left to ſuppoſe, but that it flew off as one of the component parts of the ſteam in a latent ſtate.

2. In an experiment to ſhow the fixedneſs of the boiling point of water, Dr Black incloſed ſome of that fluid in a ſtrong vial having a thermometer in it, and ſtopped cloſe with a cork. By the application of heat he hoped now to be able to raiſe the thermometer ſome degrees above the boiling point, which would be the natural conſequence of the confinement of the ſteam. When this was done, he pulled out the cork, and ſuppoſed that the water would now all fly out in vapour: but in this he was totally diſappointed; a ſudden and very tumultuous boiling enſued, which threw out ſome of the water; but though ſome quantity of ſteam likewiſe iſſued, the quantity of water was not conſiderably diminiſhed. The vial had been heated to 20° above the boiling point, but almoſt inſtantly cooled down to 212°, when the cork was taken out.

3. Mr Watt, in making ſome experiments on the force of ſteam, had occaſion to uſe Papin's digeſter, with a pipe proceeding from its ſide; the orifice of which was ſhut with a valve preſſed down by one end of a lever. Thus he heated ſteam to 400° of Fahrenheit; after which, having ſuddenly ſtruck off the lever, a quantity of ſteam flew out with conſiderable noiſe, and with ſuch violence as to make an impreſſion on the ceiling of the room; but this noiſe gradually diminiſhed, and after ten minutes it ceaſed entirely; and upon opening the machine, he found the greateſt part of the water ſtill remaining.

122 Boiling point of water *in vacuo* determined by Mr Boyle.

4. The change of ſenſible into latent heat in the formation of vapour, appears ſtill more evident in the boiling of water *in vacuo*. Mr Boyle took a quantity of water which had been previouſly boiled to purge it of its air, and put it whilſt hot under the receiver of an air-pump. In conſequence of this it began again to boil, and continued boiling till it was only lukewarm, and it ſoon arrived at this temperature; ſo that in this caſe alſo the heat had diſappeared during the converſion of the fluid into vapour. Others have repeated the experiment, as Boerhaave, Muſchenbroek; and Robinſon, who lectures on chemiſtry in Glaſgow, ſays that the heat diminiſhes very faſt till it comes to 90° or 95°, which ſeems to be the boiling point of water *in vacuo*. As a conſiderable part of the heat thus diſappears, and is to be diſcovered neither in the water nor in the vapour, we muſt conclude that it enters the latter as part of its compoſition.

123 And by Mr Robinſon of Glaſgow.

5. Thus alſo we may underſtand ſome curious experiments made by Dr Cullen upon ether and other volatile

124 Dr Cullen's experiments on cold produced by evaporation.

latile fluids. He employed ſome perſons to make experiments upon the cold produced by evaporation; and willing to repeat them himſelf *in vacuo*, he put ſome of the moſt volatile liquors under the receiver of an air-pump. One of theſe was ether. It was contained in a glaſs, in which there was alſo placed ſome water. When the air was extracted, the ether began to boil, and to be converted into vapour, till it became ſo very cold that it froze the water contained in the veſſel, though the temperature of the room was about 50°. Here therefore there was a quantity of heat which diſappeared all of a ſudden; which it is plain could not be owing to its having any communication with that of the atmoſphere or other cold bodies, as they could not render it colder than they were themſelves. Ether therefore is to be conſidered as a fluid ſo volatile, that were it not for the preſſure of the atmoſphere it would be perpetually in the ſtate of vapour.

125 Heat expelled in great quantity by the condenſation of vapour.

6. That this heat which enters into the vapour is not deſtroyed, but remains in a latent ſtate, is eaſily proved; for we find that a great quantity of heat is expelled from vapour when it is condenſed again to form the body it compoſed originally. This is eaſily aſcertained by obſerving the quantity of heat communicated to the water in the refrigeratory of a ſtill by any given quantity of liquid which comes over. Thus, if the refrigeratory contain 100 pounds of water, and the diſtillation be continued till only one pound has come over, ſuppoſing the water in the refrigeratory to have received 8° of heat; it is plain, that if the whole of the quantity thus received could be thrown into one pound of water, the latter would be heated to 800°; which is ſufficient to make an equal ſpace of iron red-hot. But that this quantity of heat is received by the water in the refrigeratory has appeared from ſeveral experiments, which ſhow that water, by being converted into vapour, abſorbs between 800° and 900° of heat.

126 Mr Watt's experiments on the evaporation of fluids *in vacuo*.

On this principle we may explain ſome curious experiments made by Mr Watt with regard to the evaporation of fluids *in vacuo*. That gentleman had formed a deſign of converting water into ſteam with leſs expence of fuel, which he imagined might be done by removing the preſſure of the air from the water, which he thought would thus require a much ſmaller quantity of fuel to convert it into vapour. Dr Black, however, perceiving that only the ſmall quantity of ſenſible heat the ſteam poſſeſſed could thus be carried off, informed him beforehand that his project would not be found attended with the advantages he imagined. The experiment, however, was made in the following manner: A ſtill was procured of tinned iron, the body of which reſembled that of a retort, with a veſſel ſerving as a condenſer; the whole apparatus being cloſe, excepting a little hole in the extremity of the condenſing veſſel. He firſt exhauſted this veſſel of air by holding the condenſer over the retort, in which ſome boiling water was contained, until it was entirely converted into ſteam. He then ſuddenly ſtopped the little hole, and removed the veſſels from the fire; when, after they were cooled, there was a pretty perfect vacuum formed by the condenſation of the ſteam. The retort was then put on the fire, and turned ſo that the pipe and condenſing veſſel ſhould hang downward; and plunging them into cold water, heat was applied to the ſtill till the water boiled, as could be known by the noiſe. It was kept boiling, till a quantity of ſteam was puſhed over and condenſed with a very gentle heat, the ſtill feeling little warmer than his hand. After a certain quantity had been diſtilled, the apparatus was removed, and he had noted the heat of the water in the refrigeratory; but though the ſteam all along came over with ſo gentle a heat, he found the quantity communicated to the water in the refrigeratory to be ſurpriſingly great, not leſs than 1000°; ſo that it would have been more than ſufficient to heat the quantity of liquor which came over red-hot.

127 Ignition a conſtant and ſteady effect of heat.

128 All ignited bodies equally hot.

IV. *Ignition*, or the cauſing bodies to ſhine or emit light in the dark. This may be conſidered as a ſpecies of inflammation, and ſhall therefore be explained under that head: here we ſhall only obſerve, that ignition is a more ſteady and conſtant effect of heat than either the production of fluidity or vapour; and appears not only to be the ſame degree with regard to any particular body, but the ſame with regard to all kinds of matter. Dr Martin imagines, that a red-hot piece of iron is hotter than a red-hot piece of ſtone; but if you put into a crucible an hundred different kinds of matter, as metals, glaſs, &c. that are capable of bearing a red heat, they will all begin to appear luminous about the ſame time, and their brightneſs will increaſe equally as their heat increaſes. But it is difficult to know at what point this begins, as we have no way of aſcertaining the beginning or loweſt degree of ignition but by the effect it produces on our ſight, and we cannot be ſure that we perceive the loweſt degree of light; for we know that other animals ſee objects with ſuch light as appears perfect darkneſs to us. Sir Iſaac Newton's method of determining this has been already mentioned.

129 Metals may become vaſtly hotter after they are brought into fuſion.

Dr Boerhaave entertained a notion, that ſome metals, after being once brought into a ſtate of fuſion, could be made no hotter; and propoſes the poſſibility of this as a queſtion, "Whether the heat of metals can be increaſed after they are melted?" There is not, however, the leaſt doubt but that their heat may be vaſtly increaſed after they are melted; and we know certainly that ſuch as are of eaſy fuſion may be heated to a vaſtly greater degree after being melted; and why may not thoſe requiring ſtronger heats be the ſame? We are ſure that this is the caſe with ſilver, which, after being melted, may be brought to ſuch a heat as to become too dazzling for the eye to bear it. If Boerhaave's opinion were juſt, it would be impoſſible to caſt any metal into moulds, becauſe it muſt loſe a little heat in being removed from the fire and in entering the mould; nor would they receive a proper impreſſion if they did not contain a greater quantity of heat than was neceſſary for their fuſion.

130 Ignition an univerſal effect of fire.

131 Water may be made ſufficiently hot to melt lead.

Ignition appears to be univerſal; and all bodies capable of ſupporting it without being converted into an elaſtic vapour that cannot be confined, are affected the ſame way. Water, which in its ordinary ſtate ſeems very little capable of enduring this heat, may be confined in ſtrong veſſels ſo as to become capable of melting lead, which is more than half way betwixt a red heat and that of boiling water. Experiments with the eolipile ſhow alſo that it can be made red-hot; for when the ſteam paſſes through burning fuel, it cannot

not miſs of being made red hot. Dr Black has alſo frequently ſeen the vapour of water heated by throwing it into the aſh-pit of a furnace, ſo as to produce a very large and tranſparent flame in riſing up through the vent. There is reaſon therefore to conclude, that ignition is one of the more general effects of heat, only that ſome bodies are incapable of it until they be reduced to a ſtate of vapour.

132 Difference betwixt ignition and inflammation.

V. The laſt of the effects of heat here to be taken notice of is *inflammation*. It differs from ignition in this, that the bodies ſubject to the latter gradually grow cooler as ſoon as they are taken out of the fire, without undergoing any conſiderable change; while thoſe ſubject to inflammation become continually hotter and hotter, communicating a vaſt quantity of heat to others, and undergoing a kind of decompoſition themſelves, inſomuch, that by this means they have been thought to be reduced to their conſtituent principles or elements.

133 Inflammation decompounds but does not deſtroy bodies.

Some ſubſtances indeed ſeem to be an exception to this, as in the open air they burn totally away, without leaving any reſiduum or producing any ſoot. Theſe are ſpirit of wine, ſulphur, and eſpecially inflammable air; which laſt, by a proper mixture with dephlogiſticated air, may be ſo totally conſumed, that ſcarce a fiftieth part of the two will remain. On a careful examination of theſe ſubſtances, however, we find that there is by no means a total conſumption, or indeed, properly ſpeaking, any conſumption at all, at leaſt if we meaſure the quantity of matter by the weight of the ſubſtance employed.

134 Spirit of wine yields a great quantity of water by being burned.

Thus, if we are at pains to collect the vapour of burning ſpirit of wine, we will find, that an aqueous dew is collected, which ſometimes equals the ſpirit of wine itſelf in weight. With regard to ſulphur, the caſe is ſtill more evident; for the vapour of this, when collected, not only equals but greatly exceeds the weight of the ſulphur employed; and on burning dephlogiſticated and inflammable air together, as much water is found to be produced as nearly equals the weight of both airs.

135 Water produced by the deflagration of dephlogiſticated and inflammable air.

In like manner, when we collect the aſhes, water, ſoot, and oil, procured by burning any of the common inflammable ſubſtances, we will find, that they in general exceed the weight of the matter employed. The great waſte of bodies by fire, therefore, is owing to the diſſipation of the volatile principles they contain, which are carried off and rendered inviſible by being mixed with the atmoſphere.

136 Of the exiſtence of phlogiſton.

The proceſs of inflammation has long been explained from the preſence of a ſubſtance called *Phlogiſton* in thoſe bodies which are ſubject to it, and which is ſuppoſed to be the ſame in all bodies belonging to this claſs; the differences between them ariſing from the principles with which it is combined.

137 Denied by M. Lavoiſier.

This doctrine, which was firſt introduced by Stahl, has given occaſion to ſuch various and diſcordant theories, that the exiſtence of phlogiſton has been lately denied altogether by M. Lavoiſier, who brought in a new method of ſolving the phenomena of fire, heat, and ignition, without any aſſiſtance from this principle.

138 Arguments againſt it drawn from the increaſed weight of metals by calcination.

The foundation of M. Lavoiſier's doctrine is the increaſe of weight in metals by calcination. This increaſe he finds to be preciſely, or very nearly ſo, proportionable to the decreaſe of weight in the air in which they are calcined. His theory, therefore, is, that in the act of calcination, the pure part of the air, which he calls the *acidifying* or *oxygenous* principle, unites with the metal, and converts it into a calx.

139 His theory of inflammation.

In like manner, in ſubſtances truly inflammable, the heat and flame are ſuppoſed to proceed from the union of the pure air, or the oxygenous principle, with the ſubſtance, and converting it into thoſe principles which are found to remain after inflammation. Thus the increaſed weight of the ſubſtance is eaſily accounted for; while the inflammation, in his opinion, is nothing more than a combination of the inflammable body itſelf with pure air, which has an attraction for it: and in confirmation of that it is urged, that when combuſtion is performed in empyreal or dephlogiſticated air, the whole of the latter is abſorbed; but in common atmoſpherical air only one-fourth, being the quantity of pure air contained in it.

140 Arguments for the non-exiſtence of phlogiſton, from the reduction of the calces of perfect metals without addition.

Other arguments in favour of this opinion are, that the calces of the perfect metals may be reduced without addition by the mere emiſſion of the oxygenous principle, (dephlogiſticated air); by an union with which they aſſume the form of a calx. Thus he evades a very ſtrong argument uſed by the oppoſite party; who adduced, as a proof of the exiſtence of phlogiſton, the uſe of charcoal in the reduction of metals to their proper form.

141 Diſpute betwixt Lavoiſier and Prieſtley.

A diſpute indeed took place betwixt M. Lavoiſier and Dr Prieſtley concerning the reduction of the whole of a mercurial calx formed by an union with the nitrous acid without addition; the Doctor maintaining that the whole could not be reduced by mere heat, but that a very perceptible quantity was always loſt: but on a thorough examination of the ſubject, the truth ſeemed rather to lie on M. Lavoiſier's ſide. See AEROLOGY.

142 Dr Lubbock's theory.

Another theory, ſomewhat ſimilar to that of Lavoiſier's, has been publiſhed by Dr Lubbock, in an Inaugural Diſſertation in 1784. In this he ſuppoſes two kinds of matter to exiſt in the univerſe; one he calls the *principium proprium*, the other the *principium ſorbile*; and it is this latter, which, according to our author, is the principle of mutability, or which by being united in various proportions with the other, forms bodies of all the different kinds we ſee in nature. It is this principle, therefore, which he ſuppoſes to be abſorbed in the calcination of metals, and not empyreal air, as M. Lavoiſier ſuppoſes; and he contends, that this ſame principle extends throughout the whole ſyſtem of nature, even to the utmoſt celeſtial bounds.

143 Diſputes concerning phlogiſton now entirely decided.

It would exceed the limits of this treatiſe to give an account of the various theories which have been invented, and the arguments uſed for and againſt them; nor indeed is there any occaſion for doing ſo, as late experiments have reduced the diſpute into a much narrower compaſs than before, and furniſhed the moſt deciſive arguments in favour of the exiſtence of phlogiſton.

144 Objections againſt the exiſtence of phlogiſton from its inviſibility and ſuppoſed want of gravity.

The greateſt objection to the belief of this principle was, that it could neither be ſeen nor felt by our ſenſes directly, nor diſcover itſelf indirectly by the weight it communicated to the bodies with which it was united; on the contrary, the latter always became lighter in proportion to the quantity they contained: ſo that it was imagined, inſtead of being poſſeſſed of any ſpecific gravity of its own, to be a principle of poſitive levity, ſuch as that of heat or light may be reaſonably ſuppoſed. This objection, however, is now intirely removed; and phlogiſton in the abſtract is found to be no ſubtile principle capable of eluding our reſearches, but one very common, and eaſily met with, being no other than common charcoal.

145
Common charcoal and phlogiſton the ſame.

In the laſt edition of this work, under the article PHLOGISTON, it was ſhown, that inflammable air, deprived of its elaſticity, and combined with metallic ſubſtances, is really their phlogiſton; and that in the inflammable bodies commonly uſed, what we call their phlogiſton, is really their oil; and that which exiſts in charcoal, and cannot be driven off by diſtillation, is part of the empyreumatic or burnt oil of the ſubject which adheres ſo obſtinately. A ſimilar doctrine ſoon after appeared in the Philoſophical Tranſactions for 1782, and the identity of phlogiſton and inflammable air was clearly proved by Mr Kirwan.

146
Deciſive proofs of this identity given by Dr Prieſtley.

Still, however, it was inſiſted by the French philoſophers and others, that no *facts* had been adduced againſt M. Lavoiſier, nor any deciſive proofs appeared of the exiſtence of phlogiſton as a ſubſtance *per ſe*. Facts of this kind, however, have now been diſcovered by Dr Prieſtley, and are related under the articles AEROLOGY, CHARCOAL, PHLOGISTON, &c.

147
Spirit of wine and metals convertible into charcoal.

It is ſufficient at preſent to mention, that he has been able to convert the pureſt ſpirit of wine, and one of the hardeſt metals, viz. copper, as well as ſeveral others, into a ſubſtance entirely reſembling charcoal; that by means of the heat of a burning glaſs in vacuo, he has diſſipated this metallic charcoal, as well as the common kind, *entirely* into inflammable air, with the aſſiſtance only of a little water, which ſeems neceſſary to make it aſſume the aerial form, and perhaps is the true ſolvent of it; and by a combination with the element of heat, with the aid of the charcoal, is enabled to reſiſt condenſation in the common way.*

148
Charcoal entirely diſſipated by heat into inflammable air.

This inflammable air, when abſorbed by metallic calces, again reduces them to their metallic form: ſo that here is one fact by which the phlogiſton not only appears to our ſenſes, but we are able to aſcertain its quantity with the utmoſt preciſion.

149
Metallic calces reduced by inflammable air.

Nor can it here be any objection, that the reduced metal is lighter than the calx; for this only proves that the metallic earth, while a calx, is united to a heavy ingredient (the baſis of dephlogiſticated air), and in the latter to a light one, viz. charcoal, the baſis of inflammable air.

150
Why metals are lighter in their metallic than in their calcined ſtate.

Another caſe in which the exiſtence of phlogiſton is made equally evident to our ſenſes, and where no ſuch objection can occur, is related under the article AEROLOGY, n° 112.

151
Dephlogiſticated air converted into aerial acid by charcoal.

It is there ſhown, that “by the loſs of one grain of charcoal of copper (formed by the union of ſpirit of wine with the metal), and which like common charcoal was conſumed without having any reſiduum, he reduced four ounce-meaſures of dephlogiſticated air till only one-ninth remained unabſorbed by water; and, again, with the loſs of one grain and a half of charcoal, ſix and an half meaſures of dephlogiſticated air were reduced till five and an half meaſures were pure fixed air.”—Here, then, is an abſolute and undeniable evidence, that fixed air is compoſed of dephlogiſticated air, and charcoal or phlogiſton, and elementary fire. There were no other ingredients preſent, and the charcoal muſt either have been annihilated or diſpoſed of in the manner juſt mentioned: but the ſuperior weight of the fixed air evidently ſhows that ſome ingredient had been added to the dephlogiſticated air; and which increaſe was more than we can ſuppoſe to ariſe from the condenſation of the dephlogiſticated air during the operation, for this ſometimes amounted to no more than one-thirtieth part.

152
Objections drawn from the total combuſtion of dephlogiſticated air in ſome caſes.

The ſtrongeſt objection which can be made againſt the doctrine of phlogiſton may be drawn from the total conſumption of pure air in certain caſes of combuſtion, for inſtance, in that of phoſphorus, inflammable air, and iron. It muſt be obſerved, however, that in no caſe whatever is the air totally conſumed; and in that of inflammable air water is produced by the union of the baſis of the latter, that is charcoal, with the baſis of dephlogiſticated air, the oxygenous principle of M. Lavoiſier, and which appears to be one of the component parts of WATER. In the caſe of phoſphorus, the latter is converted into an acid; and in all probability a quantity of water is alſo produced, by which part of it is converted into cryſtalline flowers.

153
Little phlogiſton expelled from iron by being burnt in dephlogiſticated air.

The caſe of the iron, therefore, alone remains to be conſidered. Dr Prieſtley's experiments on this ſubject are related at length under the article AEROLOGY, n° 67 *et ſeq.* In them the iron burnt briſkly in dephlogiſticated air, which, according to the common theory, ſhould have indicated the expulſion of a great quantity of phlogiſton; yet the whole reſiduum, of which the fixed air, produced by the ſuppoſed union of the phlogiſton or principle of inflammability, was only a part, ſcarce amounted ſometimes to one-fourteenth of the air originally employed.

154
The objection inconcluſive.

The argument, however, inſtead of contradicting the exiſtence of phlogiſton, only ſhows, that in ſome caſes the diſſipation of a very ſmall quantity of phlogiſton is neceſſary to inflammation; or that the aerial principle may combine with the iron in its metallic ſtate.

155
Iron is not reduced to a calx by burning in dephlogiſticated air.

In this caſe only a very little quantity of the phlogiſton of the iron was diſſipated; for it was not reduced to a calx, but to that kind of ſcoriæ which flies off in ſcales by beating the metal when red-hot with an hammer. A deciſive proof of this was had by uniting iron thus combined with the baſis of dephlogiſticated air with inflammable air.

156
Water produced in the reduction of it by inflammable air.

By this the metal was indeed reduced to perfect iron again; but water was produced at the ſame time from the union of the baſis of the two airs, that of the inflammable air being capable of furniſhing a ſuperfluous quantity, which united with the other into the form of a fluid.

157
Heat produced in the combuſtion of inflammable bodies derived from the air.

The exiſtence of phlogiſton being thus proved, and its nature aſcertained, we may now proceed to determine the queſtion, Whether the great quantity of heat produced by the combuſtion of inflammable bodies proceeds from the bodies themſelves, or from the air which muſt be admitted to them in order to make them burn? That the heat in this caſe proceeds from the atmoſphere is evident; becauſe in all caſes of combuſtion there is a certain diminution undoubtedly takes place by means of the converſion of the dephlogiſticated part of the atmoſphere into fixed air. It is proved, under the article *ELASTIC Vapours*, that elementary fire is the univerſal cauſe of elaſticity in fluids. By uniting a certain quantity of it with any ſubſtance, the latter at length aſſumes an aerial or vaporous form; and it is this vapour alone which is inflammable*. Different vapours no doubt contain different quantities of theſe ingredients; but in all caſes the baſis of the dephlogiſticated part of the atmoſphere

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* See *Elaſtic Vapour.*

* See the article *Flame.*

muſt unite with the phlogiſton of the inflammable body, or with ſomething elſe, ſo that a decompoſition may enſue: and it is this decompoſition which produces the heat and light; for then the fire contained in the atmoſphere having no longer any thing to abſorb it, muſt appear in its proper form.

158 Too much phlogiſton prevents the heat from being intenſe.

But in thoſe caſes where there is a great quantity of phlogiſton, and conſequently much fixed air produced, the latter abſorbs ſo much heat in a latent ſtate, that the quantity communicated to ſurrounding bodies muſt be greatly diminiſhed; and if an exceſs of this ingredient, not only fixed air, but the phlogiſticated kind and groſs ſmoke be alſo produced, this diminiſhes the heat ſtill farther by the great abſorption, and will even deſtroy it altogether. The remedy for this is either to diminiſh the quantity of phlogiſton, or to augment the quantity of air; which, by furniſhing a greater quantity of dephlogiſticated baſis, affords an opportunity for the evolution of a greater quantity of heat.

159 Too great a quantity of air has the ſame effect.

On the other hand, when the quantity of air is too great, the phlogiſtic matter cannot combine with the baſis of the pure air in ſufficient quantity to effect a decompoſition; and therefore the heat is abſorbed in a latent ſtate, and the fire goes out.

From this theory, which is farther illuſtrated under the articles FIRE, FLAME, HEAT, PHLOGISTON, &c. we may not only have a rational idea of the manner in which inflammation is generally accompliſhed, but ſee why a fire may be put out both by too great a quantity of fuel, and by too great a quantity of air.

160 Why the ſolar heat and that of electricity are ſo intenſe.

We may alſo ſee why the ſolar beams and electric fluid, which contain no phlogiſtic matter, excite a much more powerful heat than any we can raiſe in our hotteſt furnaces. The difference between ignition and inflammation will now likewiſe appear; ſuch bodies as are capable only of ignition containing little or no phlogiſton, but inflammable bodies a great deal.

161 Table of the various degrees of heat.

The following table ſhows the moſt remarkable degrees of heat from the congelation of mercury to that of Mr Wedgewood's hotteſt furnace.

Mercury freezes at - -	40
Weak ſpirit of wine - -	32
Brandy at - - -	10
Cold produced by ſnow and ſalt mixed	0
Strong wine freezes at -	20
Vinegar freezes at - -	27
Water freezes at - -	32
Temperature of ſpring and autumn	50
Ordinary ſummer weather -	65
Sultry heat - - -	75
Heat of human blood -	97 to 100
Feveriſh heat - - -	108
Bees wax melts - - -	142
Serum coagulates - - -	156
Spirit of wine boils - -	174
Water boils - - -	212
Tin melts - - -	408
Biſmuth melts - -	460
Oil of vitriol boils - -	550
Oil of turpentine boils -	561
Lead melts - -	585
Quickſilver and linſeed-oil boil -	600
Iron begins to ſhine in the dark -	635
Iron ſhines briſkly in the dark -	750
Iron ſhines in the twilight -	884
Iron red-hot from a common fire	1050
Red heat fully viſible in day light according to Mr Wedgewood -	1077
Heat by which his enamel colours are burnt on - - -	1857
Braſs melts - - -	3807
Swediſh copper melts - -	4587
Fine ſilver melts - -	4717
Fine gold melts - -	5237
Leaſt welding heat of iron -	12777
Greateſt ditto - -	13427
Greateſt heat of a common ſmith's forge - - -	17327
Caſt iron melts - -	17977
Greateſt heat of Wedgewood's ſmall air-furnace - - -	21877
Extremity of the ſcale of his thermometer - - -	32277

SECT. II. *Of the Doctrine of Elective Attraction, and of the different Objects of Chemiſtry.*

162 Chemical attraction.

BEFORE we proceed to give a general theory of the changes which happen upon the mixtures of different bodies together, or expoſing them ſingly to heat, we muſt obſerve, that all depend on certain qualities in bodies, by which ſome of them are apt to join together, and to remain united while they have an opportunity. The cauſe of theſe qualities is totally unknown; and therefore philoſophers, after the example of Sir Iſaac Newton, have expreſſed the apparent effect of this unknown cauſe by the word *attraction*. From them the word has been adopted by the chemiſts, and is now generally uſed in ſpeaking of the phenomena which are obſerved in the mixture of different ſubſtances; but to diſtinguiſh it from other kinds, it is uſually called *Elective*.

This attraction is not equally ſtrong between all ſubſtances; in conſequence of which, if any body is compounded of two others, and another is preſented to it which has a greater attraction for one of the component parts than they have for one another, the ſubſtance will be *decompounded*. A new compound is then formed by the union of that third ſubſtance with one of the component parts or *elements* (if we pleaſe to call them ſo) of the firſt. If the attraction between the body ſuperadded and either of the component parts of the other is not ſo ſtrong as that between themſelves, no decompoſition will enſue; or if the third ſubſtance is attracted by both the others, a new compoſition will take place by the union of all the three.

163 Objects of chemiſtry how claſſed.

The objects of chemiſtry, as we have already obſerved, are ſo various, that an enumeration of them all is impoſſible. To eaſe the mind, therefore, when ſpeaking of them, and render more uſeful any thing that is ſaid or wrote on chemiſtry, it is neceſſary to divide them into different claſſes, comprehending in each claſs thoſe bodies which have the greateſt reſemblance to one another, and to which one common rule applies pretty generally.—The diviſion formerly uſed, was that of vegetables, animals, and minerals; but this has been thought improper, as there are many ſubſtances in each of thoſe kingdoms which differ very widely from one another, and which are by no means ſubject to the ſame laws. The moſt approved method,

thod, at preſent, of arranging the objects of chemiſtry, is into ſalts, earths, metals, inflammable ſubſtances, waters, animal and vegetable ſubſtances.

Sect. III. *Salts.*

164
Salts.

Salts are either *fuſible*, that is, capable of abiding the fire, and melting in a ſtrong heat, without being diſſipated; or *volatile*, that is, being diſperſed in vapour with a ſmall heat. Their other properties are, that they are ſoluble in water: not inflammable, unleſs by certain additions; and give a ſenſation of taſte when applied to the tongue.

The moſt general characteriſtic of ſalts is, that they are all ſoluble in water, though ſome of them with much more difficulty than others. Moſt of them have likewiſe the property of forming themſelves, in certain circumſtances, into ſolid tranſparent maſſes of regular figures, different according to the different ſalt made uſe of, and which are termed *cryſtals* of that ſalt. In this ſtate they always contain a quantity of water; and therefore the utmoſt degree of purity in which a ſalt can be procured, is when it has been well cryſtallized, and the cryſtals are freed of their ſuperfluous moiſture by a gentle heat. They generally appear then in the form of a white powder.

165
Phenomena attending their ſolution.

In the ſolution of ſalts in water, the firſt thing obſervable is, that the water parts with the air contained in it; which immediately riſes to the top in the form of bubbles. This, however, is moſt remarkable when the ſalt is in the dry form we have juſt now mentioned, becauſe there is always a quantity of air entangled among the interſtices of the powder, which riſes along with the reſt; and this diſcharge of air is ſometimes ſo great, as to be miſtaken for an effervescence. From this, however, it is eſſentially different. See Effervescence.

Another thing obſervable in the ſolution of ſalts is, that a conſiderable change happens in the temperature of the water in which they are diſſolved; the mixture becoming either a good deal warmer or colder than either the ſalt or the water were before. In general, however, there is an increaſe of cold, and ſcarce any ſalt produces heat, except when it has been made very dry, and deprived of that moiſture which it naturally requires; and thus the heating of ſalts by being mixed with water may be explained on the ſame principle with the heat produced by quicklime. See Quicklime.

After ſalt has been diſſolved in a certain quantity by water, no more of that ſalt will be taken up unleſs the water is heated; and as long as the heat continues to increaſe, the ſalt will be diſſolved. When the water boils, at which time it has attained its greateſt heat, and will take up no more ſalt, it is then ſaid to be *ſaturated* with that ſalt. This, however, does not prevent it from taking up a certain quantity of another ſalt, and after that perhaps of a third, or fourth, without letting go any of the firſt which it had diſſolved. How far this property of water extends, has not yet been aſcertained by experiments.

To the above rule there is only one exception known as yet; namely, common ſea-ſalt: for water diſſolves it in the very ſame quantity when cold as when boiling hot. It has been ſaid by ſome, that all deliqueſcent ſalts, or thoſe which grow moiſt on being expoſed to the air, had the ſame property: but this is found to be a miſtake.

166
Mixture and ſeparation of ſalts.

This property of ſolubility, which all the ſalts poſſeſs in common, renders them eaſily miſcible together; and the property by which moſt of them ſhoot into cryſtals, renders thoſe eaſily ſeparable again which have no particular attraction for one another. This is likewiſe rendered ſtill more eaſy by their requiring different proportions of water, and different degrees of heat, to ſuſpend them; for by this they cryſtallize at different times, and we have not the trouble of picking the cryſtals of one out among thoſe of the other.

167
Hypotheſis concerning the ſolution of ſalts.

The manner in which the ſolution of ſalts in water is effected, is equally unaccountable with moſt of the other operations of nature. Sir Iſaac Newton ſuppoſed that the particles of water got between thoſe of the ſalt, and arranged them all at an equal diſtance from one another: and from this he alſo accounts for the regular figures they aſſume on paſſing into a cryſtalline form; becauſe, having been once arranged in an orderly manner, they could not come together in diſorder, unleſs ſomething was to diſturb the water in which they were ſuſpended; and if any ſuch diſturbance is given, we find the cryſtals are by no means ſo regular as otherwiſe they would have proved. Others have thought that theſe figures depend on a certain *polarity* in the very ſmall particles into which the ſalt is reſolved when in a ſtate of ſolution. Theſe things, however, are merely conjectural; neither is it a matter of any conſequence to a chemiſt whether they are right or wrong.

168
Salts deſtructible by repeated ſolutions.

Though ſolution is that operation which ſalts undergo the moſt eaſily, and which ſhould ſeem to affect them the leaſt of any, a repetition of it proves nevertheleſs very injurious to them, eſpecially if it is followed by quick evaporation; and the ſalt, inſtead of being cryſtallized, is dried with a pretty ſtrong heat. Newman relates, that a pound of ſea-ſalt was reduced, by 13 ſolutions and exſiccations, to half an ounce; and even that was moſtly earth. Where ſolution is required, therefore, it ought always to be done in cloſe veſſels, in which alſo the ſubſequent evaporation ſhould be performed, (ſee Evaporation); and in all caſes where cryſtallization is practicable, it ought to be preferred to violent exſiccation.

169
Acids.

The two great diviſions of ſalts are into acids and alkalies. The former of theſe are known by their peculiar taſte, which is called *acid* or *ſour*. They are not found in a ſolid form; neither are any of them, except the acids of vitriol, of tartar, of phoſphorus, and of borax, capable of being reduced to ſolidity. The others, when highly concentrated, that is, brought to the utmoſt degree of ſtrength of which they are capable, always become an inviſible vapour, permanently elaſtic, until it comes in contact with water, or ſome other ſubſtance with which they are capable of uniting. For ſuch acids the name of *ſalts* ſeems leſs proper, as we can ſcarcely ſay that a *vapour*, which is already much more fluid than water, can be *diſſolved* in that element.

The acids are divided into the mineral, the vegetable, and the animal; expreſſing their different origin, or where they are moſt commonly to be found. The mineral acids are commonly reckoned three; the

vi-

vitriolic, the nitrous, and the marine. To this the acid of borax ought to be added; but its weakneſs makes it much leſs taken notice of as an acid than the others. A Swediſh chemiſt, however, Mr Scheele, hath lately added ſeveral others, which are afterwards taken notice of.

The vegetable kingdom affords only two diſtinct ſpecies of acids, at leaſt without the aſſiſtance of ſome chemical operation. The one appears fluid, and when concentrated to the utmoſt degree becomes an inviſible vapour. This is produced from fermented liquors, under the name of *vinegar*. An acid ſimilar to this, and which is thought not to be eſſentially different from it, is extracted from moſt vegetables by diſtillation with a ſtrong fire. The other is likewiſe a conſequence of fermentation; and cruſts on the bottom and ſides of caſks in which wine is put to depurate itſelf. In its crude ſtate it is called *tartar*; and when afterwards purified, is called the *cream*, or cryſtals, of tartar. As for the various acids produced in the different chemical proceſſes to be afterwards related, we forbear to mention them at preſent, it being juſtly ſuſpected that ſome of them are artificial.

The animal acids, which have hitherto been diſcovered, are only two; the acid of ants, and that of urine, which is alſo the acid of phoſphorus. The firſt of theſe is volatile; and conſequently muſt be ſuppoſed a vapour when in its ſtrongeſt ſtate: the other is exceedingly fixed; and will rather melt into glaſs than riſe in vapours. Beſides theſe, it is ſaid an acid is contained in blood, in waſps, bees, &c.: but no experiments have as yet been made on theſe to determine this matter with any degree of preciſion.

170 Alkalies.

The alkalies are of two kinds; fixed and volatile. The fixed kind are ſubdivided into two; the vegetable, and mineral or foſſil alkali. The vegetable is ſo called, becauſe it is procured from the aſhes of burnt vegetables; the foſſile, becauſe it is found native in ſome places of the earth, and is the baſis of ſea-ſalt, which in ſome places is dug out of mines in vaſt quantity. They are called *fixed*, becauſe they endure a very intenſe degree of heat without being diſſipated in vapour, ſo as even to form a part of the compoſition of glaſs. The volatile alkali is generally obtained by diſtillation from animal ſubſtances. In its pure ſtate this alkali is perfectly inviſible; but affects the ſenſe of ſmelling to ſuch a degree, as not to be approached with ſafety.

171 Different action of alkalies and acids.

The acids and alkalies are generally thought to be entirely oppoſite in their natures to one another. Some, however, imagine them to be extremely ſimilar, and to be as it were parts of one ſubſtance violently taken from each other. Certain it is, that when ſeparated, they appear as oppoſite to one another as heat and cold. Their oppoſite action indeed very much reſembles that of heat and cold, even when applied to the tongue; for the alkali has a hot, bitter, burning taſte, while the acid, if not conſiderably concentrated, always gives a ſenſation of coldneſs. In their action too upon animal ſubſtances, the alkali diſſolves, and reduces the part to a mucilage; while the acid, if not very much concentrated, tends to preſerve it uncorrupted.

172 Neutral ſalts.

If an alkaline ſalt, and moderately ſtrong acid in a liquid ſtate, be mixed together, they will immediately unite; and, provided the alkali has not been deprived of its fixed air, their union will be attended with a very conſiderable efferveſcence: (ſee Aerology.) If the alkali has been deprived of air, no efferveſcence will enſue, but they will quietly mix together; but if a due proportion of each has been added, the liquor will neither have the properties of an acid nor an alkali, but will be what is called *neutral*. The bringing the liquor into this ſtate, is called *ſaturating* the acid or alkali, or combining them to the point of ſaturation.

If the liquor after ſuch a ſaturation be gently evaporated, a ſaline maſs will be left, which is neither an acid nor an alkali, but a new compound formed by the union of the two, and which is called a *perfect neutral ſalt*. The epithet *perfect* is given it, to make a diſtinction between the ſalts formed by the union of an acid and an alkali, and thoſe formed by the union of acids, with earthy or metallic ſubſtances; for theſe will likewiſe unite with acids, and ſome of the compounds will cryſtallize into regular figures; but, becauſe of their weaker union with theſe ſubſtances, the ſalts reſulting from combinations of this kind are called *imperfect*.

173 Vegetable colours changed by acids and alkalies.

All acids, the volatile ſulphureous one excepted, change the blue infuſions of vegetables, ſuch as violets, to a red; and alkalies, as well as ſome of the imperfect neutrals, change them to green. This is the niceſt teſt of an acid or alkali abounding in any ſubſtance, and ſeems the moſt proper method of determining whether a ſolution intended to be neutral really is ſo or not.

174 Differences in the degrees of attraction between acids and alkalies

Though between every acid and alkali there is a very ſtrong attraction, yet this is far from being the ſame in all; neither is it the ſame between the ſame acid and alkali in different circumſtances of the acid. When the acids are in a liquid ſtate, and as free as poſſible of inflammable matter, between which and the nitrous and vitriolic acids there is a very ſtrong attraction, the vitriolic will expel any of the reſt from an alkaline baſis, and take its place. Thus, if you combine the acid of ſea-ſalt, or marine acid, to the point of ſaturation, with the foſſil alkali, a neutral ſalt will be formed, which has every property of common ſalt: but, if you pour on a certain proportion of the vitriolic acid, the acid of ſea-ſalt will immediately be expelled; and the liquor, upon being evaporated, will contain not the neutral ſalt formed by an union of the marine acid with the alkali, but another conſiſting of the vitriolic acid joined with that alkali, and which has quite different properties from the former.

When the acids and alkalies are applied to one another in a liquid ſtate, the vitriolic acid always ſhows itſelf to be the moſt powerful; but when applied in a ſolid form, and urged with a violent heat, the caſe is very much altered. Thus, the acid of borax, commonly called *ſal ſedativus*, is ſo weak as to be diſengaged from its baſis by every acid applied in a liquid form, that of tartar alone excepted; but if even the vitriolic acid combined with an alkali be mixed with this weak acid, then exſiccated, and at laſt urged with a vehement fire, the vitriolic acid will be diſengaged from its baſis, and riſe in vapours, leaving the weaker acid in poſſeſſion of the alkali. The ſame thing happens on adding the phoſphorine or urinous acid,

acid, or the acid of arſenic, &c. to combinations of the vitriolic or other acids with alkaline ſalts.—When the acids are in a liquid ſtate, therefore the moſt powerful is the vitriolic; next the nitrous; then the marine; then vinegar; acid of ants; and laſtly the ſal ſedativus and tartar, which ſeem to be nearly equal in this reſpect.—If they are applied in a ſolid form, the moſt powerful are the ſal ſedativus and phoſphorine acid; then the vitriolic, nitrous, marine, and vegetable acids.

When they are reduced to vapour, the caſe is exceedingly different; for then the marine acid appears to be the moſt powerful, and the vitriolic the leaſt ſo of any. It is impoſſible, however, to preſerve the vitriolic acid in the form of vapour, without combining it with a certain quantity of inflammable matter, which muſt neceſſarily deſtroy its ſtrength. Dr Prieſtley found, that the marine acid, when reduced to vapour, was capable of diſuniting the nitrous acid from a fixed alkali.

Though the vitriolic acid ſometimes aſſumes a ſolid form, it is by no means eaſy to reduce it to this ſtate by mere concentration, without the aſſiſtance of nitrous acid. Baldaſart, however, pretends that he diſcovered, in the neighbourhood of a volcano, a pure and icy oil of vitriol, from which nothing could be precipitated by alkaline ſalts; though there is certainly very great reaſon to doubt the accuracy of this obſervation. Of late the nitrous acid has alſo been found capable of aſſuming a ſolid form. This was firſt obſerved by M. Bernhard in diſtilling a very large quantity of the acid. At that time he perceived a white ſalt adhering to the inſide of the receiver, which on examination proved to be the acid of nitre in a concrete form; being extremely corroſive, emitting red vapours copiouſly on being expoſed to the air, and at length totally evaporating in it. Its ſpecific gravity, however, was far inferior to that of the glacial oil of vitriol.

175
Acids unite with phlogiſton.

The acids have the property of uniting themſelves to many other ſubſtances beſides fixed alkalies, and forming neutral compounds with them. Of theſe the chief is the principle of inflammability or phlogiſton. In the vitriolic, nitrous, and phoſphorine acids, the attraction for this principle is very ſtrong; ſo great, that the two former will even leave a fixed alkali to unite with it. In the marine acid it is leſs perceptible; in the liquid vegetable or animal acid ſtill leſs; and in the acid of tartar, and ſal ſedativus, not at all.

176
With metals and earth.

Beſides this, all acids will diſſolve metallic and earthy ſubſtances: with theſe, however, they do not in general unite ſo firmly with alkaline ſalts; nor do they unite ſo ſtrongly with metals as with earths.

177
Elective attractions.

In general, therefore, we may expect, that after having diſſolved a metal in any acid whatever, if we add an earthy ſubſtance to that ſolution, the acid will quit the metal, which it had before diſſolved, to unite with the earth. In this caſe the ſolution will not be clear as before, but will remain muddy, and a quantity of powder will fall to the bottom. This powder is the metalline ſubſtance itſelf, but deprived of one of its component parts; and in this caſe it is ſaid to *precipitate* in the form of a *calx*.

If to this new ſolution of the earthy ſubſtance in an acid liquor, a volatile alkaline ſalt, not deprived of its fixed air, is added, the acid will quit the earth, and unite wit hthe alkaline ſalt. The earth thus diſengaged will again *precipitate*, and lie at the bottom in fine powder, while the volatile alkali and acid remain combined together, and the liquor again becomes clear.

The attraction between volatile alkalies and acids is conſiderably leſs than between fixed alkalies and the ſame acids. If, therefore, a fixed alkali be now added to the liquor, the volatile alkali will be ſeparated, and the acid will unite with the fixed alkali. The volatile alkali indeed, being perfectly ſoluble in water, cannot precipitate, but will diſcover its ſeparation by the pungent ſmell of the mixture; and upon evaporating the liquor, the volatile alkali will be diſſipated, and a ſaline maſs, conſiſting of the acid and fixed alkali, will remain.

178
Detonation of nitre.

Laſtly, If the acid employed was the nitrous, which has a ſtrong attraction for the principle of inflammability, if the ſaline maſs be mixed with a proper quantity of inflammable matter, and expoſed to a ſtrong heat, the acid will leave the alkali with vaſt rapidity, combine with the inflammable matter, and be deſtroyed in flame in a moment, leaving the alkali quite pure.

179
Exceptions to the above rules.

Though the abovementioned effects generally happen, yet we are not to expect that they will invariably prove the ſame whatever acid is made uſe of; or even that they will be the ſame in all poſſible variety of circumſtances in which the ſame acid can be uſed.—The acid of tartar is one exception, where the general rule is in a manner reverſed; for this acid will quit a fixed alkali for an earth, eſpecially if calcined, and even for iron. If lead, mercury or ſilver, are diſſolved in the nitrous acid, and a ſmall quantity of the marine acid is added, it will ſeparate the ſtronger nitrous acid, and fall to the bottom with the metals in form of a white powder.—The vitriolic acid, by itſelf, has a greater attraction for earthy ſubſtances than for metals; and greater ſtill for fixed alkaline ſalts than for either of theſe: but if quickſilver is diſſolved in the nitrous acid, and this ſolution is poured into a combination of vitriolic acid with fixed alkali, the vitriolic acid will quit the alkali to unite with the quickſilver. Yet quickſilver by itſelf cannot eaſily be united with this acid. The reaſon of all theſe anomalies, however, is fully explained in the following ſection.

§ 1. *Of the Operations of Solution and Precipitation.*

The chemical ſolution of ſolid bodies in acid or other menſtrua, is a phenomenon which, though our familiarity with it has now taken off our ſurpriſe, muſt undoubtedly have occaſioned the greateſt admiration and aſtoniſhment in thoſe who firſt obſerved it. It would far exceed the limits of this treatiſe to ſpeak particularly of all the various circumſtances attending the ſolution of different ſubſtances in every poſſible menſtruum. The following are the moſt remarkable, collected from Mr Bergman's Diſſertion on Metallic Precipitates.

180
Phenomena attending the ſolution of a metal.

1. On putting a ſmall piece of metal into any acid, it is diſſolved ſometimes with violence, ſometimes gently, according to the nature of the menſtruum and of the metal to be diſſolved.

2. The nitrous acid is the moſt powerful in its action

tion upon metallic ſubſtances, when unaſſiſted by heat. So great indeed is the violence with which this acid ſometimes acts, that the metal, inſtead of being diſſolved, ſeparates inſtantaneouſly from it in the form of a calx or powder ſcarce ſoluble in any menſtruum, at the ſame time that the heat, efferveſcence, and noxious vapours iſſuing from the mixture, render it abſolutely neceſſary to moderate the action of the menſtruum, either by dilution or cold, or both. In other caſes, however, as when put to gold or platina, the nitrous acid has no effect until it be united with the marine, when the mixture acts upon thoſe metals, which neither of the acids ſingly would touch.

181 Nitrous acid the moſt violent in its operation.

182 Vitriolic acid acts more weakly.

3. The action of the vitriolic acid, though in the higeſt degree of concentration, is more weak. It does not readily attack ſilver or mercury unleſs aſſiſted by a boiling heat, nor will even that be ſufficient to make it act upon gold or platina.

183 Marine acid generally more weak than either, except when dephlogiſticated.

4. The action of marine acid, unleſs on ſome particular ſubſtances, is ſtill more weak; but when dephlogiſticated, or deprived of part of the phlogiſton eſſential to its conſtitution as an acid, it acts much more powerfully, and diſſolves all the metals completely.

184 The reſt of the acids much weaker ſtill.

5. The other acids, as thoſe of fluor, borax, with ſuch as are obtained from the animal and vegetable kingdoms, are much inferior in their powers as ſolvents, unleſs in very few inſtances.

185 Different degrees of ſolubility in metals.

6. Metals vary very much in their degrees of ſolubility; ſome yielding to almoſt every menſtruum, and others, as has been already obſerved, being ſcarce acted upon by the moſt powerful.

186 Solution ſometimes promoted by abſtracting a certain proportion of phlogiſton.

187 But is totally prevented by taking away too much: exemplified in manganeſe.

7. Zinc and iron are of the former kind, and gold and ſilver of the latter, eluding the marine; and gold, unleſs in one particular caſe, viz. when aſſiſted by heat in a cloſe veſſel, the action of the nitrious acid alſo. Theſe metals, however, which in their perfect ſtate reſiſt the action of the moſt powerful menſtrua, may be diſſolved much more readily when deprived of a certain quantity of their inflammable principle. But though the ſeparation of this principle in ſome degree renders metals more ſoluble, the abſtraction of too much of it, particularly in the caſe of iron and tin, renders theſe metals almoſt entirely inſoluble. Manganeſe is the moſt remarkable inſtance of this power of the phlogiſtic principle, in depriving metals of their ſolubility by its abſence, or reſtoring it to them by its preſence; for this ſubſtance, when reduced to blackneſs, cannot be diſſolved by any acid without the addition of ſome inflammable matter; but when by the addition of phlogiſton it has become white, may be diſſolved in any acid.

188 Solution of metals attended with an efferveſcence.

8. The diſſolution of metals by acids, even to their very laſt particle, is attended by a viſible efferveſcence: this is more perceptible according to the quickneſs of the ſolution; but more obſcure, and ſcarcely to be ſeen at all, when the ſolution proceeds ſlowly.

189 Various kinds of elaſtic fluids extricated.

9. The elaſtic fluids extricated by theſe ſolutions are various, according to the nature of the acid and of the metal employed. With the nitrous, the fluid produced is commonly that called *nitrous air*; with vitriolic and marine acids the produce is ſometimes inflammable air, ſometimes otherwiſe, acccording to the nature of the metal acted upon.

10. Heat in a greater or ſmaller degree is always produced during the diſſolution of metals; and the degree of it is in proportion to the quantity of the matter and the quickneſs of the ſolution; and hence, in ſmall quantities of metal, and when the ſolution proceeds very ſlowly, the temperature of the maſs is ſcarcely altered.

190 Heat produced during the diſſolution of metals.

191 Little air can be obtained from metals when calcined.

11. The calces of metals either yield no air at all, or only the aerial acid, unleſs when urged by a violent heat almoſt to ignition; when, by means of vitriolic or nitrous acid, they yield a quantity of pure air, after other elaſtic fluids, ſuch as vitriolic, nitrous, or phlogiſticated air. None of the dephlogiſticated air is uſually produced by the marine acid in conjunction with metallic calces.

192 Various colours of metallic calces.

12. The ſolutions of ſome metals are coloured, others are not. The colour of the former is only that which is proper to the calx, but rendered more vivid by the moiſture. Thus ſolutions of gold and platina are yellow; thoſe of copper, blue or green; ſolutions of nickel of a bright green; but thoſe of cobalt are red, although the calx is black. We may obſerve that even this red colour may be heightened to blackneſs. Iron moderately calcined is green; but this rarely continues upon further dephlogiſtication. The white calces of ſilver, lead, tin, biſmuth, arſenic, antimony, and manganeſe, are diſſolved without colour; but ſolutions of lead, tin, and antimony, are ſomewhat yellow, unleſs ſufficiently diluted. Mercury, however, forms a ſingular exception to this rule; for the orange-coloured calx of this metal forms a colourleſs ſolution. The metals yielding coloured ſolutions are gold, platina, copper, iron, tin, nickel, and cobalt; the reſt, if properly depurated, give no tinge. A ſolution of ſilver is ſometimes of a blue or green colour at firſt, although there be no copper preſent; the vitriolic acid becomes blue with copper; the nitrous may be made either blue or green at pleaſure; the marine varies according to the quantity of water with which it is diluted. Manganeſe, when too much dephlogiſticated, renders both the vitriolic and marine acids purple.

193 Bergman's account of the cauſe of chemical ſolution.

194 Solution impeded by too great a quantity of phlogiſton.

159 Sulphur dephlogiſticated by nitrous acid.

With regard to the cauſe of chemical ſolutions, our author obſerves, that though attraction muſt be looked upon as the fundamental cauſe, yet we may alſo lay it down as a maxim, that no metal can be taken up by an acid, and at the ſame time preſerve the whole quantity of phlogiſton which was neceſſary to it in its metallic ſtate. A certain proportion of the principle of inflammability therefore may be conſidered as an obſtacle which muſt be removed before a ſolution can take place. Thus, of all the acids, the nitrous attracts phlogiſton the moſt powerfully, and ſeparates it even from the vitriolic. A proof of this may be had by boiling ſulphur ſlowly in concentrated nitrous acid. At length all its phlogiſton may be ſeparated, and the vitriolic acid will remain, deprived of its principle of inflammability. The extraordinary ſolvent powers of this acid, therefore, is conformed to the peculiarity of its nature in this reſpect. For this menſtruum diſſolves metals for ſolution with the greateſt eaſe, moſt commonly without any aſſiſtance from external heat; which in ſome inſtances would be hurtful, by ſeparating too much of phlogiſton, as appears in the caſe of iron, tin, and antimony; all of which may be ſo far dephlogiſticated by the nitrous acid, as to be rendered extremely difficult of ſolution: for this reaſon it is very often neceſſary, as has already been obſerved, to temper the

196 Calces of ſome metals prepared by nitrous acid almoſt inſoluble ever afterwards.

activity of this menſtruum by water.

197 Why the vitriolic acid cannot act on lead, ſilver, &c. without a boiling heat.

The vitriolic acid requires a boiling heat before it can act upon ſilver or mercury. The reaſon of this is, that by means of the heat, the watery part of the menſtruum is diminiſhed, its power is thereby increaſed, and the connection of the metallic earths with the inflammable principle diminiſhed.

198 Why marine acid acts on ſome metals and not on others.

Marine acid, which contains phlogiſton as one of its conſtituent principles, muſt neceſſarily have little or no effect on thoſe metals which retain their principle of inflammability very obſtinately. But its watery part being diminiſhed by boiling, it aſſumes an aerial form, and powerfully attracts a larger quantity of phlogiſton than before; ſo that in a vaporous ſtate it will diſſolve metals, particularly ſilver and mercury, which in its liquid form it would ſcarce be brought to touch. When dephlogiſticated as much as poſſible, it attracts phlogiſton with prodigious avidity, diſſolving all metals by its attraction for their phlogiſton, and, uniting the inflammable principle to itſelf, reſumes the ordinary form of marine acid. When dephlogiſticated by means of nitrous acid in aqua regis, it diſſolves gold and platina. On the ſame principles may we account for its inferiority in power to the other acids.

199 Why ſome metals are more ſoluble than others.

It has already been obſerved that the metals differ much in their degrees of ſolubility, which is owing to the various, degrees of force with which they retain their phlogiſton. Thoſe called perfect metals effectually reſiſt calcination in the dry way. In this operation, the fire on the one hand, the great cauſe of the volatility of bodies, ſtrenuouſly endeavours to expel the phlogiſton; on the other hand, the baſis of the dephlogiſticated part of the atmoſphere (the acidifying principle of M. Lavoiſier, and the *principium ſorbile* of Dr Lubbock) attracts the calx ſtrongly. Experience, however, ſhows, that theſe two forces united, cannot decompoſe gold, ſilver, or platina to any conſiderable degree. All the other metals yield to theſe forces when united, but not ſingly. Iron and zinc retain their inflammable principle ſo ſlightly, that any acid immediately acts upon them; but if the other metals be properly prepared for ſolution by being calcined to a certain degree, the acid will immediately take them up. Any further privation, however, would be injurious, and precipitate what was before diſſolved.

200 Why nitrous acid precipitates a ſolution of tin or antimony.

Thus the nitrous acid, when added to a ſolution of tin or antimony in marine acid, by its extraordinary attraction for phlogiſton carries off ſuch a quantity of it, that the calces of the metals are immediately precipitated.

201 Different kinds of air produced during the diſſolution of metals.

The various elaſtic fluids which reſemble air, and which are produced in plenty during the diſſolution of metals, may be reduced to the following, *viz.* thoſe extricated by the vitriolic, nitrous, and marine acids, fluor acid, vinegar, alkaline ſalts, and hepar ſulphuris.

202 Pure vitriolic acid cannot be reduced into an aerial form but by a combination with phlogiſton.

Pure vitriolic acid expoſed to a violent heat, is indeed reſolved into vapours, but of ſuch a nature, that when the heat is gone, they condenſe again into an acid liquor of the ſame nature as before. But if any ſubſtance be added which contains phlogiſton in a ſeparable ſtate, an elaſtic fluid is produced by means of fire, which is ſcarcely condenſible by the moſt extreme cold, unleſs it comes in contact with water. This is called the volatile ſulphureous acid, or vitriolic acid air, which may be totally abſorbed by water. In this caſe the bond of union betwixt it and the phlogiſton is ſo weak, that the latter ſoon flies off totally, and common vitriolic acid is regenerated.

203 Nitrous acid more obviouſly changed.

The nitrous acid undergoes a ſimilar change in a more obvious manner. Let a piece of ſilver, for inſtance be put into a dilute nitrous acid, and the ſurface of the metal will inſtantly be covered with innumerable bubbles, which ariſing to the top of the liquor, there burſt; and if collected, are found to be nitrous air.

204 Why nitrous air does not unite with water.

The nitrous acid ſaturates itſelf with phlogiſton more completely than the vitriolic; therefore the elaſtic fluid produced, or nitrous air, does not unite with water, and ſcarce retains any veſtige of an acid nature. The vitriolic acid, however, differs from the nitrous in this reſpect, that the phlogiſton is abſorbed by the latter even beyond the point neceſſary to obliterate its acid nature. In proof of this, our author adduces the decompoſition of hepatic by means of nitrous air.

205 Phenomena exhibited by the marine acid.

The marine acid exhibits different phenomena. It naturally contains phlogiſton, and therefore can by its means be reſolved into a kind of air ſomewhat ſimilar to that produced by the vitriolic acid when artificially united to the ſame principle, and which has the ſame property, *viz.* that of remaining permanently elaſtic as long as it is kept from the contact of water. But as the acid we ſpeak of naturally contains phlogiſton, there is no neceſſity of adding more to produce this effect. In the mean time, the marine as well as nitrous air, when in its expanded ſtate, attracts phlogiſton, and that with wonderful avidity.

206 Of the dephlogiſticated marine acid.

When the marine acid is dephlogiſticated, it yields another elaſtic fluid of a reddiſh brown colour, having an odour like that of warm aqua regia. This does not unite with water, or only in very ſmall quantity: and by the addition of a proper proportion of phlogiſton may be reduced again to common marine acid. It is ſaid that the marine acid may be dephlogiſticated by lead as well as by manganeſe, the nitrous acid, and arſenic.

207 Of the fluor acid.

The fluor acid abounds with phlogiſton, and therefore may, without any adventitious matter, be reduced to an elaſtic fluid. This air is eaſily diſtinguiſhed from all others by its corroſion of glaſs whilſt hot.

208 Why vinegar may be reduced into air without addition.

Vinegar alſo contains phlogiſton; and for that reaſon, when well dephlegmated, may be reduced without addition into a permanently elaſtic fluid, called acetous air.

209 Heat and not phlogiſton the principle of elaſticity.

All theſe fluids ſeem to be nothing elſe, according to Mr Bergman, than the acids themſelves expanded by phlogiſton. "Perhaps (ſays he) the matter of heat alſo enters their compoſition." The experiments lately made on theſe ſubjects, however, have put it beyond all doubt, that the expanſive principle is not phlogiſton but heat; nevertheleſs, it ſeems highly probable, that theſe elaſtic fluids do really conſiſt of the acid united to phlogiſton, and expanded by heat. This is alſo the caſe with the cauſtic volatile alkali, now called alkaline air.

210 Sulphur exiſts in hepatic air.

In the hepatic air, it has been ſhown by Mr Bergman, that ſulphur exiſts which contains phlogiſton; and there is little reaſon to doubt that the expanſive power here is the ſame as in other caſes. See Hepatic Air.

The heat generated during the ſolution of metals is by Mr Bergman ſuppoſed to be owing to the matter

211
Heat in ſolution moſt probably proceeds from the ſolvent liquor.

of heat which had been fixed in the metals; but it may with much more reaſon be ſuppoſed to proceed from the acid. Dr Black has demonſtrated, that heat is univerſally the principle of fluidity; and all fluids, whether acid or not, are found to contain a great quantity of it. It is not probable that ſolids, even the moſt inflammable, contain an equal quantity; for it is always obſerved, that bodies in becoming fluid abſorb heat, and throw it out again on becoming ſolid. Acids in all probability contain a much greater quantity than what is neceſſary to their fluidity; for we ſee that the nitrous acid, when poured upon ſnow, parts with as much heat as is neceſſary to diſſolve the ſnow, at the ſame time that it ſtill retains its fluidity. The caſe is not ſo with common ſalt, which is a ſolid: for though, in a mixture of ſalt and ſnow, the latter abſorbs as much heat from the ſalt as is neceſſary for its own liquefaction; yet the ſalt could not be held in ſolution by a liquid of this temperature, were it not that an additional quantity is perpetually abſorbed from the adjacent bodies, particularly the atmoſphere. But were it poſſible to prevent this adventitious increaſe of heat, there is not the leaſt reaſon to believe that the ſalt would be diſſolved; for the ſtrongeſt brine, when reduced to the temperature of 0 of Fahrenheit, is decompoſed, the ſalt falling to the bottom in powder, and the water being converted into ice. Add to this alſo, that the cold produced by ſpirit of nitre and ſnow is much more intenſe than that produced by common ſalt and ſnow; which undoubtedly ſhows, that a ſolid does not readily part with as much heat as a fluid, and conſequently cannot be ſuppoſed to contain as much. The ſolution of metals in acids alſo demonſtrates, that the ſolid ſubſtance has not parted with heat, but abſorbed it; for as ſoon as the ſolution becomes ſolid again, *i. e.* when it cryſtallizes, the temperature becomes higher than before.

212
Solid bodies do not part with ſo much heat as fluids.

213
Why little or no elaſtic fluid is obtained from metallic calces.

The calces of metals have not that quantity of phlogiſton that is neceſſary for their metallic ſtate, but yet are not entirely deſtitute of it; therefore, in their ſolution, ſcarce any elaſtic fluid is generated, unleſs the fire be continued after exſiccation. Such as contain aerial acid, diſcharge it immediately in the ſame form as they had received it. It is remarkable, that Dr Prieſtley mentions a calx of lead, which, with the acid of phoſphorous, produced an inflammable air. By means of the nitrous acid and evaporation to dryneſs, a pure air is produced. Sometimes a ſmall portion of vitriolic acid air is obtained by means of a proper degree of fire from vitriolic acid, but a far greater quantity of pure air.

214
Metallic ſolutions contain a calx of the metal with various degrees of phlogiſton.

The ſolutions made by the menſtrua abovementioned, contain a metallic calx intimately united with the acid, the quantity of phlogiſton left being various according to the difference of the menſtrua and of the temperature; but the performance of the operation either with or without intenſe heat, frequently occaſions a remarkable difference. That metals are leſs calcined by the marine than by the nitrous acid, appears from pouring concentrated nitrous acid on tin or antimony; but the difference, if it actually does take place, is leſs viſible in other metals.

215
Reaſons for believing that metals are calcined by phlogiſton.

Some modern chemiſts have denied this calcination of metals by ſolution. They have inſiſted, that the perfect metals ought to be excepted, as they do not yield to the moſt intenſe fire. On this ſubject, however, it may be obſerved, 1. That during their ſolution nitrous air is always generated, and that of a very perfect kind, which cannot happen without phlogiſton; but in this caſe there is nothing preſent which can yield phlogiſton except the metals. Therefore, 2. The metals, when precipitated from their menſtrua by fixed alkalis, both with reſpect to their external appearance and internal properties, appear to be calcined. Thus the precipitate of gold refuſes to unite with mercury, and may be diſſolved by marine acid and other ſimple menſtrua, and that without the production of any elaſtic fluid. 3. Glaſs may be ſtained by theſe calces; but no metal in its perfect ſtate can be taken up by glaſs.

216
Why the calces of the perfect metals may be reduced without addition.

The common objection is, that the calces of the perfect metals may be reduced by heat alone without the addition of charcoal. Many theories have been invented to ſolve this phenomenon. Some have ſuppoſed, that the matter of heat and light are the ſame with the phlogiſton, and that thus the calces are reduced in the ſame manner as by charcoal or other ſubſtances uſually termed *phlogiſtic*. But in this caſe we ought to find the calces of the imperfect metals alſo reduced by a long continuance of heat, as well as the more perfect; which, however, has never yet been known to take place. Some, among whoſe number is Dr Lewis, have imagined, that the poroſity of the veſſels, particularly thoſe made of earthen ware, may be ſuch as to admit the paſſage of phlogiſtic vapours through them; and he inſtances the revival of globules of lead in the middle of pieces of glaſs upwards of an inch in thickneſs, and that where there was not the leaſt appearance of a crack. But from an experiment of Mr Kirwan's to be afterwards related, it is much more probable that the reduction is effected by means of the phlogiſton contained in one part of the calx attracted by another; by which means the latter is reduced to a perfect metal, while the former becomes ſomewhat more dephlogiſticated. In conſequence of this it appears, that the calx of the perfect metals is never totally reduced: for if the operation be performed in a glaſs retort, the bottom of it is always ſtained; which indicates the exiſtence of a calx, in however little quantity.

217
Difficulty concerning the amalgamation of ſilver ſolved by Bergman.

The following fact, Mr Bergman ſays, has been propoſed to him as an inextricable dilemma. "Silver cannot amalgamate with mercury except when in its metallic ſtate, yet both ſalited and nitrated ſilver are taken up by mercury; it is therefore not calcined by the acids, but adheres to them in its metallic form." This, however, may be eaſily ſolved in the following manner. It is well known that the calx of copper, diſſolved in the vitriolic acid, is precipitated in its metallic form on the addition of iron, and that by means of a double elective attraction; for the iron, diſſolving in the acid, would form an inflammable air by its phlogiſton, were not the copper preſent which takes it up, and thereby becomes inſoluble as long as it retains it; but mercury has a ſtronger attraction for acids than ſilver: if therefore ſalited or nitrated ſilver be triturated with mercury, the ſilver muſt be precipitated in a metallic ſtate, and the mercury be calcined by being diſſolved. This alſo takes place, provided there be moiſture ſufficient to ſuffer the elective attractions to operate. The ſuperabundant mercury greedily takes up the comminuted ſilver precipitate; and the *arbores Dianæ* are nothing more than ſuch an amalgam cryſtallized. But although the acids cannot take up any metal while it retains its full proportion of phlogiſton, various metallic ſalts are able to effect that ſolution. Thus nitrated or ſalited mercury, boiled in water together with the crude metal, can take up a certain portion of it without dephlogiſtication; and the latter of theſe ſalts, even in the *via ſicca*, becomes a mercurius dulcis, which contains at the ſame time a crude and a calcined mercury.

218 Phlogiſton the cauſe of colour in metallic ſolutions.

Perfect ſolutions ſhould in general be tranſparent; but ſome, as has been already mentioned, are diſtinguiſhed by a peculiar colour. That phlogiſton is the chief cauſe of colour appears from hence, that the black clax of mangancſe tinges vitriolic acid of a red colour; but on the addition of ſugar the tinge is entirely deſtroyed. Nitrous acid is rendered blue by copper; but when the metal is added in conſiderable quantity, it becomes of a very deep green. The marine acid, which dephlogiſticates the copper leſs, is yet made green; but by dephlegmation may be ſo condenſed as to become brown. Mr Bergman has ſometimes ſeen a ſolution of ſilver green, without the preſence of the ſmalleſt particle of copper. This depends on the abſorption of nitrous air: for let ſmoking nitrous acid be diluted, on the addition of a certain quantity of water it will be of a deep green; by a greater, blue; and upon a ſtill greater, becomes limpid. By means of the water, the nitrous air is extended to a greater ſpace; and this attenuation gradually increaſed varies the colours. Hence we ſee why nitrous acid is made green by a large quantity of copper.

219 Attraction of phlogiſton the cauſe of cauſticity.

Metals dephlogiſticated by acid ſolvents powerfully attract phlogiſton; nay, nitrated ſilver and mercury, and ſalited antimony, corrode animal ſubſtances, in order, as our author ſuppoſes, to extract it. "This metallic cauſticity (ſays he), which is only to be moderated by phlogiſton, ought to be carefully diſtinguiſhed from the acid cauſticity, which is repreſſed by alkalies, and the alkaline, which is mitigated by acids. Colours vary according to the quantity of phlogiſton preſent; and ſome experiments ſhow, that by a ſufficient quantity all colour is entirely deſtroyed.

220 Phenomena attending the precipitation of metals by alkaline ſalts.

All metals may be precipitated by alkaline ſalts; which, by their ſuperior power of attraction, ſeparate them from their menſtrua; but their difference with regard to their nature and preparation alters the nature of the precipitate. With the cauſtic fixed alkali the calces fall almoſt entirely pure, but loaded with water. The weight is found to be increaſed by the water, and perhaps (ſays Mr Bergman) by the matter of heat; but yet leſs than by the aerial acid. With the aerated fixed alkali, by means of a double decompoſition, the aerial acid unites to moſt calces. The volatile alkali, which naturally contains phlogiſton, ſometimes phlogiſticates the precipitate. It throws down a black or white precipitate of mercury; nay, it makes the orange coloured precipitate white. Gold receives its fulminating quality from this precipitant, as is afterwards to be explained. The alkali, which is commonly called *phlogiſticated*, generally precipitates metals with an increaſe of weight.

221 Precipitates occaſioned by acids, and why;

The acids frequently occaſion precipitates, and that for various reaſons. By means of elective attraction, mercury, ſilver, and lead, are taken from the nitrous acid by the addition of the marine or vitriolic. Theſe acids form with the metals new compounds which are difficult of ſolution in water; they are therefore precipitated in greater or leſſer quantity according to circumſtances. The nitrous acid is capable of decompounding ſalited tin and antimony by dephlogiſticating the calx of the metals too much; for when theſe are too much calcined, they cannot be diſſolved in any menſtruum, as has been already obſerved.

222 By the perfect neutral ſalts;

Metallic ſolutions are ſometimes diſturbed by the neutral ſalts formed by an union of alkalies with acids. Thoſe which contain the vitriolic or marine acids decompoſe ſolutions of ſilver, mercury, or lead, in nitrous acid, and precipitate the metals. By forming a triple combination, the vegetable as well as the volatile alkali, though ſaturated with vitriolic, nitrous, or marine acid, precipitate platina from aqua regia; but when the baſis is mineral alkali, the ſalt has no power of this kind.

223 By a triple combination.

224 Some metallic ſalts decompoſe others.

Some metallic ſalts can decompoſe others, and precipitate their baſes; which may happen whether the acid be different in the two ſalts or not. Solution of gold affords an example of each of theſe caſes. This is precipitated by martial vitriol; the reaſon of which will appear from conſidering the nature of the precipitate: for this, when well waſhed and dried, not only ſhows many ſhining gold-coloured particles, but alſo unites with mercury by trituration, diſſolves in aqua regia, but not in marine acid alone, together with other circumſtances which evince a complete reſuſcitation of the gold. Martial vitrol, in its ordinary ſtate, contains phlogiſton, but very looſely adhering; ſo that the clax of gold may eaſily take it from the ſolution to ſupply the loſs it had ſuſtained during the ſolution. That this is the true foundation of the proceſs, appears alſo from the following circumſtances, that the weight of the gold is exactly recovered, and that dephlogiſticated vitriol will not precipitate this metal. The reaſon that the ſurrounding aqua regia leaves this precipitate untouched is, that the menſtruum is diluted and weakened by a large quantity of water; for upon boiling it gently, ſo as to expel part of the water, the menſtruum recovers its ſolvent power, and takes up the precipitate again.

225 Why ſolution of gold is precipitated by green vitriol;

226 But not by this ſalt when dephlogiſticated.

227 Why ſolution of gold is precipitated by ſolution of tin.

It is ſomewhat more difficult to explain the reaſon why the ſolution of gold in aqua regia ſhould be precipitated by a ſolution of tin in the ſame menſtruum. Here Mr Bergman firſt ſuppoſed that the the tin had attracted a ſuperabundance of acid, and taken it from the gold; which being therefore deſtitute of its proper quantity, muſt fall to the bottom: but on employing a ſolution containing a ſuperabundant aqua regia, the ſame precipitation took place. The cauſe is therefore not in the menſtruum. On examining the precipitate itſelf, we find nothing like the metallic ſplendor of gold, but that it entirely reſembles a calx. It is eaſily found by its weight, indeed, that it cannot conſiſt entirely of gold; and in fact chemical examination ſhows that it conſiſts partly of tin. It cannot be diſſolved by the marine acid alone, but is eaſily taken up by the addition of a little nitrous acid. It ſcarcely unites with mercury by trituration. Theſe properties ſeem to indicate, that the gold has ſo far received phlogiſton

228 This precipitate conſiſts partly of tin.

giſton as to reſiſt the marine acid until it receive the aſſiſtance of the nitrous; but its earthy appearance, and difficulty of uniting with mercury, evince that it is not in its complete metallic form. The following therefore, according to our author, ſeems to be the moſt eaſy and rational explanation. The ſolution of tin neceſſary for this operation muſt retain as much phlogiſton as it poſſibly can, in a conſiſtence with ſolubility. This is dropped into a ſolution of gold very much diluted; by which means the phlogiſton remaining in the tin is more looſened, and of conſequence more eaſily attracted by the gold calx, which is thereby brought to a ſtate approximating to completion, ſo that it can no longer be retained by the menſtruum; and the ſame happens to the tin, by means of the dephlogiſtication; they muſt both therefore fall to the bottom mixed intimately with one another. It is probable, ſays he, that in this caſe it is the tin which prevents the matter from uniting with mercury.

229 Precipitation of metals by one another, owing to a double elective attraction.

The metals precipitate one another after a certain order, which is the ſame in all acid menſtrua. This precipitation is occaſioned by a double elective attraction; for the metal to be precipitated exiſts in the ſolution in a calcined ſtate; but being reduced by the phlogiſton of the precipitant falls to the bottom, while at the ſame time the precipitant becomes ſoluble by calcination: but if the precipitant has been calcined ſo that a part of it being inſoluble is mixed with the precipitate, the metallic ſplendor is wanting, and it puts on an earthy appearance. A pure precipitate is of the ſame weight with the metal before ſolution. The mixed precipitates are leſs frequently met with, yet gold precipitated by tin exhibits one of that kind.

230 Variations in the order in which the metals precipitate one another.

Though the order in which the metals precipitate one another is conſtant and never inverted, yet there are many anomalous circumſtances which occur in the matter. Thus zinc conſtantly prevails over iron; iron over lead; lead over tin; tin over copper; copper over ſilver; ſilver over mercury, *&c.* yet it ſometimes happens, that a metal which, according to the general rule, precipitates another in its metallic ſtate from one menſtruum, precipitates it from another in form of a calx, and not at all from a third. Thus zinc precipitates iron from marine acid in its metallic ſtate, but from the nitrous only in form of a clax. Tin is precipated by lead from the marine acid in its metallic ſtate, but is not thrown down from the nitrous acid; and from the acetous is precipitated even by iron and zinc in form of a clax; ſolution of lead in vinegar is not precipitated by iron.

231 Mineral alkali why preferred as a precipitant by Mr Bergman.

232 How he prepared his cauſtic alkali.

233 Various precipitates of gold.

In Mr Bergman's experiments on this ſubject he employed the mineral alkali, as the degree of its ſaturation with fixed air was more conſtant. When he had occaſion for a cauſtic alkali, he prepared it by a ſmall quantity of burned lime kept in a cloſe bottle; and the goodneſs of it was proved by its occaſioning no precipitation in lime water. Phlogiſticated alkali, or that by which Pruſſian blue is prepared, was alſo made uſe of. With theſe he made the following obſervations. Gold diſſolved in aqua regia is precipitated by cauſtic alkali almoſt black; by the aerated, yellow, as well as by the phlogiſticated, unleſs ſome iron be preſent, which frequently happens; but the whole of the gold is ſcarce ever precipitated, ſo that the weight cannot be aſcertained.

234 Mineral alkalies precipitate platina imperfectly.

Neither the cauſtic nor aerated mineral alkali precipitate one half of platina diſſolved in aqua regia; the precipitate is of an orange colour, which on dying becomes brown. An over-proportion of alkali rediſſolves the precipitate, and the liquor becomes more dark; nay, the precipitation is ſo imperfect, that the matter ſeems to be diſſolved even by neutral ſalts. The phlogiſticated alkali does not precipitate the depurated ſolution, nor even make it turbid, but heightens the colour in the ſame manner as an exceſs of alkali.

235 Precipitates of ſilver.

Solution of ſilver in nitrous acid lets fall a white precipitate by the aerated alkali; brown by the cauſtic, and of an obſcure yellow. By the nitrous and marine acids it lets fall a white precipitate, which with the former conſiſts of more diſtinct particles, which grow black more ſlowly with the light of the ſun.

236 Of mercury.

Salited mercury lets fall a red precipitate, or rather one of a ferruginous colour, by aerated alkali; but of a more yellowiſh or orange colour by the cauſtic. Nitrated mercury prepared without heat, yields a ferruginous precipitate with mineral alkali; a black with cauſtic: and when prepared with heat, it yields to cauſtic alkali an orange or reddiſh yellow precipitate. By phlogiſticated alkali it is precipitated from all acids of a white colour; but turns of a browniſh yellow when dry. Salited mercury is very ſparingly precipitated by this alkali. The precipitate by phlogiſticated alkali is again diſſolved, if too much of the precipitant be made uſe of.—Corroſive ſublimate muſt be very cautiouſly precipitated by cauſtic, as well as aerated fixed alkali; for the part ſeparated may again be diſſolved by a large quantity of water. When too much alkali is uſed, a new compound ariſes of a peculiar nature.

237 Precipitates of lead.

Solution of lead in ſpirit of nitre is precipitated down white by aerated, cauſtic, or phlogiſticated alkali. By uſing too much alkali, the precipitate by the phlogiſticated kind is diſſolved with a browniſh yellow colour. Vitriol of lead and ſolution of lead in marine acid are precipitated white.

238 Of copper;

Blue ſolution of copper in ſpirit of nitre is precipitated of a bright green by aerated fixed alkali; by the cauſtic of a greyiſh brown, which grows reddiſh by age. By phlogiſticated alkali copper is precipitated of a greeniſh colour, which grows afterwards of a browniſh red, and upon exſiccation almoſt black. The aerial acid takes up a ſmall quantity of copper during the precipitation, which is again depoſited by the heat of boiling.

239 Of iron;

Aerated fixed alkali precipitates iron of a green colour from vitriolic and marine acid; but the precipitate becomes of a browniſh yellow, eſpecially on exſiccation; with the cauſtic alkali it approaches more to black. In the precipitation ſome part is held in ſolution by the aerial acid, when the mild alkali is uſed. With phlogiſticated alkali a Pruſſian blue is formed.

240 Of tin;

Tin is precipitated of a white colour by every alkaline ſalt, even by the phlogiſticated kind; but at length ſome blue particles appear in the mixture: ſo that the whole, when collected and dried, appears of a light blue colour. That theſe blue particles are occaſioned by iron appears by calcination; for they become

ferru-

ferruginous, and obey the magnet. Our author has always found a proportion of iron in tin.

241 Precipitates of biſmuth;

Biſmuth is thrown down of a fine white by water and alkalies, particularly the former; phlogiſticated alkali throws down a yellow powder, which being mixed with blue particles occaſioned by iron, at length appears green. This yellow ſediment eaſily diſſolves in nitrous acid.

242 Of nickel;

Nickel is precipitated of a whitiſh green by fixed alkalies; by the phlogiſticated alkali of a yellow; and by exſiccation it is condenſed into a dark brown maſs.

243 Of arſenic;

Arſenic diſſolved in acids, which prevent too great dephlogiſtication, may, to a certain degree, be precipitated white by the fixed alkali, even when phlogiſticated, but the ſediment is found ſoluble in water; yet nitrous acid, either alone, or joined with the marine, generally dephlogiſticates the arſenical acid, which thereby becomes unfit for ſeparation. Arſenic diſſolved in marine acid, with the aſſiſtance of a little nitrous acid, depoſited a white ſediment on the addition of a large quantity of phlogiſticated alkali. The ſediment was mixed with Pruſſian blue. This was diſſolved in water, and freed by frequent filtration from the blue particles; and at length, on evaporating to dryneſs, yielded a ſemipellucid maſs.

244 Of cobalt;

Cobalt diſſolved in acids is thrown down by fixed alkali, whether aerated or cauſtic, of a reddiſh blue, which grows darker on exſiccation, eſpecially when the former alkali has been uſed. Phlogiſticated alkali throws down a powder of almoſt the ſame colour, which, upon exſiccation, becomes of a reddiſh brown.

245 Of zinc;

Zinc is precipitated white by aerated and cauſtic fixed alkalies, as alſo by the phlogiſticated alkali; but this laſt becomes of a citron colour on exſiccation: a ſmall portion of aerial acid may eaſily eſcape during the precipitation.

246 Of antimony;

Antimony is precipitated white by alkalies. When the phlogiſticated alkali is uſed, ſome blue particles are almoſt always precipitated at the ſame time, though the regulus had been prepared without any iron. This operation ſhould be cautiouſly conducted, leſt ſome part be taken up by the alkaline ſalt.

247 Of manganeſe.

Manganeſe procured by reduction from common magneſia nigra, generally renders menſtrua brown, and with aerated alkali yields a yellowiſh brown ſediment; with the cauſtic, one ſtill darker; with the phlogiſticated, firſt a blue, then a white, powder is ſeparated, the mixture of which renders the maſs a black green. To obtain a pure and white calx of manganeſe, we muſt diſſolve in pure vinegar the precipitate thrown down by cauſtic alkali; for there ſtill remains a quantity of iron which is taken up by the aerial acid. This acetous ſolution contains little or nothing of iron. That metal may alſo at firſt be ſeparated by a ſmall quantity of volatile alkali.

The common ſolution of the regulus is not perfectly precipitated by the aerated alkali; and upon evaporating the remaining liquor ſpontaneouſly to dryneſs, grains of a metallic ſplendor, and not unlike copper, are depoſited on the glaſs. The nitrous acid attracts theſe readily, though they are only partially diſſolved by it; but on the addition of zinc, nothing falls beſides the manganeſe, though at firſt it is a little reddiſh. With phlogiſticated alkali, we obtain a yellow precipitate like pure manganeſe, provided the ſolution has depoſited the iron when too much dephlogiſticated by age. But the new ſolution yields a precipitate almoſt like that which is obtained from common regulus. The yellow ſediment may be diſſolved in water.

248 On the cauſe of ſuch great variations in the weight of precipitates.

The following is Mr Bergman's table of the quantities of precipitate of different metals, thrown down from various menſtrua by the different alkalies. "On comparing the weights (ſays he), a queſtion occurs concerning the cauſe of ſuch enormous differences; and it is plain, that this cauſe muſt be ſought for in the precipitates themſelves.—The fixed alkali ſaturated with aerial acid, when added to the ſolution, is taken up by the more powerful menſtruum; and the weaker is of courſe expelled, and is abſorbed by the calx as it falls, in greater or leſſer quantity according to circumſtances. That this is actually the caſe is eaſily demonſtrated:—Let a bottle containing a quantity of nitrous acid be accurately weighed. Let there be put into it, for inſtance, 132 parts of lead precipitated by aerated alkali; and not only an efferveſcence will be obſerved, which continues until the very laſt particle is diſſolved, but when the ſolution is finiſhed, a deficiency of weight is diſcovered, which amounts nearly to 21, and which is undoubtedly owing to the extrication of aerial acid. But 132—21=111; a weight which ſtill conſiderably exceeds that of the metal. Upon diſtillation nearly eight of water are diſcovered. There yet remain therefore three, which by violent heat are increaſed by ſeven; for 132 of the calx well calcined yield 110. The whole increment of weight then does not depend on the water and aerial acid. The ſame thing is evinced by conſidering the precipitate of lead by the cauſtic alkali; in which caſe there can be no aerial acid, nor does any efferveſcence accompany the ſolution. If we ſuppoſe the quantity of water equal in both caſes, yet even on this ſuppoſition the whole exceſs of weight is not accounted for; for 116—8=108. It is therefore probable, that the matter of heat is attached to the calx (A).—In proof of this opinion, and that cauſtic alkalies contain the matter of heat, our author adduces ſeveral arguments, of which the following is the ſtrongeſt.—"Let the heat occaſioned by the mixture of any acid and cauſtic alkali be determined by a thermometer; let then an equal portion of the ſame menſtruum be ſaturated with a metal; afterwards, on the addition of an equal quantity of cauſtic alkali, it will be found, either that no heat is generated, or a degree very much leſs than before.—Some of the matter of heat therefore is taken up and fixed, which alſo generally makes the colours of the precipitates more obſcure; and in diſtillation with ſal-ammoniac, communicates to the volatile alkali the quantity that had been taken away."

249 Argument in favour of the weight of precipitates being augmented by the matter of heat.

250 Inſufficient

In this inſtance alſo, however, our author ſeems to have been deceived. It has already been obſerved, that in all ſolutions generating heat, it moſt probably comes from the fluid. Acids contain a quantity ſufficient

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(A) This increaſe of weight is with more probability to be aſcribed to a remainder of the acid.

ficient not only for their own fluidity, but for rendering ſolid bodies fluid alſo. After they have diſſolved the metal, however, this ſuperfluous quantity is employed; and when the cauſtic alkali is added, if in a ſolid form, it is again employed in giving fluidity to the alkali; or if the alkali be already diſſolved, the increaſed quantity of fluid makes the heat extricated leſs perceptible.

251 A quantity of the menſtruum retained by ſome precipitates.

252 Difference in the precipitates of mercury.

"What has been ſaid of lead (continues our author), is alſo true of the other metals, a few excepted, which ſeem to take up little or no aerial acid; ſuch are tin, antimony, gold and platina.—But ſome precipitates retain alſo a quantity of the menſtruum. Thus, corroſive mercury, precipitated by aerated alkali, retains a portion of marine acid, which cannot be waſhed off by water; but, by cauſtic alkali, the precipitate may be obtained, either free of the acid altogether, or in a great meaſure. In this caſe, as in many others, the aerial acid ſeems to generate a triple ſalt, ſcarce at all ſoluble. The preſence of the marine acid is eaſily diſcovered by ſolution of ſilver in nitrous acid, if the menſtruum has been pure. Hence we obſerve another difference in mercury precipitated from marine acid, according as we employ the aerated or cauſtic alkali; the latter, well waſhed, and put into volatile alkali, is ſcarcely changed in colour; but the former inſtantly grows white, generating a ſpecies of ſal-alembroth, but containing ſo little marine acid as not to be eaſily ſoluble in water. The calces which retain any of their former menſtruum, generally give over on diſtillation a ſmall portion of ſublimate. The mercurial calx juſt mentioned, expoſed to a ſufficient degree of heat, is partly reduced to crude mercury, partly to mercurius dulcis, by means of its remaining marine acid. This mercurius dulcis did not exiſt in the precipitate; for in that caſe it would be eaſily diſcovered by acids in which it is not ſoluble, and would grow black with cauſtic alkali, neither of which take place, ſo that it muſt be generated during the diſtillation."

253 Advantages to be derived from the examination of metallic precipitates.

254 Platina is not compoſed partly of iron;

255 Nor regulus of nickel;

256 Cobalt or manganeſe

257 Quantity of precipitate obtained from manganeſe by phlogiſticated alkali.

Mr Bergman concludes his diſſertation, with an enumeration of the advantages reſulting from the careful examination of metallic precipitates.—Theſe are 1. That thus the theory of the operation will be more perfectly underſtood. 2. We may diſcover the more uſeful and remarkable properties. 3. A foundation is thereby laid for eſſaying in the moiſt way, from the bare knowledge of the weights. "It may be objected (ſays he), that the doctrine of the weights is very fallacious; that they vary in different precipitates; that by imperfect precipitation ſomething remains in the liquor; and that ſometimes extraneous matters remain in them. All this is true; but if the mode of operation be the ſame, the reſults of the experiments will be equally conſtant. Thus, let us ſuppoſe that a certain quantity of metal *a*, precipitated in a certain manner, makes a weight *b*; if that ſame manner be exactly employed, we may fairly conclude, that a quantity of precipitate *nb*, occurring in any caſe, is correſpondent to a quantity of perfect metal *na*; though, in the fundamental experiment, the precipitation is either incomplete, or ſome extraneous matter may be preſent. 4. The nature of metals is thus illuſtrated. Platina, nickel, cobalt, and manganeſe, are ſuppoſed by ſome to derive their origin from a mixture of other metals. But if iron neceſſarily enters into the compoſition of platina, when the latter is diſſolved in aqua regia, it ought to yield a Pruſſian blue on the addition of phlogiſticated alkali; which indeed is the caſe when common platina is employed, but not with that which is well depurated. In like manner, if iron, adhering very obſtinately to nickel, formed a great part of the latter, the precipitates obtained from it by alkalies could not differ from martial precipitates ſo much as they do in colour, weight, and other properties. The ſame holds true of cobalt and manganeſe. The regulus obtained from the latter contains about 0.08 of iron, which affects the mixture in the following manner. An hundred pounds diſſolved in an acid menſtruum, yields, by treatment with phlogiſticated alkali, a powder conſiſting partly of blue, partly of browniſh yellow particles, equal in weight to 150 pounds; but eight pounds of iron yield 48 of Pruſſian blue, nearly ⅓ of the whole maſs of precipitate: whence it follows, that 100 parts of pure manganeſe yield to phlogiſticated alkali ſcarcely 111; *i. e.* nearly ſix times leſs than an equal weight of iron.

258 Metals contain different quantities of phlogiſton.

"Laſtly, by this method of examining precipitates, it may perhaps be poſſible to determine the unequal quantities of phlogiſton in different metals; for a given weight of precipitating metal does not yield an equal quantity of precipitate: thus, for inſtance, copper is able to precipitate from nitrous acid four times its weight of ſilver."

259 Table of different precipitates.

100 parts of	Precipitated by	Yielded dry precip.
Gold,	aerated mineral alkali	106
———	cauſtic	110
———	phlogiſticated	—
———	martial vitriol	100
Platina,	aerated mineral alkali	34
———	cauſtic	36
———	phlogiſticated	—
Silver,	aerated mineral alkali	129
———	cauſtic	112
———	phlogiſticated	145
———	ſalited	133
———	vitriolated	134
Mercury,	aerated mineral alkali	110
———	cauſtic	104
———	phlogiſticated	—
———	vitriolated	119
Lead,	aerated mineral alkali	132
———	cauſtic	116
———	phlogiſticated	—
———	vitriolated.	143
Copper,	aerated mineral alkali	194
———	cauſtic	158
———	phlogiſticated	530
Iron,	aerated mineral alkali	225
———	cauſtic	170
———	phlogiſticated	590
Tin,	aerated mineral alkali	131
———	cauſtic	130
———	phlogiſticated	250
Biſmuth,	aerated mineral alkali	130
———	cauſtic	125
———	phlogiſticated	180
———	pure water	113
Nickel,	aerated mineral alkali	135
———	cauſtic	128
———	phlogiſticated	250
Arſenic,	aerated mineral alkali	—

Arſenic,

100 parts of	Precipitated by	Yielded dry precip.
Arſenic,	cauſtic	—
	phlogiſticated	180
Cobalt,	aerated mineral alkali	160
	cauſtic	140
	phlogiſticated	142
Zinc,	aerated mineral alkali	193
	cauſtic	161
	phlogiſticated	495
Antimony	aerated mineral alkali	140
	cauſtic	138
	phlogiſticated	138
Mang.	aerated mineral alkali	180
	cauſtic	168
	phlogiſticated	150

260
Kirwan's definition of chemical attraction.

Mr Kirwan has made a great number of experiments on the attractive powers of the mineral acids to various ſubſtances, and greatly illuſtrated the operations of both ſolution and precipitation. Chemical attraction, he obſerves, "is that power by which the inviſible particles of different bodies intermix and unite with each other ſo intimately, as to be inſeparable by mere mechanical means." Thus it differs from the attraction of coheſion, as well as from that of magnetiſm and electricity, as not acting with the indifference obſerved to take place in theſe powers, but cauſing a body already united to another to quit that and unite with a third; whence it is called *elective* attraction. Hence attraction of coheſion often takes place betwixt bodies that have no chemical attraction for each other; as for inſtance, biſmuth and regulus of cobalt, which cannot be made to unite together by fuſion, though they cohere with each other ſo ſtrongly, that they cannot be ſeparated but by the blow of a hammer.

261
Difference betwixt chemical attraction and that of coheſion.

262
Geoffroy's rule for determining the degree of chemical attraction.

To determine the degrees of attraction betwixt different ſubſtances, M. Geoffroy laid it down as a general rule, that when two ſubſtances are united, and either quits the other to unite with a third, that which thus unites to the third muſt be ſaid to have a greater affinity to it than to the ſubſtance it has quitted. In many caſes, however, the ſeemingly ſingle decompoſition is in truth a double one. Thus, when the vitriolic acid expels the air from a fixed alkali, it does not neceſſarily follow, that the acid is more attracted by the alkali than the fixed air; for here though the latter reſigns its place to the acid, yet the acid gives out its fire to the air; whence a decompoſition might take place, even though the attractive powers of both the vitriolic and aerial acid to the alkali were equal.

263
Chemical decompoſitions, tho' ſeemingly ſingle are often double.

264
Force of the attractive powers to be determined by numbers.

To attain to any certainty in this matter, therefore, it is neceſſary to determine the quantity and force of each of the attractive powers, and denote it by numbers. The neceſſity of this has been obſerved by Mr Morveau and Mr Wenzel, who have both propoſed methods for anſwering the purpoſe; but Mr Kirwan has ſhowed that both are defective: and he tells us, that the diſcovery of the quantity of real acid in each of the mineral acid liquors, with the proportion of real acid taken up by a given quantity of each baſis at the point of ſaturation, led him unexpectedly to what ſeems the true method of inveſtigating the quantity of attraction which each acid bears to the ſeveral baſes to which it is capable of uniting: "for it was impoſſible (ſays he) not to perceive, 1. That the quantity of real acid neceſſary to ſaturate a given weight of each baſis is inverſely as the affinity of each baſis to ſuch acid. 2. That the quantity of each baſis requiſite to ſaturate a given quantity of each acid is directly as the affinity of ſuch acid to each baſis. Thus 100 grains of each of the acids require for their ſaturation a greater quantity of fixed alkali than of calcareous earths, more of this earth than of volatile alkali, more of this alkali than of magneſia, and more of magneſia than of earth of alum.

265
True method of inveſtigating the quantity of attraction each of the acids has for its different baſes.

"If an acid be united to leſs of any baſis than is requiſite for its ſaturation, its affinity to the deficient part of its baſis is as the ratio which that deficient part bears to the whole of what the acid can ſaturate. Thus, if 100 grains of vitriolic acid, which can ſaturate 110 of calcareous earth, be united only to 55, its affinity to the deficient 55 parts ſhould be eſtimated one half of its whole affinity; but its affinity to the retained part is as its whole affinity."

266
Method of explaining the decompoſitions effected by acids alone.

To explain the decompoſitions in which theſe acids are concerned, we muſt conſider, firſt, the powers which reſiſt any decompoſition, and tend to keep the bodies in their preſent ſtate; and, ſecondly, the powers which tend to effect a decompoſition and new union; the former our author calls *quieſcent affinities*, the latter *divellent*. A decompoſition will therefore always take place when the ſum of the divellent affinities is greater than the quieſcent; and, on the contrary, no decompoſition will happen when the ſum of the quieſcent affinities is greater than that of the divellent. All we have to do therefore is to compare the ſums of each of theſe powers. The method our author takes to compare the affinities together is by the following table; in which the quantity of alkali, earth, &c. ſaturated by 100 grains of each of the mineral acids, is ſtated.

267
Quieſcent and divellent affinities.

268
Quantity of acid taken up by various baſes.

	Veg. fixed alkali.	Mineral alkali.	Calcar. earth.	Vol. alk.	Magneſia.	Earth of alum.
Vitriolic acid	215	165	110	90	80	75
Nitrous acid	215	165	96	87	75	65
Marine acid	215	158	89	79	71	55

Theſe numbers he conſiders as adequate expreſſions of the quanity of each of the affinities. Thus the affinity of the vitriolic acid to fixed vegetable alkali is to the affinity with which it adheres to calcareous earth as 215 to 110; and to that which the nitrous acid bears to calcareous earth as 215 to 96, &c. Hence we ſum up the powers of affinity betwixt any number of different ſubſtances, and account for their decompoſitions, as in the following example of the double decompoſition, which takes place when a ſolution of vitriolated tartar and ſolution of lime or chalk in nitrous acid are mixed together.

269
Expreſſive of the quantity of attraction they have for each of theſe baſes.

270
Decompoſition of vitriolated tartar by ſolution of calcareous earth explained.

Quieſcent Affinities.		*Divellent Affinities.*	
Vitriolic acid to vegetable fixed alkali,	215	Vitriolic acid to calcareous earth,	110
Nitrous acid to calcareous earth,	96	Nitrous acid to vegetable alkali,	215
Sum of quieſcent affinities	311	Sum of divellent affinities	325

Hence we ſee that a double decompoſition muſt enſue. The ſame will be produced, if inſtead of vitriolated tartar we make uſe of Glauber's ſalt; for the ſum of the

the quieſcent affinities is 261, of the divellent 275; with vitriolic ammoniac the ſum of the quieſcent is 186, of the divellent 195, &c. In mixing vitriolated tartar with ſolution of magneſia in nitrous or marine acids, a double decompoſition takes place though inviſibly, as the vitriolic Epſom ſalt is very ſoluble in water, and therefore cannot be precipitated like ſelenite. In the former caſe the ſum of the quieſcent powers is 290, of the divellent 295; in the ſecond 286 and 295.

271 Coincidence of the above table with experience.

Other decompoſitions take place in the ſame manner; and from all the facts which our author had occaſion to obſerve, he concludes, that the quantity of each affinity, as determined in the above table, coincides exactly with experience; and that theſe decompoſitions are perfectly conſiſtent with the ſuperior affinity which has been hitherto obſerved in the vitriolic and nitrous acids with fixed alkalies over the calcareous earths; nor do they infringe in the leaſt the known laws of affinity, as has been inſinuated by ſome chemiſts.

272 Miſtake of Dr Crell corrected.

One fact only, mentioned in Dr Crell's Journal, ſeems to be repugnant to what is here advanced; and that is, that if ſolutions of one part of alum and two of common ſalt be mixed together, evaporated, and ſet to cryſtallize, a Glauber's ſalt will be formed; though, in this caſe, the ſum of the quieſcent affinities is 233, and that of the divellent only 223. Mr Kirwan repeated this experiment without ſucceſs; and Dr Crell himſelf owns that it will not ſucceed but in the moſt intenſe cold. If it does ſucceed at all, he ſays the decompoſition muſt ariſe from a large exceſs of acid in the alum, which acted upon and decompoſed the common ſalt: and this explanation is confirmed by the ſmall proportion of Glauber's ſalt ſaid to be obtained by this proceſs; for from 30lb. of common ſalt and 16 of alum, only 15lb. of Glauber's ſalt were produced; whereas, if the whole of the alum had been decompoſed, there ſhould have been formed, according to Mr Kirwan's computation of the quantity of acid in the different ſalts, 29½lb, or, according to Mr Bergman's, 22lb. of Glauber's ſalt.

273 Formation of triple and quadruple ſalts.

In ſome caſes, the neutral ſalts have a power of uniting, without any decompoſition, or with only a very ſmall one, to a third ſubſtance; thus forming triple ſalts, and ſometimes quadruple; which often cauſes anomalies that have not yet been ſufficiently inveſtigated. Volatile alkalies in particular are poſſeſſed of the power of uniting with neutral ſalts in this manner. Hence they ſeem to precipitate magneſia from Epſom ſalt, even when perfectly cauſtic; but this is owing to their combination with that ſalt, and forming a triple one, which is inſoluble in water.

274 Volatile alkalies particularly form ſalts of this kind.

275 Vitriolic ſalts decompoſed by the nitrous and marine acids.

It ſeems extraordinary that, according to Mr Kirwan's table, the three mineral acids ſhould have the ſame affinity to vegetable fixed alkalies, when it is well known that the vitriolic will expel either of the other two from an alkaline baſis. In explication of this, Mr Kirwan obſerves, that nitre is decompoſed by the marine acid; and that Glauber's ſalt and vitriolic ammoniac are decompoſed by that of nitre; and that theſe ſalts, as well as cubic nitre and nitrous ammoniac, are decompoſed by the marine acid.

276 Theſe decompoſitions ſuppoſed to ariſe from compound forces.

Mr Kirwan is of opinion, that theſe decompoſitions are the effect of a double affinity, or at leaſt of compound forces. He ſuſpected that they aroſe from the different capacities of the acids for elementary fire; and to determine this matter, he made the following experiments, in which the decompoſitions were not diſcovered by cryſtallization, but by teſts.

277 Experiments to determine this by the various degrees of heat excited by mixtures.

1. Having procured a quantity of each of the three mineral acids containing the ſame proportion of real acid, and reduced them to the temperature of 68° of Fahrenheit, 100 grains of vitriolic acid, containing 26.6 of real acid, was projected upon 480 grains of oil of tartar at the ſame temperature, by which the thermometer was raiſed to 138°.

2. An hundred grains of ſpirit of nitre, containing alſo 26.6, projected on 480 grains of oil of tartar, produced only 120° of heat.

3. An hundred grains of ſpirit of ſalt, the ſpecific gravity of which was 1220, and which contained the uſual proportion of real acid, raiſed the thermometer from 69 to 129.

278 Vitriolic acid contains more fire than the nitrous and marine.

"Hence (ſays he) it follows, that the vitriolic acid contains more ſpecific fire, or at leaſt gives out more by uniting with fixed alkalies, than either the nitrous or marine; and therefore when the vitriolic acid comes in contact with either nitre or ſalt of Sylvius, its fire paſſes into theſe acids, which are thereby rarefied to a great degree, and are thus expelled from their alkaline baſis, which is then ſeized on by the vitriolic."—On this, however, it is obvious to remark, that, according to Mr Kirwan's explanation, the marine acid, as giving out more ſpecific heat, ought to expel the nitrous from an alkaline baſis; which, however, is not the caſe. Something elſe, therefore, beſides the mere quantity of ſpecific heat, muſt here be taken into conſideration. Mr Kirwan, however, goes on to prove the truth of his theory by the following experiments.

279 Difficulty in the theory.

280 On the expulſion of the nitrous acid by the vitriolic diluted.

4. To 400 grains of vitriolic acid, whoſe ſpecific gravity was 1.362, ſixty grains of nitre were added; on which the thermometer fell from 68° to 60°. During the time of this deſcent, the nitrous acid was not expelled; for ſome filings of copper, put into the mixture, were not acted upon in the leaſt; but in five minutes afterwards they viſibly effervesced, which ſhowed that the nitrous acid began to be expelled; for the vitriolic acid does not act upon copper but by a boiling heat.

281 By the ſame acid concentrated.

5. Sixty grains of nitre were put to 400 of oil of vitriol, whoſe ſpecific gravity was 1.870; the thermometer inſtantly roſe from 68° to 105°, and the nitrous acid was expelled in a viſible fume.—"Theſe experiments (ſays Mr Kirwan) prove, 1. That neutral ſalts are not decompoſed by mere ſolution in an acid different from their own. 2. That the nitrous acid, being converted into vapour, had imbibed a large quantity of fire. But as the vitriolic acid, in both theſe experiments, was uſed in much larger quantity than was neceſſary to ſaturate the alkali of the nitre, ſixty grains of the latter were put into 64 of the abovementioned dilute ſpirit of vitriol, which contained the ſame quantity of real vitriolic acid that the 60 grains of nitre did of the nitrous; with the addition of 40 grains of water and a few copper-filings. In leſs than two hours the copper was acted upon, and conſequently the nitrous acid was expelled.

282 With a ſmall quantity of diluted vitriolic acid.

283 On the expulſion of marine acid by the concentrated vitriolic.

6. To 400 grains of oil of vitriol, of the ſpecific gravity of 1.870, 100 grains of common ſalt were added. An effervescence immediately enſued, and

and the marine acid roſe in white vapours. A thermometer held in the liquor roſe only 4 degrees, but in the froth it aſcended to 10°, and fell again upon being replaced in the liquor. Hence Mr Kirwan concludes, that the vitriolic acid gives out its fire to the marine; and that this latter received more than it could abſorb even in the ſtate of vapour, and therefore communicated heat to the contiguous liquor. It appears to him alſo, that the nitrous and marine acids receive fire from the vitriolic, and are thrown into a vaporous ſtate, or at leaſt rarefied to ſuch a degree as to be expelled from their alkaline baſis, though their affinity with that baſis may be equally ſtrong with the vitriolic.

284 Both the nitrous and marine acids receive fire from the vitriolic during their expulſion.

285 On the decompoſition of vitriolated tartar by nitrous acid.

7. To aſcertain the manner in which vitriolated tartar and Glauber's ſalt are decompoſed by ſpirit of nitre, 60 grains of powdered tartar of vitriol were put into 400 of nitrous acid, whoſe ſpecific gravity was 1.355, and which contained about 105 grains of real acid. The thermometer was not affected by the mixture; but in 24 hours the vitriolic acid was in part diſengaged, as appeared by the acid mixture acting upon regulus of antimony, which neither pure vitriolic nor pure nitrous acid will do by themſelves. On putting the ſame quantity of vitriolated tartar into 400 grains of ſpirit of nitre whoſe ſpecific gravity was 1.478°, the thermometer roſe from 67° to 79°: the vitriolated tartar was quickly diſſolved, and the regulus of antimony ſhowed that the vitriolic acid, was diſengaged. Hence it appeared that the nitrous acid, having the ſame affinity with the baſis of vitriolated tartar as the vitriolic, but giving out, during the ſolution, more fire than was neceſſary to perform the ſolution, the vitriolic, receiving this fire, was diſengaged: for as it cannot unite to alkalies without giving out fire; ſo when it receives back that fire, it muſt quit them. The reaſon why the nitrous acid, which ſpecifically contains leſs fire than the vitriolic, gives out ſo much is, that its quantity in both theſe experiments is far greater than that of the vitriolic; it being in the firſt as 105 to 17, and in the laſt as 158 to 17.

286 Acids unite to alkalies by giving out fire, and quit them by receiving it.

287 Vitriolated tartar cannot be decompoſed by diluted nitrous acid.

8. To 60 grains of ſpirit of nitre, whoſe ſpecific gravity was 1.355, Mr Kirwan added 1000 grains of water; and into this dilute acid put 60 grains of vitriolated tartar, containing exactly the ſame quantity of real acid that the 60 grains of nitrous acid did. In eight days the vitriolated tartar was almoſt entirely diſſolved, and without any ſign of its decompoſition; and no nitre was found upon evaporating the liquor. Hence he concludes, that the nitrous acid can never decompoſe vitriolated tartar, without the aſſiſtance of heat, but when its quantity is ſo great that it contains conſiderably more fire, and by the act of ſolution is determined to give out this fire. This ſalt is alſo decompoſed, in ſimilar circumſtances, by the marine acid; though ſtill more ſlowly and with more difficulty than by the nitrous, as appears by the following experiments.

288 Decompoſition of vitriolated tartar by marine acid.

9. Into 400 grains of ſpirit of ſalt, whoſe ſpecific gravity was 1.220, were put 60 grains of vitriolated tartar. The thermometer was not affected in the leaſt, and the ſalt diſſolved very ſlowly. Some pulverized biſmuth was added to try whether the vitriolic acid was diſengaged; and in 12 hours part of it was diſſolved, ſo that it could not be precipitated by water. This ſhowed, that part of the vitriolic acid was diſlodged; for this ſemi-metal cannot be kept in ſolution when much diluted with water, excepting by a mixture of marine and vitriolic acids.

289 Requiſites for the ſucceſs of this experiment.

In this experiment the quantity of marine acid was much greater than that of the vitriolic; and therefore it was capable of diſlodging it. This circumſtance alone, however, is not ſufficient; the acid muſt be diſpoſed to give out by ſolution that quantity of fire which it is neceſſary the vitriolic ſhould receive in order to its quitting the baſis to which it is united; and therefore when Mr Cornette added two ounces of ſpirit of ſalt to half an ounce of vitriolated tartar already diſſolved, in water, no decompoſition took place. The reaſon of this was, that as the vitriolated tartar was already diſſolved, no cold nor heat was generated by the mixture; and therefore the ſpirit of ſalt could not give out any fire. Glauber's ſalt is more eaſily decompoſed by marine acid then vitriolated tartar, on account of its being more eaſily ſoluble in ſpirit of ſalt; and likewiſe becauſe its alkaline baſis takes up an equal quantity of both acids: conſequently the marine gives out more fire in uniting to the baſis of Glauber's ſalt than on being united to that of vitriolated tartar. Vitriolic ammoniac is alſo decompoſed by means of marine acid; but in all theſe caſes, the quantity of marine acid muſt greatly exceed that of the vitriolic contained in the ſalt to be decompoſed; and it muſt be remarked, that according to the obſervations of Mr Bergman, the decompoſition of Glauber's ſalt or vitriolic ammoniac by this acid is never complete.

290 Vitriolated tartar diſſolved in water cannot be decompoſed by marine acid, and why.

291 Decompoſition of vitriolic ammoniac and Glauber's ſalt by marine acid never complete.

On the ſame principles the marine acid decompoſes ſalts which have the nitrous acid for their baſis. Mr Cornette found, that cubic nitre was more eaſily decompoſed by it than that which has vegetable alkali for its baſis. Accordingly, during the ſolution of priſmatic nitre, only three degrees of cold were produced; but ſix by the ſolution of cubic nitre; which ſhows that the ſpirit of ſalt gave out more fire in the latter caſe than in the former; and its quantity muſt always be greater than that of the nitrous acid contained in the mineral alkaline baſis; becauſe this baſis requires for its ſaturation more of the marine than of the nitrous acid. The nitrous acid, however, in its turn decompoſes ſalt of Sylvius and common ſalt; but it muſt always be in greater quantity than the marine to produce that effect.

292 Nitrous ſalts decompoſed by marine acid.

293 Marine ſalts decompoſed by the nitrous acid.

10. Sixty grains of common ſalt being added to 400 of colourleſs ſpirit of nitre, whoſe ſpecific gravity was 1.478, the mixture quickly efferveſced and grew red, yet the thermometer roſe but two degrees; which ſhowed that the marine acid had abſorbed the greater part of the firſt given out by that of nitre; the decompoſition was likewiſe haſtened by the ſuperior affinity of the nitrous acid to the alkaline baſis of the ſea-ſalt: hence the decompoſition of ſea-ſalt by means of nitre takes place without any ſolution; but ſpirit of ſalt will not decompoſe cubic nitre until it has firſt diſſolved it. This mutual expulſion of the nitrous and marine acids by each other, is the reaſon why aqua-regia may be made by adding nitre or nitrous ammoniac to ſpirit of ſalt, as well as by adding common ſalt or ſal ammoniac to ſpirit of nitre.

Selenite cannot be decompoſed either by nitrous or

294 Selenites cannot be decompoſed by marine acid.

295 Why the vitriolic acid aſſumes on evaporation the baſes it had loſt.

marine acid ; becauſe it cannot be diſſolved in either without the aſſiſtance of foreign heat. It muſt likewiſe be obſerved, that in all decompoſitions of this kind, when the liquor has been evaporated to a certain degree, the vitriolic acid expels in its turn the nitrous or marine acid to which it had already yielded its baſis. The reaſon of this is, that the free part of the weaker acids being evaporated, the neutral ſalts begin to cryſtallize, and then giving out heat, the vitriolic abſorbs it ; and thus reacting upon them expels them from the alkali or earth to which they are united.

296 Difficulties in determining the attractive powers of the acids to metals.

Mr Kirwan found much more difficulty in determining the attractive powers of the different acids to the metals than to alkaline ſalts or earths. Some of the difficulties met with in this caſe aroſe from the nature of metallic ſubſtances themſelves. Their calces when formed by fire always contain a quantity of air, which cannot be extracted from them without great difficulty, and is very ſoon re-abſorbed ; and if formed by ſolution, they as conſtantly retain a part of their ſolvent or precipitant ; ſo that the preciſe weight of the metalline part can ſcarce be diſcovered. Our author, therefore, and becauſe metallic calces are generally inſoluble in acids, choſe to have the metals in their perfect ſtate : and even here they muſt loſe a part of their phlogiſton before they can be diſſolved in acids, and a conſiderable part remains in the ſolution of the acid and calx ; which laſt quantity he endeavoured to determine.

297 Metallic ſalts inſoluble in water without an exceſs of acids.

A new difficulty now occurred, ariſing from the impoſſibility of finding the real quantity of acid neceſſary to ſaturate the metal, for all metallic ſolutions contain an exceſs of acid : the reaſon of which is, that the ſalts formed by a due proportion of acid and calx are inſoluble in water without a further quantity of acid ; and in ſome caſes this quantity, and even its proportion to the aqueous part of the liquor, muſt be very conſiderable, as in ſolutions of biſmuth. It was in vain attempted to deprive thoſe ſolutions of their exceſs of acid by means of cauſtic alkalies and lime-water ; for when deprived of only part of it, many of the metals were precipitated, and all of them would be ſo if deprived of the whole. As the ſolution of ſilver, however, can be very much ſaturated, Mr Kirwan began with it and found that 657 grains of this ſolution contained 100 grains of ſilver, and 31.38 grains of real acid, after making the proper allowance for the quantity diſſipated in nitrous air. Nine grains of this ſolution tinged an equal quantity of ſolution of litmus as red as $\frac{8}{10}$ of a grain of real acid of ſpirit of nitre would have done; whence our author concluded that 9 grains of his ſolution of ſilver contained an exceſs of $\frac{8}{10}$ of a grain of real ſilver : according to which calculation, the whole quantity ought to have contained 5.6 grains ; which deducted from 31.38, leaves 25.78 grains for the quantity of acid ſaturated by 100 grains of ſilver.

As the vitriolic ſolutions of tin, biſmuth, regulus of antimony, nickel, and regulus of arſenic, contain a large exceſs of acid, Mr Kirwan ſaturated part of it with cauſtic volatile alkali before he tried them with the infuſion of litmus ; and the ſame method was uſed with ſolutions of iron, lead, tin, and regulus of antimony in the nitrous and marine acids. The proportion of vitriolic and marine acid taken up by lead, ſilver, and mercury, were determined by computing the quantity of real acid neceſſary to precipitate theſe metals from their ſolutions in the nitrous acid ; which ſeemed to be the moſt exact method of determining this point. The reſult of all the experiments was, that 100 grains of each of theſe acids take up at the point of ſaturation of each metallic ſubſtance, dephlogiſticated ſuch a degree as is neceſſary for its ſolution in each acid, the quantities marked in the following table.

298 Quantities of the different metals taken up by acid:

100 grains of	Iron.	Copper.	Tin.	Lead.	Silver.	Merc.	Zinc.	Biſmuth.	Nickel.	Cobalt.	Reg. of ant.	Reg. of arſen.
Vitriolic acid	270	260	138	412	390	432	318	250 310	320	360	200	260
Nitrous acid	255	255	120	365	375	416	304	290	300	350	194	220
Marine acid	265	265	130	400	420	438	312	250 320	275 310	370	198	290

299 Metals have a greater affinity with acids than alkalies.

300 Why alkalies precipitate the metals.

Though from this table, compared with the former, we might ſuppoſe that metals, having a greater attraction for acids than alkalies, could not be precipitated by them, yet Mr Kirwan obſerves, that the common tables, which poſtpone metallic ſubſtances to alkaline ſalts, are in reality juſt, though there can ſcarce be any room to doubt that almoſt all metallic ſubſtances have a greater affinity with acids than alkalies have. The common tables, he ſays, are tables of precipitation rather than of affinity, as far as they relate to metallic ſubſtances. Theſe precipitations, however, are conſtantly the reſult of a double affinity and decompoſition ; the precipitating metal yielding its phlogiſton to the precipitated one, while the precipitated metal yields its acid to the other. Thus, though copper in its metallic form precipitates ſilver and mercury from the nitrous acid, yet the calx will precipitate neither.

301 Nitrous acid attracts ſilver more than fixed alkali.

The ſuperior attraction the nitrous acid has to ſilver rather than fixed alkali, appears from the following experiment. If a ſolution of ſilver in nitrous acid be poured into a mixed ſolution of alkali and ſea-ſalt, the ſilver will be precipitated by the ſea-ſalt into a luna cornea, and not by the looſe alkali contained in the liquor. “ Now (ſays Mr Kirwan), if the nitrous acid had a greater affinity to the free alkali than to the ſilver, it is evident that the ſilver would be precipitated pure, and not in the ſtate of luna cornea ; but from its being precipitated in this ſtate, it is plain, that the precipitation was not accompliſhed by a ſingle but by a double affinity. Hence alſo the marine acid appears to have a greater attraction to ſilver than the nitrous has to fixed alkalies.’ The reſult is ſimilar when we make uſe of ſolutions of lead or mercury in the nitrous acid. Mr Bayen has alſo ſhown, that vitriol of lead and corroſive ſublimate mercury cannot be deprived of more than half their acid, even by cauſtic fixed alkalies.

With

302
Sea-ſalt decompoſed in various ways by means of lead.

With regard to lead, if perfectly dry ſalt be projected on this metal heated to ignition, the common ſalt will be decompoſed, and plumbum corneum formed. Nor can we attribute this to the volatilization of the alkali by heat; for the alkali is as fixed as the lead, and muſt therefore be cauſed by the ſuperior attraction which the calx of this metal, even when dephlogiſticated, has for the marine acid. Mr Scheele informs us, that if a ſolution of common ſalt be digeſted with litharge, the common ſalt will be decompoſed, and a cauſtic alkali produced. It may alſo be decompoſed ſimply by letting its ſolution paſs ſlowly through a funnel filled with litharge; and the ſame thing happens to a ſolution of calcareous earth in marine acid; which ſhows that the decompoſition takes place merely by the ſuperior degree of attraction betwixt the acid and metallic calx (A).

303
Acids attract metallic earth more ſtrongly than volatile alkali.

304
Why the metallic earths ſeldom decompoſe ſalts having an earth or alkali for their baſis.

305
Decompoſition of vitriolated tartar by ſolution of ſilver explained;

That acids have a greater attraction for metallic earths than volatile alkalies, is ſtill more evident. Luna cornea is ſoluble in volatile alkalies; but if this ſolution be triturated with four times its weight of quickſilver, a *mercurius dulcis*, and not ſal ammoniac, is formed. The reaſon why alkalies and earths precipitate all metallic ſolutions is, that the metals are held in ſolution by an exceſs of acid. Even if the alkaline and earthy ſubſtance did no more than abſorb this exceſs of acid, a precipitation muſt neceſſarily enſue; but they not only take up this ſuperabundant acid, but alſo the greater part of that which is neceſſary to ſaturate the metallic earth. This they are enabled to do by means of a double affinity; for during the ſolution of metals, only a ſmall part of the phlogiſton, comparatively ſpeaking, eſcapes, the remainder being retained by the compound of acid and calx. When therefore an alkali or earth is added to ſuch a ſolution, the phlogiſton quits the acid, and joins with the calx, while the greater part of the acid reunites to the precipitate. Notwithſtanding this great affinity, however, of metallic earths to acids, there are but few inſtances of their decompoſing thoſe ſalts which have an alkali, or an earth for their baſis, by reaſon of the inability of the acids, while combined with theſe baſes, and thereby deprived of a great part of their ſpecific fire, to volatilize the phlogiſton combined with the metallic earths, which muſt neceſſarily be expelled before an acid can combine with them: and as to the metallic calces, they are generally combined with fixed air, which muſt alſo be partly expelled; but ammoniacal ſalts (containing much more fire, for they abſorb it during their formation) for that reaſon act much more powerfully on metals. Allowing then the affinities of the mineral acids with metallic ſubſtances to be as above, all double decompoſitions, in which only ſalts containing theſe acids united to alkaline, terrene, or metallic baſes, are concerned, admit of an eaſy explanation; nay, ſays Mr Kirwan, I am bold to ſay, they cannot otherwiſe be explained. Thus, if a ſolution of tartar vitriolate, and of ſilver in the nitrous acid, be mixed in proper proportion, nitre and vitriol of ſilver will be formed; and this latter for the moſt part precipitated.

Quieſcent Affinities		*Divellent Affinities.*	
Nitrous acid to ſilver,	375	Nitrous acid to vegetable alkali,	215
Vitriolic acid to vegetable alkali,	215	Vitriolic acid to ſilver,	390
	590		605

306
And of Glauber's ſalt, vitriolic ammoniac, &c.

Thus alſo, if, inſtead of a ſolution of tartar vitriolate, that of Glauber's ſalt, or of vitriolic ſal ammoniac, ſelenite, Epſom ſalt, or alum, be uſed, the balance is conſtantly in favour of the divellent powers; and a precipitation is the conſequence, though but ſlight when ſelenite or alum are uſed.

307
In what caſes ſolution of ſilver is precipitated by other metals.

Solution of ſilver is alſo precipitated by the vitriolic ſolutions of iron, copper, tin, and probably by many other ſolutions of metals in the vitriolic acid: for this reaſon, among others undoubtedly, that they contain an exceſs of acid: but if a ſaturated ſolution of ſilver be mixed with a very ſaturated ſolution of lead or mercury in the vitriolic acid, the ſilver will not be precipitated; and in both caſes the balance is in favour of the quieſcent affinities.

308
Conſtantly decompoſed by marine ſalts;

309
As alſo ſolution of lead.

All the marine neutral ſalts, whether the baſis be alkaline, terrene, or metallic, decompoſe the nitrous ſolution of ſilver; and theſe decompoſitions are conſtantly indicated by the balance of affinities already deſcribed. The ſame thing alſo takes place with ſolution of ſilver in the vitriolic acid, as is indicated alſo by the ſame table. The nitrous ſolution of lead is alſo decompoſed, and the metal for the moſt part precipitated, unleſs the ſolution be very dilute in the form of vitriol of lead, by all the neutral ſalts containing either the vitriolic or marine acid, excepting only the combination of ſilver with marine acid, which precipitates it in no other way than by its exceſs of acid.

310
Solution of lead in marine acid decompoſed by vitriolic ſalts;

Solution of lead in marine acid is decompoſed by all the neutral ſalts containing the vitriolic acid, excepting only ſelenite and ſolution of nickel in oil of vitriol. Theſe can only precipitate it by virtue of an exceſs of acid.

311
Alſo nitrous ſolution of mercury;

Nitrous ſolution of mercury is decompoſed by all the neutral ſalts containing the vitriolic acid, except vitriol of lead, which only decompoſes it by an exceſs of acid.

312
And by the ſalts containing marine acid.

All the ſalts containing marine acid decompoſe the nitrous ſolution of mercury, excepting the combinations of marine acid with ſilver and lead, which decompoſe it by exceſs of acid.

313
Vitriol of mercury decompoſed by marine acid.

314
Why luna cornea cannot be reduced without loſs by alkaline ſalts.

Theſe ſalts alſo decompoſe vitriol of mercury, tho' a precipitation does not always appear, owing, as Mr Kirwan ſuppoſes, to the facility with which a ſmall quantity of the marine ſalt of mercury is ſoluble in an exceſs of acid. Marine ſalt of ſilver, however, decompoſes vitriol of mercury only through its exceſs of acid. Hence we ſee why luna cornea can never be reduced by fixed alkalies without loſs; and were it not that the action of the alkali is aſſiſted by heat, it never could be reduced by them at all.

When oil of vitriol is mixed with a ſolution of corroſive ſublimate, a precipitate falls: but this, as Mr Bergman remarks, does not proceed from a decompoſition

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(A) Theſe experiments have been repeated by many other chemiſts without ſucceſs; and Mr Wiegleb informs, that none of thoſe who have attempted to decompoſe ſea-ſalt by means of lead, ever found their methods anſwer the purpoſe.

ſition of the mercurial ſalt, but from an abſtraction of the water neceſſary to keep the ſublimate diſſolved.

315
Precipitation of corroſive mercury by oil of vitriol explained.

316
Table of the affinities to the different metals explained.

In the foregoing table two different affinities are aſſigned to the vitriolic acid with regard to biſmuth and nickel; one ſhowing the affinity which theſe acids bear to the metals when dephlogiſticated only by ſolution in the acids; the other that which the acids bear to them when more dephlogiſticated, as when they are diſſolved in the nitrous acid. On the other hand, all the acids have leſs affinity with the calces of iron, zinc, tin, and antimony, when they are dephlogiſticated to a certain degree; but our author found himſelf unable to give any certain criteria of this dephlogiſtication.

317
Of the quantity of phlogiſton contained in the different metals.

318
Method of calculating this quantity exemplified in regulus of arſenic.

The moſt difficult point to be ſettled was the precipitation of metals by each other from the mineral acids. To determine this it was neceſſary to find the quantity of phlogiſton in each of them, not only in their natural ſtate, but according to their various degrees of dephlogiſtication by each of the acids. The ſubſtance he choſe for determining the abſolute quantity of phlogiſton in a metallic ſubſtance was regulus of arſenic. An hundred grains of this ſemimetal diſſolved in dilute nitrous acid yielded 102.4 cubic inches of nitrous air; which, according to his calculations on that ſubject, contain 6.86 grains of phlogiſton: and hence he concluded that 100 grains of regulus of arſenic contain 6.86 grains of phlogiſton. From this experiment, three times repeated with the ſame ſucceſs, our author proceeded to form, by calculation, a table of the abſolute quantity of phlogiſton contained in metals, the relative quantity having been computed by Mr Bergman and his calculations adopted by our author. Theſe quantities are as follow.

319
Table of the quantities of phlogiſton in different metals.

		Relative Quantity.	Abſolute Quantity
100 grains	Gold	394	24.82
	Copper	312	19.65
	Cobalt	270	17.01
	Iron	233	14.67
	Zinc	182	11.46
	Nickel	156	9.82
	Regulus of antimony	120	7.56
	Tin	114	7.18
	Regulus of arſenic	109	6.86
	Silver	100	6.30
	Mercury	74	4.56
	Biſmuth	57	3.59
	Lead	43	2.70

320
Experiments explaining the reduction of ſilver *per ſe*.

This point he likewiſe endeavoured to aſcertain by other experiments. As ſilver loſes a certain quantity of phlogiſton, which eſcapes and ſeparates from it during its ſolution in nitrous acid, he concluded, that if the ſolution was expoſed to nothing from which it could reobtain phlogiſton, and this was diſtilled to dryneſs, and entirely ſeparated from the acid, as much ſilver ſhould remain unreduced as correſponded with the quantity of phlogiſton loſt by it; and if this quantity correſponded with that in the above table, he then had good reaſon to conclude that the table was juſt.

For this purpoſe 120 grains of ſtandard ſilver were diſſolved in dephlogiſticated nitrous acid diluted with water, and he obtained from it 24 cubic inches of nitrous air. This ſolution was gently evaporated to dryneſs; and he found that, during the evaporation, about a quarter of a grain of the ſilver had been volatilized. The dry reſiduum was then diſtilled, and kept an hour in a coated green-glaſs retort heated almoſt to a white heat. Abundance of nitrous acid paſſed off during the operation, and a green and white ſublimate roſe into the neck of the retort, ſome of it even paſſing over into the receiver. On breaking the retort, the inſide was penetrated with a yellow and red tinge, and partly covered over with an exceedingly fine ſilver powder, which could ſcarcely be ſcraped off. The remainder of the ſilver was white, and perfectly free from acid, but not melted into a button. On being collected, it weighed 94 grains; conſequently 26 grains had been loſt either by ſublimation or vitrification; but of theſe 26 grains 9 were copper; for 100 grains of ſtandard ſilver contain $7\frac{1}{4}$ of copper, therefore only 17 grains of pure ſilver remained unreduced, being either volatilized or vitrified. The whole quantity of pure ſilver in 120 grains of ſtandard ſilver amounts to 111 grains; then if 111 grains of pure ſilver loſe 17 by being deprived of its phlogiſton, 100 grains of the ſame ſhould loſe 15.3; and by the above table 15.3 grains of ſilver ſhould contain 0.945 of a grain of phlogiſton. Now, 100 grains of pure ſilver afford 14 cubic inches of nitrous air, which, according to our author's calculation, contain 0.938 of a grain of phlogiſton; and this differs from 0.945 only by .007 of a grain. "In this experiment (ſays Mr Kirwan) only as much of the ſilver ſublimed as could not regain phlogiſton; the remainder regained it from the nitrous air abſorbed by the ſolution, and by that which remained in the acid and calx. If this were not ſo, I do not ſee why the whole of the ſilver would not ſublime."

321
Quantity of pure metal contained in ſtandard ſilver.

322
Examination of Dr Prieſtley's experiment concerning the revival of mercury.

Dr Prieſtley having ſeveral times diſſolved mercury in the nitrous acid, and revivified it by diſtilling over that acid, conſtantly found a conſiderable portion of it unreduced. To try whether that proportion correſponded with his calculation, Mr Kirwan examined Dr Prieſtley's experiment, *viz.* that having diſſolved 17 penny-weights 13 grains (321 grains) of mercury in nitrous acid, 36 grains remained unreduced. According to Mr Kirwan's calculation 56 grains ſhould have remained unreduced; for 100 grains of mercury afford 12 cubic inches of nitrous air; of conſequence 321 grains ſhould afford 38.52, which contain 2.58 of phlogiſton: and if, as according to the table, 4.56 grains of phlogiſtion be neceſſary to metallize 100 grains of mercury, 2.58 grains will be neceſſary to metallize 56 grains of the ſame metal; and our author is ſatisfied from his own trials, that more than 50 grains would have remained unreduced, if dephlogiſticated nitrous acid had been uſed in diſſolving the mercury, and the ſolution performed with heat and a ſtrong acid: but that which the Doctor uſed was of the ſmoking kind, and conſequently contained a conſiderable quantity of phlogiſton already, which undoubtedly contributed to revive more of the metal than would otherwiſe have been done. It is true, Dr Prieſtley afterwards revived a great part of what had originally remained unreduced; but this happened after it had been ſome time expoſed to the free air, from which the calces of metals always attract phlogiſton; as is evident in luna cornea, which blackens on being expoſed to the air.

323
Why ſo much of the metal was revived in the Doctor's experiments.

By another experiment of Dr Prieſtley's, it was found

324 Of the revival of lead from minium by inflammable air.

325 Mr Kirwan's remarks on the experiments of Dr Prieſtley.

found, that nearly five pennyweights of minium, from whence all its air was extracted, that is, about 118 grains, abſorbed 40 ounce-meaſures, or 75.8 cubic inches of inflammable air, containing 2.65 grains of phlogiſton, by which they were reduced. An hundred grains of minium, therefore, require for their reduction nearly 2.25 grains of phlogiſton. In another experiment made with more care, he found, that 480 grains of minium abſorbed 108 ounce-meaſures of inflammable air; ſo that, according to this, 100 grains of minium require for their reduction 1.49 grains of phlogiſton; and in two ſucceeding experiments he found the quantity ſtill leſs. On this Mr Kirwan remarks, 1. That the whole of the minium was not dephlogiſticated; for it is never equally calcined, and beſides much of it muſt have been reduced during the expulſion of its air. 2. The quantity of phlogiſton in the inflammable air may have been greater, as this varies with its temperature and the weight of the atmoſphere: ſo that on the whole theſe experiments confirm the reſults expreſſed in the table.

326 Of the attraction of metallic calces to phlogiſton.

327 Of finding the ſpecific gravity of the different metallic calces.

328 Whence their various degrees of affinity to phlogiſton may be determined.

Mr Kirwan next proceeds to conſider the attraction of metallic calces to phlogiſton. Inflammable air, when condenſed into a ſolid ſubſtance, he ſuppoſes not only equal, but much ſuperior, to any metallic calx in ſpecific gravity; and therefore, if we could find the ſpecific gravity of any calx free both from phlogiſton and fixed air, we would thus know the denſity which phlogiſton acquires by its union with ſuch calx. It has, however, hitherto proved impoſſible to procure calces in ſuch a ſtate; as, during their dephlogiſtication, they combine with fixed air or ſome particles of the menſtruum, whence their abſolute weight is increaſed, and their ſpecific gravity diminiſhed. Hence it appears, that the ſpecific gravity of the calces differs much leſs from that of their reſpective metals, than the ſpecific gravity which the phlogiſton acquires by its union with thoſe calces from that which it poſſeſſes in its uncombined ſtate. Hence, inſtead of deducing the quantity of affinity betwixt phlogiſton and metallic calces from the following propoſition, that "the affinity of metallic calces to phlogiſton is in a compound ratio of its quantity and denſity in each metal," he is obliged to deduce it from this other, that "the affinity of metallic calces to phlogiſton is directly as the ſpecific gravity of the reſpective metals, and inverſely as the quantity of calx contained in a given weight of theſe metals." This latter propoſition is an approximation to the former, founded on this truth, that "the larger the quantity of phlogiſton in any metal is, the ſmaller is the quantity of calx in a given weight of that metal;" and, that "the denſity which the phlogiſton acquires is as the ſpecific gravity of the metal." This latter propoſition, however, is not ſtrictly true, for this denſity is much greater; but its defect is only ſenſible with regard to thoſe metals which contain a conſiderable quantity of phlogiſton, as gold, copper, cobalt, and iron. With regard to the reſt, it is of no importance. The ſpecific gravity of the different metals, then, being as repreſented in the firſt column of the following table, the affinity of their calces to phlogiſton will be as in the ſecond; and the third expreſſes the affinities in numbers homogeneous with thoſe which expreſs the affinities of acids with their baſis.

330 Table of the proportional affinities of metallic calces to phlogiſton.

	Specific Gravity.	Proportionable Affinities.	Real Affinities of Calx to Phlogiſt.
Gold	19	0.25	1041
Mercury	14	0.147	612
Silver	11.091	0.118	491
Lead	11.33	0.116	483
Copper	8.8	0.109	454
Biſmuth	9.6	0.099	412
Cobalt	7.7	0.092	383
Iron	7.7	0.090	375
Regulus of Arſenic	8.31	0.089	370
Zinc	7.24	0.0812	338
Tin	7	0.075	312
Regulus of Antimony	6.86	0.074	308

331 Why lead is uſeful in cupellation.

From this table we may ſee why lead is uſeful in cupellation; namely, becauſe it has a greater affinity with phlogiſton than the calces of any of the other imperfect metals; conſequently after it has loſt its own phlogiſton, it attracts that of the other metals with which it is mixed, and thus promotes their calcination and vitrification.

332 Quantity of phlogiſton loſt by metals during calcination.

The third point neceſſary for the explanation of the phenomena attending the ſolution of metals, and their precipitation by each other, is to determine the proportion of phlogiſton which they loſe by ſolution in each of the acids, and the affinity which their calces bear to the part ſo loſt. Though our author was not able to determine this by any direct experiment, yet from various conſiderations he was led to believe that it was as follows:

Quantity of Phlogiſton ſeparated

	From Iron,	Copper,	Tin,	Lead,	Silver,	Mercury,	Zinc,	Biſmuth,	Cobalt,	Nickel,	Reg. of Ant.	Reg. of Arſ.
By the vitriolic acid	$\frac{2}{3}$	$\frac{8}{10}$	$\frac{7}{10}$	$\frac{98}{100}$	Entire	$\frac{87}{100}$	$\frac{85}{100}$	$\frac{85}{100}$	$\frac{93}{100}$	Entire	$\frac{97}{100}$	$\frac{86}{100}$
By nitrous acid	$\frac{1}{3}$	$\frac{81}{100}$	$\frac{7}{10}$	$\frac{88}{100}$	Entire	$\frac{9}{10}$	$\frac{99}{100}$	$\frac{97}{100}$	Entire	Entire	Entire	$\frac{99}{100}$
By marine acid	$\frac{42}{100}$	$\frac{57}{100}$	$\frac{3}{10}$	$\frac{6}{10}$	——	——	$\frac{6}{10}$	$\frac{7}{10}$	$\frac{94}{100}$	$\frac{8}{10}$	$\frac{84}{100}$	$\frac{6}{10}$

329 Of the affinity of calces to the deficient part of their phlogiſton.

The affinity of the calces to the deficient part of their phlogiſton may now be eaſily calculated; for they may be conſidered as acids, whoſe affinity to the deficient part of their baſis is as the ratio which that part bears to the whole. Thus the affinity of iron, thoroughly deprived of its phlogiſton, being 375, as it loſes two-thirds of its phlogiſton by ſolution in the vitriolic acid, the affinity of iron to theſe is two-thirds of its whole affinity; that is, two-thirds of 375, or 250.

333 Uſe of theſe calculations and tables for knowing *à priori* the phenomena of precipitation.

Thus we may eaſily conſtruct a table of the affinities of the phlogiſton of different metals for their calces; and from this and that formerly given, by which the affinities of the acids to the metallic calces was expreſſed, we may gueſs what will happen on putting one metal in the ſolution of another. Thus if a piece of copper be put into a ſaturated ſolution of ſilver, the ſilver will be precipitated; for the balance is in favour of the divellent powers, as appears from the following calculation.

Quieſcent

Quieſcent Affinities.		*Divellent Affinities.*	
Nitrous acid to ſilver	375	Nitrous acid to copper	255
Calx of copper to phlogiſton	363	Calx of ſilver to phlogiſton	491
Sum of the quieſcent affinities	738	Sum of the divellent	746

334 Of the exceſs of acid in ſolutions proper for making theſe experiments.

In making theſe experiments the ſolutions muſt be nearly, though not entirely, ſaturated. If much ſuperfluous acid be left, a large quantity of the added metal will be diſſolved, before any precipitation can be made to appear; and when the ſolution is perfectly ſaturated, the attraction of the calces for one another begins to appear; a power which ſometimes takes place, and which has not yet been fully inveſtigated.

335 Why the metals are more dephlogiſticated by mutual precipitation than by direct ſolution.

336 Why copper is diſſolved by ſolution of ſilver, mercury, or iron.

In this way the precipitating metals are more dephlogiſticated than by direct ſolution in their reſpective menſtrua; and are even diſſolved by menſtrua which would not otherwiſe affect them. The reaſon of this is, that their phlogiſton is acted upon by two powers inſtead of one: and hence, though copper be directly ſoluble in the vitriolic acid only when in its concentrated ſtate, and heated to a great degree; yet if a piece of copper be put into a ſolution of ſilver, mercury, or even iron, though dilute and cold, and expoſed to the air, it will be diſſolved; a circumſtance which has juſtly excited the admiration of ſeveral eminent chemiſts, and which is inexplicable on any other principles than thoſe juſt now laid down. From this circumſtance we may ſee the reaſon why vitriol of copper, when formed by nature, always contains iron.

Mr Kirwan now proceeds to conſider the ſolutions of metallic ſubſtances in all the different acids.

337 Iron and zinc the only metals diſſolved by vitriolic acid.

Vitriolic acid, he obſerves, diſſolves only iron and zinc of all the metallic ſubſtances, becauſe its affinity to their calces is greater than that which they bear to the phlogiſton they muſt loſe before they can unite with it.

338 Nitrous acid diſſolves all metals, though it has leſs affinity with them than the vitriolic or marine.

339 Why it cannot diſſolve them when much concentrated.

Nitrous acid has leſs affinity with all metallic ſubſtances than either the vitriolic or marine; yet it diſſolves them all, gold, ſilver, and platina excepted, though it has even leſs affinity with them than they have with that portion of phlogiſton which muſt be loſt before they can diſſolve in any acid. The reaſon of this is, that it unites with phlogiſton, unleſs when in too diluted a ſtate; and the heat produced by its union with phlogiſton is ſufficient to promote the ſolution of the metal. On the other hand, when very concentrated, it cannot diſſolve them: becauſe the acid does not then contain fire enough to throw the phlogiſton into an aerial form, and reduce the ſolid to a liquid.

340 In what caſes the marine acid can diſſolve metals, and when it cannot.

The marine acid dephlogiſticates metals leſs powerfully than any other. It can make no ſolution, or at leaſt can operate but very ſlowly, without heat, in thoſe caſes where the metallic calx has a ſtronger affinity with that portion of the phlogiſton which muſt be loſt, than the acid: nor can it operate briſkly even where the attraction is ſtronger, provided, the quantity of acid be ſmall; becauſe ſuch a little quantity of acid does not contain fire enough to volatilize the phlogiſton: and hence heat is neceſſary to aſſiſt the marine acid in diſſolving lead. When dephlogiſticated, it acts more powerfully.

341 Why copper and iron precipitate one another.

It has been obſerved, that copper and iron mutually precipitate one another. If a piece of copper be put into a ſaturated ſolution of iron freſh made, no precipitation will enſue for 12 hours, or even longer, if the liquor be kept cloſe from the air; but if the liquor be expoſed to the open air, the addition of volatile alkali will ſhow, in 24 hours, that ſome of the copper has been diſſolved, or ſooner, if heat be applied, and a calx of iron is precipitated. The reaſon of this will be underſtood from the following ſtate of the affinities.

Quieſcent.		Divellent.	
Vitriolic acid to calx of iron	270	Vitriolic acid to copper	260
Copper to its phlogiſton	360	Calx of iron to phlogiſton	250
	360		510

In this caſe no decompoſition can take place, becauſe the ſum of the divellent affinities is leſs than that of the quieſcent; but in the ſecond, when much of the phlogiſton of the iron has eſcaped, the affinity of the calx of iron to the acid is greatly diminiſhed, at the ſame time that the affinity of the calx to phlogiſton is augmented. The ſtate of the affinities may therefore be ſuppoſed as follows.

Quieſcent.		*Divellent.*	
Vitriolic acid to calx of iron	240	Vitriolic acid to copper	260
Copper to its phlogiſton	360	Calx of iron to phlogiſton	370
	600		630

342 Increaſe of the attraction of calx of iron to phlogiſton demonſtrated.

The increaſe of affinity of the calx of iron to phlogiſton is not a mere ſuppoſition; for if we put ſome freſh iron to a ſolution of the metal ſo far dephlogiſticated as to refuſe to cryſtallize, ſo much of the phlogiſton will be regained that the impoveriſhed ſolution will now yield cryſtals. The reaſon why the increaſed quantity of phlogiſton does not enable the acid to react upon the metal is, becauſe it is neither ſufficiently large, nor attracted with a ſufficient degree of force, to which the acceſs of air and heat employed contribute conſiderably. The diminution of attraction in calces of iron for acids is evident, not only from this but many other experiments; and particularly from the neceſſity of adding more acid to a turbid ſolution of iron in order to re-eſtabliſh its tranſparency.

343 Calces of copper precipitate dephlogiſticated ſolutions of iron.

A dephlogiſticated ſolution of iron is alſo precipitated by the calces of copper. The ſame thing happens to a ſolution of iron in nitrous acid; only as the acid predominates greatly in this ſolution, ſome of the copper is diſſolved before any of the iron is precipitated. Copper precipitates nothing from ſolution of iron in the marine acid, though expoſed to the open air for 24 hours.

344 Martial vitriol procured by precipitation of copper leſs fit for dyeing than the common.

Solution of copper in the vitriolic acid is inſtantly precipitated by iron; the reaſon of which is plain from the common table of affinities: and hence the foundation of the method of extracting copper, by means of iron, from ſome mineral waters. The precipitated ſolution affords a vitriol of iron, but of a paler kind than that commonly met with, and leſs fit for dyeing, as being more dephlogiſticated: the reaſon of which is, that copper contains more phlogiſton than iron: old iron is alſo uſed which has partly loſt its phlogiſton.

giſton. Hence the iron is more dephlogiſticated by precipitating copper than by mere diſſolution in the vitriolic acid; and hence caſt iron, according to the obſervations of Mr Schlutter, will ſcarcely precipitate a ſolution of copper; becauſe it contains leſs phlogiſton than bar-iron, as Mr Bergman has informed us.

345. Solution of copper ſcarcely decompoſed by caſt iron.

346. Why a ſaturated ſolution of ſilver can ſcarce be precipitated by iron.

Mr Kirwan always found ſilver eaſily precipitated by means of iron from its ſolution in nitrous acid; though Bergman had obſerved that a ſaturated ſolution of ſilver could not be thus precipitated without great difficulty, even though the ſolution were diluted and and an exceſs of acid added to it. What precipitation took place could only be accompliſhed by ſome kinds of iron. The reaſon of this Mr Kirwan ſuppoſes to be, that the ſolution, even after it is ſaturated, takes up ſome of the ſilver in its metallic form; which Mr Scheele has alſo obſerved to take place in quickſilver. The laſt portions of both theſe metals when diſſolved in ſtrong nitrous acid, afford no air, and conſequently are not dephlogiſticated. This compound of calx, therefore, and of ſilver in its metallic ſtate, it may reaſonably be ſuppoſed cannot be precipitated by iron, as the ſilver in its metallic form prevents the calx from coming into contact with the iron, and extracting the phlogiſton from it; and for the ſame reaſon iron has been obſerved not to precipitate a ſolution of mercury in the nitrous acid.

347. Of the precipitation of zinc and iron by one another.

Zinc cannot precipitate iron, as Mr Bergman has ſhown, until the ſolution of the latter loſes part of its phlogiſton. Hence we may underſtand why Newmann denied that iron can be precipitated by means of zinc. Mr Kirwan, however, has found, that zinc does not precipitate iron from the nitrous acid; but on the contrary, that iron precipitates zinc. In a ſhort time the acid rediſſolves the zinc and lets fall the iron, owing to the calx of iron being too much dephlogiſticated. Iron, however, will not precipitate zinc either from the vitriolic or marine acids. Moſt of the metallic ſubſtances precipitated by iron from the nitrous acid are in ſome meaſure rediſſolved ſhortly after; becauſe the nitrous acid ſoon dephlogiſticates the iron too much, then lets it fall, reacts on the other metals, and diſſolves them.

348. Why copper ſometimes cannot precipitate ſilver.

Dr Lewis obſerves, that ſilver is ſometimes not precipitated by copper from the nitrous acid; which happens either when the acid is ſuperſaturated with ſilver by taking up ſome in its metallic form, or when the ſilver is not much dephlogiſticated. In this caſe, the remedy is to heat the ſolution and add a little more acid, which dephlogiſticates it further; but the nitrous acid always retains a little ſilver.

349. Blue vitriol cannot be formed by boiling a ſolution of alum with copper filings.

It has commonly been related by chemical authors, that blue vitriol will be formed by adding filings of copper to a boiling ſolution of alum. Mr Kirwan, however, has ſhowed this to be an error; for after boiling a ſolution of alum for 20 hours with copper filings, not a particle of the metal was diſſolved; the liquor ſtanding even the teſt of the volatile alkali. The alum indeed was precipitated from the liquor, but ſtill retained its ſaline form; ſo that the precipitation was occaſioned only by the diſſipation of the ſuperfluous acid.

350. Why tin cannot be precipitated in its metallic form.

No metal is capable of precipitating tin in its metallic form; the reaſon of which, according to Mr Kirwan, is, becauſe the precipitation is not the effect of a double affinity, but of the ſingle greater affinity of its menſtruum to every other metallic earth. Metals precipitated from the nitrous acid by tin are afterwards rediſſolved, becauſe the acid ſoon quits the tin by reaſon of its becoming too much dephlogiſticated.

351. Why metals precipitated by tin are afterwards rediſſolved.

352. Precipitations by lead.

Lead precipitates metallic ſolutions in the vitriolic and marine acids but ſlowly, becauſe the firſt portions of lead taken up form ſalts very difficult of ſolution, which cover its ſurface, and protect it from the further action of the acid; at the ſame time it contains ſo little phlogiſton, that a great quantity of it muſt be diſſolved before it will diſſolve other metals. A ſolution of lead very much ſaturated cannot be precipitated by iron but with difficulty, if at all. Mr Kirwan conjectures that this may ariſe from ſome of the lead alſo being taken up in its metallic form, as is the caſe with mercury and ſilver. Iron will not precipitate lead from marine acid; for though a precipitate appears the acid is ſtill adhering to the metal. On the contrary, iron is precipitated from its ſolution in this acid by lead, though very ſlowly.

353. Precipitations of mercury by copper.

Mercury is quickly precipitated from the vitriolic acid by copper, though the difference between the ſum of the quieſcent and divellent affinities is but very ſmall. The precipitation, however, takes place, becauſe the calx of mercury has a ſtrong attraction for phlogiſton; and a very ſmall portion of what is contained in copper is ſufficient to revive it.

354. It cannot be precipitated by ſilver from vitriolic acid.

Silver, however, is not able to precipitate mercury from the vitriolic acid, unleſs it contains copper; in which caſe a precipitation will enſue: but on diſtilling ſilver and turpeth mineral, the mercury will paſs over in its metallic form; which ſhows that the affinity of the calx of mercury to phlogiſton is increaſed by heat, though the difference betwixt the divellent and quieſcent powers is very ſmall.

355. Why mercury and ſilver precipitate one another from the nitrous acid.

Mercury appeared to be precipitated by ſilver from the nitrous acid, though very ſlowly; but when the ſolution was made without heat, it was not at all precipitated. On the other hand, mercury precipitates ſilver from this acid, not by virtue of the ſuperiority of the uſual divellent powers, but by reaſon of the attraction of mercury and ſilver for each other; for they form partly an amalgam and partly a vegetation, ſcarcely any thing of either remaining in the ſolution.

356. Corroſive ſublimate cannot be precipitated by ſilver; but luna cornea may be decompoſed by mercury, and ſublimate by ſilver, in the dry way.

Silver does not precipitate mercury from the ſolution of corroſive ſublimate; but, on the contrary, mercury precipitates ſilver from the marine acid: and if a ſolution of *luna cornea* in volatile alkali be triturated with mercury, calomel will be formed; yet on diſtilling calomel and ſilver together, the mercury will paſs in its metallic form, and luna cornea will be formed. The ſame thing happens on diſtilling ſilver and corroſive ſublimate, the affinity of calx of mercury to phlogiſton increaſing with heat.

357. Precipitations of biſmuth.

Biſmuth precipitates nothing from vitriol of copper in 16 hours; nor does copper from vitriol of biſmuth. The two metallic ſubſtances, however, alternately precipitate one another from the nitrous acid, which proceed from their different degrees of dephlogiſtication.

358. Nickel precipitated by zinc.

Nickel will ſcarcely precipitate any metal except it be reduced to powder. A black powder is precipitated by means of zinc from the ſolution of nickel in in the vitriolic and nitrous acids, which has been ſhown by Bergman to conſiſt of arſenic, nickel, and a little of the zinc itſelf. The latter, however, precipitates nickel from the marine acid.

359 Iron and nickel will ſcarcely precipitate one another.

The ſolutions of iron and nickel in the vitriolic acid mutually act upon theſe metals; but neither of them will precipitate the other in 24 hours, though on remaining longer at reſt iron ſeems to have the advantage. Iron, however, evidently precipitates nickel from the nitrous acid; and though nickel ſeems to precipitate iron, yet this ariſes only from the gradual dephlogiſtication of the iron.

360 Precipitation of copper, lead, and biſmuth by nickel.

Copper is precipitated in its metalic form from the vitriolic, nitrous, and marine acids, by nickel. The vitriolic and nitrous ſolutions of lead ſeem to act upon it without any decompoſition, the calces uniting to each other. Lead ſeems for ſome time to be acted upon in the ſame manner by the vitriolic and nitrous ſolutions of nickel, but at laſt nickel ſeems to have the advantage; but a black precipitate appears which ever of them is put into the ſolution of the other. However, nickel readily precipitates vitriolic and nitrous ſolutions of biſmuth; but in the marine acid both theſe ſemimetals are ſoluble in the ſolutions of each other: yet nickel precipitates biſmuth very ſlowly, and only in part; while biſmuth precipitates a red powder, ſuppoſed by Mr Kirwan to be ochre, from the ſolution of nickel.

361 Zinc cannot precipitate cobalt.

Cobalt is not precipitated by zinc either from the vitriolic or nitrous acids, though it ſeems to have ſome effect upon it when diſſolved in that of ſea-ſalt.

362 Cobalt precipitated by iron.

363 Nickel precipitates ſome heterogeneous matter from it.

364 ſolutions of cobalt let fall a white powder on the addition of biſmuth or copper.

Iron precipitates cobalt from all the three acids, yet much of the ſemimetal is retained in the vitriolic and nitrous ſolutions of it, particularly the latter; which, after letting fall the cobalt, takes it up again, and lets fall a dephlogiſticated calx of iron. Nickel alſo, though it does not precipitate cobalt itſelf, as appears by the remaining redneſs of the ſolution, yet conſtantly precipitates ſome heterogeneous matter from it. Solution of cobalt in the marine acid becomes colourleſs by the addition of nickel. Biſmuth is ſoluble in the vitriolic and nitrous ſolutions of cobalt, and throws down a ſmall white precipitate, but does not affect the metallic part. Nor can we attribute theſe ſolutions in vitriolic acid to any exceſs in that acid, as they are dilute and made without heat. Copper alſo precipitates from the ſolution of cobalt a white powder ſuppoſed to be arſenic.

365 Precipitations of and by regulus of antimony.

The regulus of antimony has no effect on ſolution of copper in vitriolic acid, nor is precipitated by it from the ſame acid; but it diſſolves ſlowly in vitriol of antimony. With ſolution of vitriol of lead it becomes red in 16 hours, but is ſcarcely precipitated by lead from the vitriolic acid. Powdered regulus alſo precipitates vitriol of mercury very ſlightly. Biſmuth neither precipitates nor is precipitated by the regulus in 24 hours from the vitriolic acid. Tin precipitates the regulus from the nitrous acid; but if regulus be put into a ſolution of tin in the ſame acid, neither of the metals will be found in the liquid in 16 hours, either by reaſon of the dephlogiſtication or of the union of the calces to each other.

366 A triple ſalt formed by iron, regulus of antimony, and marine acid.

Iron does not precipitate regulus of antimony entirely from the marine acid; but ſeems to form a triple ſalt, conſiſting of the acid and both calces. The regulus may alſo be diſſolved by marine ſalt of iron.

367 Another formed by regulus of antimony, marine acid, and copper.

Copper does not precipitate regulus of antimony from marine acid in 16 hours; and if the regulus be put into marine ſalt of copper, it will be diſſolved, and volatile alkalies will not give a blue, but a yellowiſh white precipitate; ſo that here alſo a triple ſalt is formed.

368 Precipitations of and by arſenic.

Solution of arſenic in vitriolic acid acts upon iron, lead, copper, nickel, and zinc; but ſcarce give any precipitate: neither is arſenic precipitated by iron from the nitrous acid, though it is by copper, and even ſilver gives a ſlight white precipitate. Regulus of arſenic, however, precipitates ſilver completely in 16 hours: whence the former precipitate ſeems to be a triple ſalt. Mercury alſo ſlightly precipitates arſenic from the nitrous acid, and ſeems to unite with it, though it is itſelf precipitated by regulus of arſenic in 24 hours.

369 Regulus of arſenic precipitated by biſmuth from the nitrous acid;

Biſmuth ſlightly precipitates arſenic from ſpirit of nitre, but regulus of arſenic forms a copious precipitate in the nitrous ſolution of biſmuth; ſo that Mr Kirwan is of opinion that the calces unite. It is not precipitated from this acid by nickel, but the calces unite. Though regulus of arſenic produces a copious precipitate in the ſolution of nickel in nitrous acid, yet the liquor remains green; ſo that the nickel is certainly not precipitated. The white precipitate in this caſe ſeems to be arſenic ſlightly dephlogiſticated. Regulus of arſenic alſo produces a white precipitate in the nitrous ſolution of cobalt, but the liquor ſtill continues red.

370 And by copper from the marine acid.

Regulus of arſenic is precipitated from the marine acid by copper; but the precipitate does not ſtrike a blue colour with volatile alkali, becauſe the metal unites with the arſenic. The arſenic is alſo precipitated by iron. Tin is ſoluble in marine ſolution of arſenic, but Mr Kirwan could not obſerve any precipitation; nor does regulus of arſenic precipitate tin. Neither biſmuth nor regulus of arſenic precipitate each other from marine acid in 16 hours. Regulus of antimony is alſo acted upon by the marine ſolution of arſenic, though it cauſes no precipitate, nor does the regulus of arſenic precipitate it.

§ 2. *Of the Quantities of Acid, Alkali, &c. contained in different Salts, with the Specific Gravity of the Ingredients.*

It is a problem by which the attention of the beſt modern chemiſts has been engaged, to determine the quantity of acid exiſting in a dry ſtate in the various compound ſalts, reſulting from the union of acid with alkaline, earthy, and metallic ſubſtances. In this way Mr Kirwan has greatly excelled all others, and determined the matter with an accuracy and preciſion altogether unlooked for. His deciſions are founded on the following principles.

371 Specific gravity of bodies how found.

1. That the ſpecific gravity of bodies is their weight divided by an equal bulk of rain or diſtilled water; the latter being the ſtandard with which every other body is compared.

2. That if bodies ſpecifically heavier than water be weighed in air and in water, they loſe in water part of the weight which they were found to have in air; and

and that the weight ſo loſt is juſt the ſame as that of an equal bulk of water; and conſequently, that their ſpecific gravity is equal to their weight in air, or abſolute weight divided by their loſs of weight in water.

3. That if a ſolid, ſpecifically heavier than a liquid, be weighed firſt in air and then in that liquid, the weight it loſes is equal to the weight of an equal volume of that liquid; and conſequently, if ſuch ſolid be weighed firſt in air, then in water, and afterwards in any other liquid, the ſpecific gravity will be as the weight loſt in it by ſuch ſolid, divided by the loſs of weight of the ſame ſolid in water. This method of finding the ſpecific gravity of liquids, our author found more exact than that by the aerometer, or the compariſons of the weights of equal meaſures of ſuch liquids and water, both of which are ſubject to ſeveral inaccuracies.

372 To find the weight of an equal bulk of water where the ſpecific gravity is known.

4. That where the ſpecific gravity of bodies is already known, we may find the weight of an equal bulk of water; it being as the quotient of their abſolute weight divided by their ſpecific gravities: and this he calls their loſs of weight in water.

Thus where the ſpecific gravity and abſolute weight of the ingredients of any compound are known, the ſpecific gravity of ſuch compound may eaſily be calculated; as it ought to be intermediate betwixt that of the lighter and that of the heavier, according to their ſeveral proportions: and this Mr Kirwan calls the *mathematical* ſpecific gravity.

373 Mathematical ſpecific gravity explained.

But in fact the ſpecific gravity of compounds, found by actual experiment, ſeldom agrees with that found by calculation; but is often greater, without any diminution of the lighter ingredient.

374 Increaſed denſity of mixtures accounted for.

This increaſe of denſity, then, Mr Kirwan ſuppoſes to ariſe from a cloſer union of the component parts to each other than either had ſeparately with its own integrant parts; and this more intimate union muſt, he thinks, proceed from the attraction of theſe parts to each other: for which reaſon he ſuppoſed, that this attraction might be eſtimated by the increaſe of denſity or ſpecific gravity, and was proportionable to it; but ſoon found that he was miſtaken in this point.

575 Weights of different kinds of air

With regard to the abſolute weights of ſeveral ſorts of air, our author adheres to the computations of Mr Fontana, at whoſe experiments he was preſent; the thermometer being at 55°, and the barometer at 29½ inches, or nearly ſo. Theſe weights were as follow:

Cubic inch of common air,	-	0.385
fixed air,	-	0.570
marine acid air,		0.654
nitrous air,	-	0.399
vitriolic acid air,		0.778
alkaline air,	-	0.2
inflammable air,		0.03

376 Method of finding the quantity of pure acid contained in ſpirit of ſalt.

Mr Kirwan begins his inveſtigations with the marine acid; endeavouring firſt to find the exact quantity of pure acid it contains at any given ſpecific gravity, and then by means of it determining the weight of acid contained in all other acids. For if a given quantity of pure fixed alkali were ſaturated, firſt by a certain quantity of ſpirit of ſalt, and then by determined quantities of the other acids, he concluded, that each of theſe quantities of acid liquor muſt contain the ſame quantity of acid; and this being known, the remainder, being the aqueous part, muſt alſo be known. This concluſion, however, reſted entirely on the ſuppoſition that the ſame quantity of all the acids was requiſite for the ſaturation of a given quantity of fixed alkali; for if ſuch given quantity of fixed alkali might be ſaturated by a ſmaller quantity of one acid than of another, the concluſion fell to the ground. The weight of the neutral ſalts produced might indeed determine this point in ſome meaſure; but ſtill a ſource of inaccuracy remained; to obviate which he uſed the following expedient. 1. He ſuppoſed the quantities of nitrous and vitriolic acids neceſſary to ſaturate a given quantity of fixed alkali exactly the ſame as that of marine acid, whoſe quantity he had determined; and to prove the truth of this ſuppoſition, he obſerved the ſpecific gravity of the ſpirit of nitre and oil of vitriol he employed, and in which he ſuppoſed, from the trial with alkalies, a certain proportion of acid and water. He then added to theſe more acid and water, and calculated what the ſpecific gravity ſhould be on the above ſuppoſition; and finding the reſult agreeable with the ſuppoſition, he concluded the latter to be exact. The following experiments were made on the marine acid.

377 Method of finding the ſpecific gravity of ſpirit of ſalt.

Two bottles were filled nearly to the top with diſtilled water, of which they contained in all 1399.9 grains, and ſucceſſively introduced into two cylinders filled with marine air; and the proceſs was renewed, until the water had imbibed, in 18 days, about 794 cubic inches of the marine air. The thermometer did not riſe all this time above 55°; nor ſink, unleſs perhaps at night, above 50°; the barometer ſtanding between 29 and 30 inches. This dilute ſpirit of ſalt then weighed 1920 grains; that is, 520.1 more than before; the weight of the quantity of marine air abſorbed. The ſpecific gravity of the liquor was found to be 1.225. Its loſs of weight in water (that is, the weight of an equal bulk of water) ſhould then be 1567.346 nearly; but it contained only, as we have ſeen, 1399.9 grains of water: ſubtracting this therefore from 1567.346, the remainder (that is, 167.446) muſt be the loſs of 520.1 grains of marine acid; and conſequently the ſpecific gravity of the pure marine acid, in ſuch a condenſed ſtate as when it is united to water, muſt be $\frac{520.1}{167.446}$, or 3.100.

Still, however, it might be ſuſpected, that the denſity of this ſpirit did not entirely proceed from the mere denſity of the marine acid, but in part alſo from the attraction of this acid to water; and though the length of time requiſite to make the water imbibe this quantity of marine acid air, naturally led to the ſuppoſition that the attraction was not very conſiderable, yet the following experiment was more ſatisfactory. He expoſed 1440 grains of this ſpirit of ſalt to marine acid air for five days, the thermometer being at 50°, or below; and then found that it weighed 1562 grains, and conſequently had imbibed 122 grains more. Its ſpecific gravity was then 1.253, which was preciſely what it ſhould have been by calculation.

378 To find the proportion of pure air in other acid liquors.

Being now ſatisfied that the proportion of acid in ſpirit of ſalt was diſcovered, our author determined to find it in other acids alſo. For this purpoſe he took 180 grains of very ſtrong oil of tartar *per deliquium*, and found that it was ſaturated by 180 grains of ſpirit of ſalt, whoſe ſpecific gravity was 1.225; and by calculation it appeared, that 180 grains of this ſpirit contained 48.7 grains of acid, and 131.3 of water. Hence he drew up a table of the ſpecific gravities of acid liquors containing 48.7 grains of pure acid, with different proportions of water, from 50 to 410 parts; the liquor with the firſt proportion having a ſpecific gravity of 1.497, and the latter weighing only 1.074. Mr Baume had determined the ſpecific gravity of the ſtrongeſt ſpirit of ſalt made in the common manner to 1.187, and Bergman 1.190; but we are told in the Paris Memoirs for 1700, that Mr Homberg had produced a ſpirit whoſe ſpecific gravity was 1.300; and that made by Dr Prieſtley, by ſaturating water with marine acid air, muſt have been about 1.500. The ſpirit of ſalt, therefore, whoſe ſpecific gravity is 1.261, has but little attraction for water, and therefore attracts none from the air; for which reaſon alſo it does not heat the ball of a thermometer, as the vitriolic and nitrous acids do; though Mr Cavallo found that this alſo had ſome effect upon the thermometer. Common ſpirit of ſalt, Mr Kirwan informs us, is always adulterated with vitriolic acid, and therefore unfit for theſe trials.

379
Quantities of acid, water, and alkali in digeſtive ſalt.

Mr Kirwan now ſet about inveſtigating the quantity of acid, water, and fixed alkali, in digeſtive ſalt, or a combination of the marine acid with vegetable alkali. For this purpoſe he took 100 grains of a ſolution of tolerably pure vegetable alkali, that had been three times calcined to whiteneſs, the ſpecific gravity of which was 1.097; diluting alſo the ſpirit of ſalt with different portions of water; the ſpecific gravity of one ſort being 1.015, and of another 1.098. He then found that the above quantity of ſolution of the vegetable alkali required for its ſaturation 27 grains of that ſpirit of ſalt whoſe ſpecific gravity was 1.098, and 23.35 grains of that whoſe ſpecific gravity was 1.115. Now, 27 grains of ſpirit of ſalt, whoſe ſpecific gravity is 1.098, contain 3.55 grains of marine acid, as appears by calculation. The principles on which calculations of this kind are founded, our author gives in the words of Mr Cotes.

380
How to find the ſpecific gravities of the different ingredients.

“ The data requiſite are the ſpecific gravities of the mixture and of the two ingredients. Then, as the difference of the ſpecific gravities of the mixture and the lighter ingredient is to the difference of the ſpecific gravities of the mixture and the heavier ingredient; ſo is the magnitude of the heavier to the magnitude of the lighter ingredient. Then, as the magnitude of the heavier, multiplied into its ſpecific gravity, is to the magnitude of the lighter multiplied into its ſpecific gravity; ſo is the weight of the heavier to the weight of the lighter. Then, as the ſum of theſe weights is to the weight of either ingredient; ſo is the weight given to the weight of the ingredient ſought.” Thus, in the preſent caſe, 1.098—1.000=.098 is the magnitude of the heavier ingredient, viz. the marine acid, and .098×3.100=0.3038 the weight of the marine acid; and on the other hand, 3.100—1.098=2.002, the magnitude of the water; and 2.002×1.000=2.002 its weight; the ſum of theſe weights is 2.3058: then if 2.3058 parts of ſpirit of ſalt contain 0.3038 parts acid, 27 grains of this ſpirit of ſalt will contain 3.55 acid. In the ſame manner it will be found, that 23.35 grains of ſpirit of ſalt, whoſe ſpecific gravity is 1.115, contains 3.55 grains acid.

Our author deſcribes very particularly his method of making the ſaturation of the alkali with the acid; which, as it is always difficult to hit with preciſion, we ſhall here tranſcribe. “ It was performed by putting the glaſs cylinder which contained the alkaline ſolution on the ſcale of a very ſenſible balance, and at the ſame time weighing the acid liquor in another pair of ſcales; when the loſs of weight indicated the eſcape of nearly equal quantities of fixed air contained in the ſolution. Then the acid was gradually added by dipping a glaſs rod in it, to the top of which a ſmall drop of acid adhered. With this the ſolution was ſtirred, and very ſmall drops taken up and laid upon bits of paper ſtained blue with radiſh juice. As ſoon as the paper was in the leaſt reddened, the operation was completed; ſo that there was always a very ſmall exceſs of acid, for which half a grain was conſtantly allowed; but no allowance was made for the fixed air, which always remains in the ſolution. But as on this account only a ſmall quantity of the alkaline ſolution was uſed, this proportion of fixed air muſt have been inconſiderable. If one ounce of the ſolution had been employed, this inappretiable portion of fixed air, would be ſufficient to cauſe a ſenſible error; for the quantity of fixed air loſt by the difference betwixt the weight added to the 100 grains and the actual weight of the compound was judged of; and when this difference amounted to 2.2 grains, the whole of the fixed air was judged to be expelled: and it was found to be ſo; as 100 grains of the alkaline ſolution, being evaporated to dryneſs, in the heat of 300°, left a reſiduum which amounted to 10½ grains, which contained 2.2 grains of fixed air.”

381
Mr Kirwan's method of ſaturating the acid and alkali with accuracy.

382
Quantity of mild and cauſtic vegetable alkali ſaturated by a given weight of marine acid.

The reſult of this experiment was, that 8.3 grains of pure vegetable alkali, freed from fixed air and water, or 10.5 of mild fixed alkali, were ſaturated by 3.55 grains of pure marine acid; and conſequently the reſulting neutral ſalt ſhould, if it contained no water, weigh 11.85 grains: but the ſalts reſulting from this union (the ſolution being evaporated to perfect dryneſs in a heat of 160 degrees, kept up for four hours) weighed at a medium 12.66 grains. Of this 11.85 grains were acid and alkali; therefore the remainder, *viz.* 0.81 grains, were water. An hundred grains of perfectly dry digeſtive ſalt contain 28 grains acid, 6.55 of water, and 65.4 of fixed alkali.

In his experiments on the nitrous acid, Mr Kirwan made uſe only of the dephlogiſticated kind, which appears pure and colourleſs as water. “ This pure acid (ſays he) cannot be made to exiſt in the form of air, as Dr Prieſtley has ſhown; for when it is deprived of water and phlogiſton, and furniſhed with a due proportion of elementary fire, it ceaſes to have the properties of an acid, and becomes dephlogiſticated air. Its proportion therefore could not be determined in ſpirit of nitre as the marine acid had been in ſpirit of ſalt in the laſt experiment.”—To determine the matter, the following experiments were made.

383
Nitrous acid, when pure, cannot be made to exiſt in an aerial form.

384
How to determine the quantity of pure acid contained in ſpirit of nitre.

1. To 1963.25 grains of dephlogiſticated ſpirit of nitre, whoſe ſpecific gravity was 1.419, he gradually added 179.5 grains of diſtilled water; and when it cooled, the ſpecific gravity of the mixture was found to be 1.389.

2. To 1984.5 of this 178.75 grains of water were then added, and the ſpecific gravity of the mixture found to be 1.362.

3. An hundred grains of a ſolution of fixed vegetable

table

table alkali, whoſe ſpecific gravity was 1.097, the ſame that had been formerly uſed in the experiments with ſpirit of ſalt, was found to be ſaturated by 11 grains of the ſpirit of nitre, whoſe ſpecific gravity was 1.419, by 12 of that whoſe ſpecific gravity was 1.389, and by 13.08 of that whoſe ſpecific gravity was 1.362. Theſe quantities were the medium of five experiments; and it was found neceſſary to dilute the acid with a ſmall quantity of water. When this was neglected, part of the acid was phlogiſticated, and flew off with the fixed air. Ten minutes were alſo allowed after each affuſion for the matters to unite; a precaution which was likewiſe found to be abſolutely neceſſary.

385
Proportion of acid in ſpirit of nitre to that in ſpirit of ſalt.

386
To find the ſpecific gravity of the pure nitrous acid.

387
How to determine the accrued denſity on mixing ſpirit of nitre with water.

Upon the ſuppoſition, therefore, that a given quantity of vegetable fixed alkali is ſaturated by the ſame weight of both acids, we ſee that 11 grains of ſpirit of nitre, whoſe ſpecific gravity is 1.419, contain the ſame quantity of acid with 27 grains of ſpirit of ſalt, whoſe ſpecific gravity is 1.098, or 3.55 grains. The remainder of 11 grains, or 7.45 grains, is therefore mere water; and of conſequence, if the denſity of the acid and water had not been increaſed by their union, the ſpecific gravity of the pure nitrous acid ſhould be 11.8729. But the ſpecific gravity of the nitrous, as well as of the vitriolic acid, is augmented by its union with water; and therefore the loſs of its weight in water is not exactly, as it would appear by calculation from the above premiſes, according to the rules already laid down. To determine therefore the real ſpecific gravity of the acid in its natural ſtate, the quantity of *accrued* denſity muſt be found, and ſubtracted from the ſpecific gravity of the ſpirit of nitre, whoſe true mathematical ſpecific gravity will then appear. This our author endeavoured to effect by mixing different portions of ſpirit of nitre and water, remarking the degree of diminution they ſuſtained by ſuch union; but was never able to attain a ſufficient degree of exactneſs in the experiment. He had recourſe therefore to the following method, as affording more ſatisfaction, though not altogether accurate. Twelve grains of the ſpirit of nitre, whoſe ſpecific gravity by obſervation was 1.389, contained, as our author ſuppoſed from the former experiment, 3.55 grains of real acid, and 8.45 of water: then if the ſpecific gravity of the pure nitrous acid were 11.872, that of this compound acid and water ſhould be 1.371; for the loſs of 3.55 ſhould be 0.299, and the loſs of the water 8.45, the ſum of the loſſes 8.749. Now, $\frac{12}{8.749}=1.371$: but the ſpecific gravity, as already mentioned, was 1.389: therefore the accrued denſity was at leaſt 0.18. the difference betwixt 1.389 and 1.371. This calculation indeed is not altogether exact: but our author concludes, that 0.18 is certainly a near approximation to the degree of denſity that accrues to 3.55 grains of acid by their union to 7.45 grains of water: therefore, ſubtracting this from 1.419, we have nearly the mathematical ſpecific gravity of that proportion of acid and water, namely, 1.401.

388
To determine the mathematical ſpecific gravity of this acid

Again, ſince 11 grains of this ſpirit of nitre contain 3.55 grains acid, and 7.45 of water, its loſs of weight ſhould be $\frac{11}{1.401}=7.855$; and ſubtracting the loſs of the aqueous part from this, the remainder 0.45 is the loſs of the 3.55 grains acid; and conſequently the true ſpecific gravity of the pure and mere nitrous acid is $\frac{3.55}{0.405}=8.7654$. This being ſettled, the mathematical ſpecific gravity and true increaſe of denſity of the above mixtures will be found. Thus the mathematical ſpecific gravity of 12 grains of that ſpirit of nitre, whoſe ſpecific gravity, by obſervation, was 1.389, muſt be 1.355; ſuppoſing it to contain 3.55 grains acid and 8.45 of water. For the loſs of 3.55 grains acid is $\frac{3.55}{8.763}=0.405$, and the loſs of water 8.45; the ſum of theſe loſſes is 8.855. Then $\frac{12}{8.855}=1.355$; and conſequently the accrued denſity is 1.389—1.355=.034. In the ſame manner it will be found that the mathematical ſpecific gravity of 13.08 grains of that ſpirit of nitre, whoſe ſpecific gravity by obſervation was 1.362, muſt be 1.315; and conſequently its accrued denſity .047.

389
Experiment to determine the quantity of real acid in ſpirit of nitre.

The whole of this, however, ſtill reſts on the ſuppoſition that each of theſe portions of ſpirit of nitre contain 3.55 grains of acid. To verify this ſuppoſition, our author examined the mathematical ſpecific gravities of the firſt mixture he had made of ſpirit of nitre and water in large quantities; for if the mathematical ſpecific gravities of theſe agreed exactly with thoſe of the quantities he had ſuppoſed in ſmaller portions of each, he could not but conclude that the ſuppoſitions of ſuch proportions of acid and water, as he had determined in each, were juſt.

390
Table of ſpecific gravities for ſpirit of nitre, how conſtructed.

This being determined by proper calculations, Mr Kirwan next proceeded to conſtruct another table of ſpecific gravities, continuing his mixtures, till the mathematical ſpecific gravities found by obſervation nearly coincided with thoſe made by calculation. In this table the ſpirit of nitre was mixed with water in various proportions, but after a different manner from that obſerved with the ſpirit of ſalt. Nine grains of the ſpirit containing 3.55 grains of pure acid were mixed with 5.45 of water; the accrued denſity of the mixture was found to be nothing, the mathematical ſpecific gravity 1.537, and the ſpecific gravity by obſervation was found the ſame. When 10 grains of ſpirit were mixed with 6.45 of water, the accrued denſity was 0.009, the mathematical ſpecific gravity 1.458, and the ſpecific gravity by obſervation 1.467. In this manner he proceeded until 38.90 grains of water were mixed with 42.45 of ſpirit. In this caſe the accrued denſity was found to be 0.002, the mathematical ſpecific gravity 1.080, and the ſpecific gravity by obſervation 1.082.

The intermediate ſpecific gravities, in a table of this kind, may be found by taking an arithmetical mean betwixt the ſpecific gravities, by obſervation, betwixt which the deſired ſpecific gravity lies, and noting how much it exceeds or falls ſhort of ſuch arithmetical mean; and then taking alſo an arithmetical mean betwixt the mathematical ſpecific gravities betwixt which that ſought for muſt lie, and a proportionate exceſs or defect.

The ſpecific gravity of the ſtrongeſt ſpirit of nitre yet made, is, according to Mr Baume, 1.500, and according to Mr Bergman 1.586.

Our author next proceeded to examine the proportion

391 Quantity of acid, water, and alkali in nitre determined.

tion of acid, water, and fixed alkali in nitre, in a manner ſimilar to what he had already done with digeſtive ſalt; and found that 100 grains of perfectly dry nitre contained 28.48 grains of acid, 5.2 of water, and 66.32 of fixed alkali.

392 Homberg's experiments compared with thoſe of Mr Kirwan.

Some experiments of the ſame kind had been made by M. Homberg; the reſults of which our author compared with thoſe of his own. The ſpecific gravity of the ſpirit of nitre which M. Homberg made uſe of was 1.349; and of this, he ſays, one ounce two drachms and 36 grains, or 621 troy grains, are required to ſaturate one French ounce (472.5 troy) of dry ſalt of tartar. According to Mr Kirwan's computation, however, 613 grains are ſufficient; for the ſpecific gravity lies between the ſpecific gravities by obſervation 1.362 and 1.337, and is nearly an arithmetical mean between them. The correſponding mathematical ſpecific gravity lies between the quantities marked in Mr Kirwan's table 1.315 and 1.286, being nearly 1.300. Now the proportion of acid and water in this is 2.629 of acid and 7.465 of water; for 8.765—1.300=7.465 of water, and 8.765×.300=2.629 of acid; and the ſum of both is 10.044. Now, ſince 10.5 grains of mild vegetable alkali require 3.53 grains of acid for their ſaturation, 472.5 will require 159.7; therefore if 10.044 grains of nitre contain 2.629 grains acid, the quantity of this ſpirit of nitre requiſite to give 159.7 will be 613.2 nearly, and thus the difference with M. Homberg is only about eight grains.

393 Different reſults of Homberg and Kirwan's experiments accounted for.

M. Homberg ſays he found his ſalt, when evaporated to dryneſs, to weigh 186 grains more than before, but by Mr Kirwan's experiment, it ſhould weigh but 92.8 grains more than at firſt; the cauſe of which difference will be mentioned in treating of vitriolated tartar, as it cannot be entirely attributed to the difference of evaporation.

He alſo aſſerts, that one ounce (472.5 Troy grains) of this ſpirit of nitre contains 141 grains of Troy of real acid. According to Mr Kirwan's computation, however, it contains only 123.08 grains of real acid. But this difference evidently proceeds from his neglecting the quantity of water that certainly enters into the compoſition of nitre; for he proceeds on this analogy, 621 : 186.6 :: 472.5 : 141.

394 Mr Kirwan's experiments confirmed by one of Fontana.

Our author obſerves, that the proportion of fixed alkali aſſigned by him to nitre is fully confirmed by an experiment of Mr Fontana's inſerted in Rozier's Journal for 1778. He decompoſed two ounces of nitre by diſtilling it with a ſtrong heat for 18 hours. After the diſtillation there remained in the retort a ſubſtance purely alkaline, amounting to 10 French drachms and 22 grains. Now two French ounces contain 945 grains Troy, and the alkaline matter 607 grains of the ſame kind: according to Mr Kirwan's computation the two ounces of nitre ought to contain 625 grains of alkali. Such a ſmall difference he ſuppoſes to proceed from the loſs in transferring from one veſſel to another, weighing, filtering, evaporating, *&c.* Mr Kirwan alſo ſhows in a very particular manner the agreement of his calculations with the experiments of M. Lavoiſier on mercury diſſolved in ſpirit of nitre; but our limits will not allow us to inſert an account of them.

When finding the quantity of pure acid contained in oil of vitriol, our author made uſe of ſuch as was not dephlogiſticated; but, though pale, yet a little inclining to red. It contained ſome whitiſh matter, as he preceived by its growing milky on the affuſion of pure diſtilled water; but he imagines it was as pure as the kind uſed in all experiments.

395 Experiments on oil of vitriol.

To 2519.75 grains of this oil of vitriol, whoſe ſpecific gravity was 1.819, he gradually added 180 grains of diſtilled water, and ſix hours after found its ſpecific gravity to be 1.771.—To this mixture he again added 178.75 grains of water, and found its ſpecific gravity, when cooled to the temperature of the atmoſphere, to be 1.719, at which time it was milky. The ſame quantity of the oil of tartar abovementioned was then ſaturated with each of theſe kinds of oil of vitriol in the manner already deſcribed. The ſaturation was effected (taking a medium of five experiments) by 6.5 grains of that whoſe ſpecific gravity was 1.819, by 6.96 grains of that whoſe ſpecific gravity was 1.771, and by 7.41 of that whoſe ſpecific gravity was 1.719.

396 Dilution of oil of vitriol why neceſſary in theſe experiments.

It was found neceſſary to add a certain proportion of water to each of theſe ſorts of oil of vitriol; for when they were not diluted, part of the acid was phlogiſticated, and went off with the fixed air; but knowing the quantity of water that was added, it was eaſy to find by the rule of proportion the quantity of each ſort of vitriol that was taken up by the alkali. Hence it was ſuppoſed, that each of theſe quantities of oil of vitriol of different denſities contained 3.55 grains of acid; as they ſaturated the ſame quantity of vegetable fixed alkali with 11 grains of ſpirit of nitre, which contained that quantity of acid.

397 To find the ſpecific gravity of pure vitriolic acid.

It was next attempted to find the ſpecific gravity of the pure vitriolic acid in a manner ſimilar to that by which the gravity of the nitrous acid was found; as it cannot be had in the ſhape of air, unleſs when united with ſuch a quantity of phlogiſton as quite alters its properties. The loſs of 6.5 grains of oil of vitriol, whoſe ſpecific gravity is 1.819, is $\frac{6.5}{1.819} = 3.572$; but as theſe 6.5 grains contained, beſides 3.55 of acid, 2.95 of water, the loſs of this muſt be ſubtracted from the entire loſs; and then the remainder, or 0.622, is the loſs of the pure acid part in that ſtate or denſity to which it is reduced by its union with water. The ſpecific gravity, therefore, of the pure vitriolic acid, in this ſtate of denſity, is $\frac{3.55}{0.622} = 5.707$. But to find its natural ſpecific gravity, we muſt find how much its denſity is increaſed by its union with this quantity of water: and in order to obſerve this, he proceeded as before with the nitrous acid. 6.96 grains of oil of vitriol, whoſe ſpecific gravity was 1.771, contained 3.55 of acid and 3.41 of water; then its ſpecific gravity by calculation ſhould be 1.726; for the loſs of 3.55 grains of acid is $\frac{3.55}{5.707} = 0.622$; the loſs of 3.41 grains of water is 3.41; the ſum of the loſſes 4.032: then $\frac{6.96}{4.032} = 17.16$; therefore the accrued denſity is 1.771—1.726=0.45. Taking this therefore from 1.819, its mathematical ſpecific gravity will be 1.774. Then the loſs of 6.5 grains of oil of vitriol, whoſe ſpecific gravity by obſervation is 1.819, will be found to be $\frac{6.5}{1.774} = 4.663$; but of this, 2.95 grains are the loſs

of

of the water it contains, and the remainder 0.714 are the loſs of the mere acid part. Then $\frac{3.55}{0.714}$ is nearly the true ſpecific gravity of the pure vitriolic acid. The ſpecific gravity of the moſt concentrated oil of vitriol yet made, is, according to M. Baume and Bergman, 2.125.

398 Quantity of acid, alkali, and water, in vitriolated tartar determined

Mr Kirwan now conſtructed a table of the ſpecific gravities of vitriolic acids, of different ſtrengths, in a manner ſimilar to thoſe conſtructed for ſpirit of ſalt and ſpirit of nitre; but for which, as well as the others, we muſt refer to Phil. Tranſ. vol. 71. He then proceeded to find the proportion of acid, water, and fixed alkali, in vitriolated tartar as he had before done in ſal digeſtivus and nitre.—He found the ſalts reſulting from the ſaturation of the ſame oil of tartar, with portions of oil of vitriol, of different ſpecific gravities, to weigh at a medium 12,45 grains. Of this weight only 11.85 grains were alkali and acid. The remainder, therefore, was water, *viz* 0.6 of a grain. Conſequently 100 grains of perfectly dry tartar vitriolate contain 21.58 grains acid, 4.82 of water, and 66.67 of fixed vegetable alkali.—In drying this ſalt, a heat of 240 degrees was made uſe of, to expel the adhering acid more thoroughly. It was kept in this heat for a quarter of an hour.

399 Difference with Mr Homberg accounted for.

According to Mr Homberg, one French ounce, or 472.5 grains troy, of dry ſalt of tartar, required 297.5 grains troy, of oil of vitriol, whoſe ſpecific gravity was 1.674, to ſaturate it: but by Mr Kirwan's calculation, this quantity of fixed alkali would require 325 grains; a difference which, conſidering the different methods they made uſe of for determining the ſpecific gravities (Homberg's method by menſuration, giving it always leſs than Mr Kirwan's) the different deſiccation of their alkalies, &c. may be accounted inconſiderable.

The ſalt produced, according to Mr Homberg, weighed 182 grains troy above the original weight of the fixed alkali; but by Kirwan's experiment, it ſhould weigh but 87.7 grains more. "It is hard to ſay (adds Mr Kirwan) how Mr Homberg could find this great exceſs of weight, both in nitre and tartar vitriolate; unleſs he meant by the weight of the ſalt of tartar the weight of the mere alkaline part diſtinct from the fixed air it contained: and indeed one would be tempted to think he did make the diſtinction; for in that caſe the exceſs of weight would be nearly ſuch as he determined it."

From Mr Homberg's calculations, he inferred that one ounce (472.5 grains) of oil of vitriol contains 291.7 grains of acid. Mr Kirwan computes the acid only at 213.3 grains; but Homberg made no allowance for the water contained in tartar-vitriolate; and imagined the whole increaſe of weight proceeded from the acid that is united in it to the fixed alkali. Now the aqueous part in 560 grains of tartar vitriolate amounts to 36 grains; the remaining difference may be attributed to the different degrees of deſiccation, &c.

400 Specific gravity of the acetous acid.

On the acetous acid Mr Kirwan did not make any experiment; but by calculating from thoſe of Homberg, he finds that the ſpecific gravity of the pure acetous acid, free from ſuperfluous water, ſhould be 2.30. "It is probable (ſays Mr Kirwan), that its affinity to water is not ſtrong enough to cauſe any irregular increaſe in its denſity; at leaſt what can be expreſſed by three decimals: and hence its proportion of acid and water may always be calculated from its ſpecific quantity and abſolute weight."

401 Specific gravity of ſtrong vinegar.

An hundred parts of foliated tartar, or, as it ſhould rather be called, acetous tartar, contain, when well dried, 32 of fixed alkali, 19 of acid, and 49 parts of water.—The ſpecific gravity of the ſtrongeſt concentrated vinegar yet made is 1.069.—It is more difficult to find the point of ſaturation with the vegetable than with the mineral acids, becauſe they contain a mucilage that prevents their immediate union with alkalies; and hence they are commonly uſed in too great quantity: they ſhould be uſed moderately hot, and ſufficient time allowed them to unite.

402 Vegetable fixed alkali takes up an equal quantity of all the mineral acids.

From all the experiments above related, Mr Kirwan concludes, 1. That the fixed vegetable alkali takes up an equal quantity of the three mineral acids, and probably of all pure acids; for we have ſeen that 8.3 grains of pure vegetable alkali, that is, free from fixed air, take up 3.55 grains of each of theſe acids; and conſequently 100 parts of cauſtic fixed alkali would require 42.4 parts of acid to ſaturate them. But Mr Bergman has found that 100 parts of cauſtic fixed vegetable alkali take up 47 parts of the aerial acid; which, conſidering that his alkali might contain ſome water, differs but little from that already given. It ſhould ſeem, therefore, that alkalies have a certain determined capacity of uniting to acids, that is, to a given weight of acids; and that this capacity is equally ſatiated by a given weight of any pure acid indiſcriminately. This weight is about 2.35 of the vegetable alkali.

403 Quantity of the alkali neceſſary to ſaturate the acids.

2. That the three mineral acids, and probably all pure acids, take up 2.253 times their own weight of pure vegetable alkali, that is, are ſaturated by that quantity.

404 Increaſe of denſity in compound ſubſtances.

405 Why decompoſitions are ſometimes incomplete, and otherwiſe.

406 Why the laſt portions of a ſubſtance obſtinately adhere to that with which it was united.

407 Acids can never totally dephlogiſticate metallic earths.

3. That the denſity accruing to compound ſubſtances, from the union of their compound parts, and exceeding its mathematical ratio, increaſes from a *minimum*, when the quantity of one of them is very ſmall in proportion to that of the other; to a *maximum*, when their qualities differ leſs: but that the attraction, on the contrary, of that part which is in the ſmalleſt quantity to that which is in the greater, is at its maximum when the accrued denſity is at its minimum; but not reciprocally: and hence the point of ſaturation is probably the maximum of denſity and the minimum of ſenſible attraction of one of the parts. Hence no decompoſition operated by means of a ſubſtance that has a greater affinity with one part of a compound than with the other, and than theſe parts have with each other, can be complete, unleſs the minimum affinity of this third ſubſtance be greater than the maximum affinity of the parts already united. Hence alſo few decompoſitions are complete, unleſs a double affinity intervenes; and hence the laſt portions of the ſeparated ſubſtance adhere ſo obſtinately to that with which it was firſt united, as all chemiſts have obſerved.—Thus, though acids have a greater affinity to phlogiſton than the earths of the different metals have to it, yet they can never totally dephlogiſticate theſe earths but only to a certain degree; ſo, though atmoſpheric air, and particularly dephlogiſticated air, attracts phlogiſton more ſtrongly than the nitrous acid does, yet not even dephlogiſticated air can deprive the nitrous acid totally of its phlogiſton; as is evident from the

408 Why precipitates of mercury and alum retain part of the acid.

the red colour of the nitrous acid, when nitrous air and dephlogiſticated air are mixed together. Hence mercury precipitated from its ſolution in any acid, even by fixed alkalies, conſtantly retains a portion of the acid to which it was originally united, as Mr Bayen has ſhown. Thus alſo the earth of alum, when precipitated in like manner from its ſolution, retains part of the acid; and thus ſeveral anomalous decompoſitions may be explained.

409 Alkalies phlogiſticate concentrated acids.

4. That concentrated acids are in ſome meaſure phlogiſticated, and evaporate by union with fixed alkalies.

410 How to determine the quantity of pure acid in any ſubſtance.

5. That, knowing the quantity of fixed alkali in oil of tartar, we may determine the quantity of real pure acid in any other acid ſubſtance that is difficultly decompoſed; as the ſedative acid, and thoſe in vegetables and animals. For 10.5 grains of the mild alkali will always be ſaturated by 3.55 grains of real acid; and reciprocally, the quantity of acid in any acid liquor being known, the quantity of real alkali in any vegetable alkaline liquor may be found.

411 Specific gravity of fixed air determined.

Having thus determined the quantity of acid contained in the liquids of that kind uſually employed in chemiſtry, as well as the ſpecific gravities of the acids themſelves, Mr Kirwan became deſirous of inveſtigating the gravity of fixed and volatile alkalies. But as theſe ſubſtances are not eaſily preſerved from uniting themſelves with fixed air, he was led to conſider the gravity of this in its fixed ſtate, as an element neceſſary for the calculation of the quantities of the alkalies.

412 Specific gravity of fixed vegetable alkali inveſtigated.

To find the ſpecific gravity of the fixed vegetable alkali, our author proceeded in a manner ſimilar to that already deſcribed, excepting that he weighed it in ether inſtead of ſpirit of wine. The reſults of his experiments are.

413 Quantity of earth contained in it.

1. That 100 grains of this alkali contain about 6.7 grains of earth; which, according to Mr Bergman, is ſiliceous. It paſſes the filter along with it when the alkali is not ſaturated with fixed air; ſo that it ſeems to be held in ſolution in the ſame manner as in the *liquor ſilicum.*

414 Quantity of fixed air in oil of tartar and dry vegetable fixed alkali.

415 Mr Watſon's account of the ſpecific gravity of ſalt of tartar, &c.

2. The quantity of fixed air in oil of tartar and dry vegetable fixed alkali is various at various times, and in various parcels of the ſame ſalt; but in the purer alkalies it may be reckoned at a medium 21 grains in 100; and hence the quantity of this alkali may very nearly be gueſſed at in any ſolution, by adding a known weight of any dilute acid to a given weight of ſuch a ſolution, and then weighing it again; for as 21 is to 100, ſo is the weight loſt to the weight of mild alkali in ſuch ſolution. The ſpecific gravity of mild and perfectly dry vegetable fixed alkali, four times calcined, free from ſiliceous earth, and containing 21 *per cent.* of fixed air, was found to be 5.0527. When it contains more fixed air the gravity is probably higher, except when it is not perfectly dry; and hence the ſpecific gravity of this alkali, when cauſtic, was ſuppoſed by Mr Kirwan to be 4.234. For this reaſon the fixed alkalies, when united to aerial acid, are ſpecifically heavier than when united either to the vitriolic or nitrous. Thus Mr R. Watſon, in the Philoſophical Tranſactions for 1770, informs us, that he found the ſpecific gravity of dry ſalt of tartar, including the ſiliceous earth it naturally contains, to be 2.761; whereas the ſpecific gravity of vitriolated tartar was only 2.636, and that of nitre 1.933. The reaſon why nitre is ſo much lighter than tartar vitriolate is, that it contains much more water, and the union of the acid with the water is leſs intimate.

416 Why nitre is ſo much lighter than vitriolated tartar.

417 Quantity of fixed air in pure vegetable alkalies determined by Mr Cavendiſh.

Impure vegetable fixed alkalies, ſuch as pearl-aſh, potaſhes, &c. contain more fixed air than the purer kind. According to Mr Cavendiſh, pearl-aſh contains 28.4 or 20.7 *per cent.* of fixed air. Hence in lyes made from theſe ſalts, of equal ſpecific gravities with thoſe of a purer alkali, the quantity of ſaline matter will probably be in the ratio of 28.4 or 28.7 to 21; but this additional weight is only fixed air. Much alſo depends on their age; the oldeſt containing moſt fixed air. Our author alſo gives a table of the ſpecific gravities of different ſolutions of vegetable fixed alkali, in a manner ſimilar to what he had done before with the acids. He begins with 64.92 grains of a ſolution containing 26.25 grains of ſalt, and 38.67 of water. The accrued denſity he finds to be .050, the mathematical ſpecific gravity 1.445, and the ſpecific gravity by obſervation 1.495. By continually diluting the ſolution containing the ſame quantity of ſalt, he brings the abſolute weight of it at laſt to 341.94 grains, of which 317.49 are water; the accrued denſity 0.01, the mathematical ſpecific gravity 1.061, and the ſpecific gravity by obſervation 1.062.

418 Quantity of acid taken up by mild fixed alkali exactly determined.

419 Of the quantity of ingredients in vitriolated tartar;

420 In nitre;

421 In digeſtive ſalt.

In a ſubſequent paper on this ſubject, Philoſophical Tranſactions, vol. 72, p. 179, our author corrects a ſmall miſtake concerning the quantity of acid taken up by 10.5 grains of mild vegetable alkali. In his former computations he had made no allowance for the ſmall quantity of earth contained in this quantity of alkali; which, though inconſiderable in it, becomes of conſequence where the quantities are large. The error, however, occaſioned by this omiſſion, is ſenſible in his calculations concerning the quantities of acid alkali, &c. contained in the neutral ſalts, as well as in that concerning the vegetable alkali. When the correction is properly made, he ſays, it will be found that 100 grains of ſuch alkali, free from earth, water, and fixed air, take up 46.77 of the mineral acids, that is, of the mere acid part; and 100 grains of common mild vegetable alkali take up 36.23 grains of real acid. An hundred grains of perfectly dry tartar vitriolate contain 30.21 of real acid, 64.61 of fixed alkali, and 5.18 of water. Cryſtallized tartar vitriolate loſes only one *per cent.* of water in a heat in which its acid is not ſeparated in any degree; and therefore contains 6.18 of water. An hundred grains of nitre, perfectly dry, contain 30.86 of acid, 66 of alkali, and 3.14 of water; but in cryſtallized nitre the proportion of water is ſomewhat greater; for 100 grains of thoſe cryſtals being expoſed to a heat of 180° for two hours, loſt three grains of their weight without exhaling any acid ſmell; but when expoſed to a heat of 200 degrees, the ſmell of the nitrous acid is diſtinctly perceived. Hence 100 grains of cryſtallized nitre contain 29.89 of mere acid, 63.97 of alkali, and 6.14 of water. An hundred grains of digeſtive ſalt perfectly dry, contain 29.68 of marine acid, 63.47 of alkali, and 6.85 of water. One hundred grains of cryſtallized digeſtive ſalt loſe but one grain of their weight before the ſmell of the marine acid is perceived; and hence they contain 7.85 grains of water.

Another miſtake, more difficult to be corrected, was his ſuppoſing the mixtures of oil of vitriol and water, and ſpirit of nitre and water, had attained their maximum of denſity when they had cooled to the temperature of the atmoſphere; which at the time he made the experiment was between 50° and 60° of Fahrenheit.

422 Time required by mixtures of mineral acids and water to acquire their utmoſt denſity.

The mixture with oil of vitriol had been ſuffered to ſtand ſix hours; but when the acid was ſo much diluted as to occaſion little or no heat, it was allowed to ſtand only for a very little time. Several months afterwards, however, many of theſe mixtures were found much denſer than when he firſt examined them; and it was diſcovered, that at leaſt twelve hours reſt was neceſſary before concentrated oil of vitriol, to which even twice its weight of water is added, can attain its utmoſt denſity; and ſtill more when a ſmaller proportion of water is uſed. Thus when he made the mixture of 2519.75 grains of oil of vitriol, whoſe ſpecific gravity was 1.819, with 180 of water, he found its denſity ſix hours after 1.771, but after 24 hours it was 1.798: and hence, according to the methods of calculating already laid down, the accrued denſity was at leaſt .064 inſtead of .045. But by uſing oil of vitriol ſtill more concentrated, whoſe ſpecific gravity was 1.8846, he was enabled to make a ſtill nearer approximation; and found, that the accrued denſity of oil of vitriol, whoſe ſpecific gravity is 1.819, amounts to 0.104, and conſequently its mathematical ſpecific gravity is 1.715. Six grains and a half of this oil of vitriol contained, as has been already obſerved, 3.55 of mere acid, and the remainder was water. The weight of an equal bulk of water is 3.79 grains; and ſubtracting from this the weight of the water that enters into the compoſition of the oil of vitriol, it will be found, that the weight of a bulk of water equal to the acid part is 0.84; and conſequently the ſpecific gravity of the mere acid part is 4.226. Thus, by conſtantly allowing the mixtures to reſt at leaſt 12 hours, until the oil of vitriol was diluted with four times its weight of water, and then only ſix hours before the denſity of the mixtures was examined, he conſtructed another table, in which 1000 grains of liquor contained 612.05 of pure acid, 387.95 of water, the accrued denſity being .07, and the mathematical ſpecific gravity 1.877. Increaſing the quantity of water till the acid weighed 7000 grains, and the water 6387.95, he found the accrued denſity .059, and the mathematical ſpecific gravity 1.069. By a ſimilar correction of his experiments on the acid of nitre, he found its denſity to be 5.530; a ſimilar table was conſtructed for it, for which we refer our readers to the 72d volume of the Philoſophical Tranſactions.

423 Alteration of the denſity of acids by various degrees of heat.

Theſe experiments were made when the thermometer ſtood between 50° and 60° of Fahrenheit; but, as it might be ſuſpected that the denſity of acids is conſiderably altered at different degrees of temperature, he endeavoured to find the quantity of this alteration in the following manner: To calculate what this denſity would be at 55°, he took ſome dephlogiſticated ſpirit of nitre, and examined its ſpecific gravity at different degrees of heat; which was found to be as follows,

Degrees of heat.	Specific gravity.
30	1.4653
46	1.4587
86	1.4302
120	1.4123

The total expanſion of this ſpirit of nitre, therefore, from 30 to 120 degrees, that is, by 90° of heat, was 0.0527; for 1.4650=4123+.0527. By which we ſee, that the dilatations are nearly proportional to the degrees of heat: for beginning with the firſt dilatation from 30 to 46 degrees, that is, by 16 degrees of heat, we find that the difference between the calculated and obſerved dilatations is only $\frac{30}{1000}$; a difference of no conſequence in the preſent caſe, and which might ariſe from the immerſion of the cold glaſs-ball filled with mercury in the liquor. In the next caſe the difference is ſtill leſs, amounting only to $\frac{21}{10000}$.

With another, and ſomewhat ſtronger ſpirit of nitre, the ſpecific gravities were as follow:

Degrees of heat.	Specific gravity.
34	1.4750
49	1.4653
150	1.3792

Here alſo the expanſions were nearly proportional to the degrees of heat; for 116° of heat, the difference between 34 and 150, produce an expanſion of 0.0958; and 15° of heat, the difference between 34 and 49, produce an expanſion of 0.0097; and by calculation 0.0123: which laſt differs from the truth only by $\frac{21}{10000}$.

484 Strong ſpirit of nitre more expanded by heat than weak, and why.

From this experiment we ſee, that the ſtronger the ſpirit of nitre is, the more it is expanded by the ſame degree of heat; for if the ſpirit of nitre of the laſt experiment were explained in the ſame proportion as in the former, its dilatation, by 116 degrees of heat, ſhould be 0.0679; whereas it was found to be 0.0958.

As the dilatation of the ſpirit of nitre is far greater than that of water by the ſame degree of heat, and as it conſiſts only of acid and water; it clearly follows, that its ſuperior dilatability muſt be owing to the acid part: and hence the more acid that is contained in any quantity of ſpirit of nitre, the greater is its dilatability. We might therefore ſuppoſe, that the dilatation of nitre was intermediate betwixt the quantity of water it contains and that of the acid. But there exiſts another power alſo which prevents this ſimple reſult, *viz.* the attraction of the acid and water to each other, which makes them occupy leſs ſpace than the ſum of their joint volumes; and by this condenſation our author explains his phraſe of *accrued denſity*.

425 Exact quantity of dilatation of ſpirit of nitre.

Taking this into the account, we may conſider the dilatation of the ſpirit of nitre as equal to thoſe of the quantities of water and acid it contains, minus the condenſation they acquire from their mutual attraction; and this rule holds as to all other heterogeneous compounds.

426 Of the quantities of acid and water contained in ſpirit of nitre.

To find the quantities of acid and water in ſpirit of nitre, whoſe ſpecific gravity was found in degrees of temperature different from thoſe for which the table was conſtructed, viz. 54°, 55°, or 56° of Fahrenheit, the ſureſt method is to find how much that ſpirit of nitre is expanded or condenſed by a greater or leſſer degree of heat; and then, by the rule of proportion, find what its denſity would be at 55°. But if this cannot be done, we ſhall approach pretty near the truth if we allow $\frac{10}{1000}$ for every 15° degrees of heat above or below 55° of Fahrenheit, when the ſpecific gravity is between 1.400 and 1.500, and $\frac{8}{1000}$ when the ſpecific gravity is between 1.600 and 1.800.—The dilatations of oil and ſpirit of vitriol were found to be exceedingly irregular, probably by reaſon of a white foreign matter, which is more or leſs ſuſpended or diſſolved in it, according to its greater or leſſer dilution; and

and this matter our author did not ſeparate, as he intended to try the acid in the ſtate in which it is commonly uſed. In general he found that 15° of heat cauſed a difference of above $\frac{8}{1000}$ in its ſpecific gravity, when it exceeds 1.800, and of $\frac{3}{10000}$ when its ſpecific gravity is between 1.400 and 1.300—The dilatations of ſpirit of ſalt are very nearly proportional to the degrees of heat, as appears by the following table.

427
Dilatation of ſpirit of ſalt by various degrees of heat.

Degrees of heat,	Specific gravity.
33	1.1916
54	1.1860
66	1.1820
128	1.1631

Hence $\frac{6}{10000}$ ſhould be added or ſubtracted for every 21° above or below 55°, in order to reduce it to 55°, the degree for which its proportion of acid and water was calculated. The dilatability of this acid is much greater than that of water, and even than that of the nitrous acid of the ſame denſity.

428
Quantity of pure acid taken up by various ſubſtances.

429
Mineral alkali how prepared for theſe experiments.

Our author next proceeds to conſider the quantity of pure acids taken up at the point of ſaturation by the various ſubſtances they unite with.—He begins with the mineral alkali. Having rendered a quantity of this cauſtic in the uſual manner, and evaporating one ounce of the cauſtic ſolution to perfect dryneſs, he found it to contain 20.25 grains of ſolid matter. He was aſſured, that the watery part alone exhaled during evaporation, as the quantity of fixed air contained in it was very ſmall, and to diſſipate this a much greater heat would have been requiſite than that which he uſed. This dry alkali was diſſolved in twice its weight of water; and ſaturating it with dilute vitriolic acid, he found it to contain 2.25 grains of fixed air; that being the weight which the ſaturated ſolution wanted of being equal to the joint weights of water, alkali, and ſpirit of vitriol employed.

430
Quantity of vitriolic acid neceſſary to ſaturate it.

The quantity of mere vitriolic acid neceſſary to ſaturate 100 grains of pure mineral alkali was found to be 60 or 61 grains; the ſaturated ſolution thus formed being evaporated to perfect dryneſs weighed 36.5 grains; but of this weight only 28.38 were alkali and acid; the remainder, that is, 8.12 grains, therefore, were water. Hence 100 grains of Glauber's ſalt, perfectly dried, contained 29.12 of mere vitriolic acid, 48.6 of mere alkali, and 22.28 of water. But Glauber's ſalt cryſtallized contains a much larger proportion of water; for 100 grains of theſe cryſtals heated red hot loſt 55 grains of their weight; and this loſs Mr Kirwan ſuppoſes to ariſe merely from the evaporation of the watery part, and the remaining 45 contained alkali, water, and acid, in the ſame proportion as the 100 grains of Glauber's ſalt perfectly dried abovementioned. Then theſe 45 contained 13.19 grains of vitriolic acid, 21.87 of fixed alkali, and 9.94 of water: conſequently 100 grains of cryſtallized Glauber's ſalt contains 13.19 of vitriolic acid, 21.87 of alkali, and 64.94 of water.

431
Quantity of ingredients in Glauber's ſalt.

432
Quantity of mineral alkali taken up by dephlogiſticated nitrous acid;

On ſaturating the mineral alkali with dephlogiſticated nitrous acid, it was found that 100 grains of the alkali took up 57 of the pure acid in the experiment he moſt depended upon; though in ſome others this quantity varied by a few grains: he concludes, therefore, that the quantity of alkali taken up by this acid is nearly the ſame as that taken up by the vitriolic. Suppoſing this quantity to be 57 grains, then 100 grains of cubic nitre, perfectly dry, contain 30 of acid, 52.18 of alkali, and 17.82 of water: but cubic nitre cryſtallized contains ſomething more water; for 100 grains of theſe cryſtals loſe about four by gentle drying; therefore 100 grains of the cryſtallized ſalt contain 28.8 of acid, 50.09 of alkali, and 21.11 of water.

433
By marine acid.

An hundred grains of mineral alkali require from 63 to 66 or 67 grains of pure marine acid to ſaturate it; but Mr Kirwan ſuppoſes that one reaſon of this variety is, that it is exceeding hard to hit the true point of ſaturation. Allowing 66 grains to be the quantity required, then 100 grains of perfectly dry common ſalt contain nearly 35 grains of real acid, 53 of alkali, and 13 of water; but 100 grains of the cryſtallized ſalt loſe five by evaporation; ſo that 100 grains of theſe cryſtals contain 33.3 of acid, 50 of alkali, and 16.7 of water.

434
Proportion of fixed air, alkali, and water, inveſtigated by this ſaturation.

The proportion of fixed air, alkali, and water, was thus inveſtigated: 200 grains of theſe cryſtals were diſſolved in 240 of water; the ſolution was ſaturated by ſuch a quantity of ſpirit of nitre as contained 40 of pure nitrous acid; whence it was inferred that theſe 200 grains of ſalt of ſoda contained 70 of pure alkaline ſalt. The ſaturated ſolution weighed 40 grains leſs than the ſum of its original weight, and that of the ſpirit of nitre added to it; conſequently it loſt 40 grains of fixed air. The remainder of the original weight of the cryſtals therefore muſt have been water, *viz.* 90 grains. Conſequently 100 grains of theſe cryſtals contained 35 of alkali, 20 of fixed air, and 45 of water. This proportion differs conſiderably from that aſſigned by Mr Bergman and Lavoiſier, which our author imputes to their having made uſe of ſoda recently cryſtallized; but Mr Kirwan's had been made for ſome months, and probably loſt much water and fixed air by evaporation, which altered the proportion of the whole. According to the calculations of Bergman and Lavoiſier, 100 grains of this alkali take up 80 of fixed air. The ſpecific gravity of the cryſtallized mineral alkali, weighed in ether, found to be 1.421.

435
Differences with M. Bergman and Lavoiſier accounted for.

436
Proportions of ingredients in volatile alkalies.

The proportion of the different ingredients in volatile alkalies can only be had from the experiments lately made by Dr Prieſtley concerning alkaline air. He informs us, that $\frac{6}{10}$ of a meaſure of this, and one meaſure of fixed air, ſaturate one another. Then, ſuppoſing the meaſure to contain 100 cubic inches, 185 cubic inches of alkaline air take up 100 of fixed air; but 185 cubic inches of alkaline air weigh at a medium 42.55 grains, and 100 cubic inches of fixed air weigh 57 grains; therefore 100 grains of pure volatile alkali, free from water, take up 134 of fixed air.

On expelling its aerial acid from a quantity of this volatile alkali in a concrete ſtate, and formed by ſublimation, he found, that 53 grains of it were fixed air: according to the preceding calculation, 100 grains of it ſhould contain 39.47 of real alkali, and 7.53 of water, the reſt being fixed air.—On ſaturating a quantity with the vitriolic, nitrous, and marine acids, 100 grains of the mere alkali were found to take up 106 of mere vitriolic acid, 115 of the nitrous, and 130 of the marine acid. The ſpecific gravity of the volatile alkali

alkali weighed in ether (B) was 1.4076. The proportion of water in the different ammoniacal ſalts could not be found on account of their volatility; but was ſuppoſed to be very ſmall, as both volatile alkali and fixed air cryſtallize without the help of water when in an aerial ſtate.

437 Experiments on calcareous earth.

In making experiments on calcareous earth, it was firſt diſſolved in nitrous acid; and after allowing for the loſs of fixed air and water, 100 grains of the pure earth was found to take up 104 of nitrous acid; but only 91 or 92 of mere vitriolic acid were required to precipitate it from the nitrous ſolution.

438 Quantity of marine acid ſaturated by this earth.

Of the marine acid 100 grains of the pure calcareous earth require 112 for their ſolution. The liquor at firſt is colourleſs, but acquires a greeniſh colour by ſtanding.

439 Proportion of ingredients in natural gypſum;

Natural gypſum varies in its proportion of acid, water, and earth; 100 grains of it containing from 32 to 34 of acid and likewiſe of earth, and from 26 to 32 of water. The artificial gypſum contains 32 of earth, 29.44 of acid, and 38.56 of water. When well dried, it loſes about 24 of water; and therefore contains 42 of earth, 39 of acid, and 19 of water, *per* hundred.

440 In nitrous ſelenite;

Nitrous ſelenite (ſolution of calcareous earth in nitrous acid) carefully dried, contains 33.28 of acid, 32 of earth, and 34.72 of water.

441 In marine ſelenite.

The ſame quantity of marine ſelenite (ſolution of calcareous earth in marine acid), well dried, in ſuch a manner as to loſe no part of the acid, contain of the latter 42.56, of earth 38, and of water 19.44.

442 Calcined magneſia will not diſſolve in acids without heat.

Magneſia, when perfectly dry and free from fixed air, cannot be diſſolved in any of the acids without heat. Even the ſtrongeſt nitrous acid did not act upon it in 24 hours in the temperature of the atmoſphere; but in a heat of 180°, the mineral acids, diluted with four, or even ſix, times their quantity of water, had a very ſenſible effect upon it; but the quantity of acid diſſipated by heat rendered it impoſſible to aſcertain how much was neceſſary for ſolution, except by precipitation after it had been diſſolved. For this purpoſe the cauſtic vegetable alkali was employed; by which it appeared that 100 grains of pure magneſia take up 125 of mere vitriolic acid, 132 of the nitrous, and 140 of the marine. All of theſe ſolutions appeared to contain ſomething gelatinous; but none of them reddened vegetable blues; and that in the marine acid became greeniſh on ſtanding for ſome time.

443 Proportion of the ingredients in common Epſom ſalt;
444 In nitrous Epſom.
445 Cannot be found in marine Epſom.

An hundred grains of perfectly dry Epſom ſalt contain 45.67 of mere vitriolic acid, 36.54 of pure earth, and 17.83 of water. Solution of common Epſom ſalt, however, reddens vegetable blues, and therefore contains an exceſs of acid. A like quantity of nitrous Epſom, well dried, contains 35.64 of acid, 27 of pure earth, and 37.36 of water. The ſolution of marine Epſom cannot be tolerably dried without loſing much of its acid together with the water. The ſpecific gravity of this earth is 2.3296.

446 Earth of alum contains a great quantity of fixed air.

Moſt writers on chemiſtry have ſaid that earth of alum contains ſcarce any fixed air; but Mr Kirwan found that it contained no leſs than 26 *per cent.* though it had been previouſly kept red-hot for half an hour. It diſſolved with a moderate efferveſcence in acids until the heat was raiſed to 220°; after which the ſolution was found to have loſt weight in the proportion abovementioned.

447 Quantity of ingredients in alum.
448 This ſalt always contains an exceſs of acid.
449 Proportion of pure earth of alum taken up by nitrous acid;
450 By marine acid.

An hundred grains of this earth, deprived of the fixed air, require 133 of the pure vitriolic acid to diſſolve them. The ſolution was made in a very dilute ſpirit of vitriol, whoſe ſpecific gravity was 1.093, and in which the proportion of acid to the water was nearly as 1 to 14. It contained a ſlight exceſs of acid, turning the vegetable blues to a browniſh red; but it cryſtallized when cold, and the cryſtals were of the form of alum. Our author, therefore, is of opinion, that this is the true proportion of acid and earth to be uſed in the formation of that ſalt, though there was not water enough to form large cryſtals. Perceiving that the liquor contained an exceſs of acid, more earth was added; but thus it was found impoſſible to prevent it from tinging vegetable blues of a red colour until a precipitation was formed: and even when this was the caſe, though one part of the ſalt fell in the form juſt mentioned, yet the reſt would ſtill redden vegetable blues as before; though here our author doubts whether this be a mark of acidity. An hundred grains of alum, when dried, contain 42.74 of acid, 32.14 of earth, and 25.02 of water; but cryſtallized alum loſes 44 *per cent.* by deſiccation: therefore 100 grains of it contain 23.94 of acid, and 58.06 of water. An hundred grains of this pure earth take up, as near as can be judged, 153 of pure nitrous acid. The ſolution ſtill reddened vegetable blues; but after the above quantity of earth was added, an inſoluble ſalt began to precipitate. The ſolution, when cold, became turbid, and could not be rendered quite clear by 500 times its quantity of water. An hundred and ſeventy-three grains of pure marine acid are required for the diſſolution of 100 grains of earth of alum, but the liquor ſtill reddened vegetable blues. After this an inſoluble ſalt was formed; but it is difficult to aſcertain the beginning of its formation preciſely both in this and the preceding caſes. The ſpecific gravity of pure argillaceous earth, containing 25 *per cent.* of fixed air, is 1.9901.

451 Experiments on metals.
452 Beſt method of diſſolving them.

In the experiments made by our author on metals, the acids employed were ſo far dephlogiſticated as to be colourleſs; the metals were for the moſt part reduced to filings, or to fine powder in a mortar. They were added by little and little to their reſpective menſtrua; much more being thus diſſolved than if the whole had been thrown in at once, and the ſolution was performed in glaſs vials with bent tubes.

453 Proportion of iron taken up by the vitriolic acid.

An hundred grains of bar-iron, in the temperature of 56°, require for their ſolution 190 grains of the real acid, whoſe proportion to that of the water, with which it ſhould be diluted, is as 1 to 8, 10, or 12. It would act on iron, though its proportion were greater or leſſer, though not ſo vigorouſly; but by applying a heat of 200° towards the end, 123 grains of

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(B) The fixed and volatile alkalies were weighed in ether on account of their great ſolubility in water.

of real acid would be ſufficient. The air produced by this ſolution is entirely inflammable, and generally amounts to 115 cubic inches.

454 Quantity of inflammable air produced.

By the aſſiſtance of a ſtrong heat, iron is alſo ſoluble in the concentrated vitriolic acid, though in ſmaller quantity; and inſtead of inflammable air, a large quantity of vitriolic air is produced, and a little ſulphur is ſublimed towards the end.

455 Why vitriolic air is produced by diſſolving iron in concentrated oil of vitriol.

The reaſon of this is, that the concentrated vitriolic acid, containing much leſs ſpecific fire than the dilute kind, cannot expel the phlogiſton in the form of inflammable air (which abſorbs a vaſt quantity of fire), but unites with it when further dephlegmated by heat, and thus forms both vitriolic air and ſulphur. An hundred grains of iron diſſolved without heat afford more than 400 of vitriol; and 100 grains of vitriol, when cryſtallized, contain 25 of iron, 20 of real acid, and 55 of water. When calcined nearly to redneſs, theſe cryſtals loſe about 40 *per cent.* of water.

456 Solution of the calces of iron in vitriolic acid.

The calces of iron are ſoluble in the vitriolic acid according to the quantity of phlogiſton they contain; the more phlogiſticated being more readily ſoluble, and thoſe which are dephlogiſticated leſs ſo. The latter not only require more real acid for their ſolution, but afford only a thick liquor or magma by evaporation, inſtead of cryſtals like the others.

457 That of the dephlogiſticated calces of iron refuſes to cryſtallize.

Hence alſo ſolutions of iron, when newly made, diminiſh, and conſequently phlogiſticate, the ſuperincumbent air by their gradual emiſſion of phlogiſton; at the ſame time that the calx, becoming more and more dephlogiſticated, gradually falls to the bottom, unleſs more acid be added to keep it in ſolution.

458 Proportion of iron diſſolved in nitrous acid.

An hundred grains of iron require for their ſolution in nitrous acid 142 grains of real acid, ſo diluted that its proportion to water ſhould be as 1 to 13 or 14; and when this laſt proportion is uſed, the heat of a candle may be employed for a few ſeconds, and the acceſs of common air prevented. Thus about 18 cubic inches of nitrous air are produced, the reſt being abſorbed by the ſolution, and no red vapours appear. But if the proportion of acid and water be as 1 to 8 or 10, a much greater quantity of metal will be dephlogiſticated by the application of heat, though very little of it be held in ſolution

459 Quantity of nitrous air obtained from this ſolution.

Thus, from 100 grains of iron Mr Kirwan has obtained 83.87 cubic inches of nitrous air; and by diſtilling the ſolution, a ſtill greater quantity may be obtained which had been abſorbed.

460 Why no inflammable air is here produced.

The reaſon that nitrous ſolutions of iron or other metals yield no inflammable air is, becauſe this acid has leſs affinity to water, and more to phlogiſton, than the vitriolic, and likewiſe contains much leſs fire than either that or the marine (ſee n° 278); and therefore unites with phlogiſton, inſtead of barely expelling it.

461 Vitriolic acid acts on iron in a much more dilute ſtate than nitrous.

Hence alſo the vitriolic acid, though united with 30 times its weight of water, will ſtill viſibly act on iron, and ſeparate inflammable air in the temperature of 55°; whereas nitrous acid, diluted with 15 times its weight of water, has no perceptible effect on the metal in that temperature. The calces of iron, if not too much dephlogiſticated, are alſo ſoluble in the nitrous acid.

462 Iron taken up by the marine acid.

Two hundred and fifteen grains of real marine acid are required for the ſolution of 100 grains of iron. When the proportion of water to the acid is as four to one, it efferveſces rather too violently with the metal; and heat is rather prejudicial, as it volatilizes the acid. No marine air flies off; and the quantity of inflammable air is exactly the ſame as with diluted vitriolic acid.

463 Calces of iron precipitated of a reddiſh colour from their ſolution in marine acid.

The calces of iron are alſo ſoluble in marine acid, and may be diſtinguiſhed by their reddiſh colour when precipitated by fixed alkalies, while the precipitates of the metal are greeniſh.

464 Proportion of copper diſſolved by vitriolic acid.

An hundred and eighty-three grains of real vitriolic acid are required to diſſolve an hundred grains of copper; the proportion of acid to that of water being as 1 to 1.5, or at leaſt as 1 to 1.7; and a ſtrong heat muſt alſo be applied. Mr Kirwan ſays he never could diſſolve the whole quantity of copper; but to diſſolve a given quantity of it, a ſtill greater heat muſt be employed in the proportion of 28 to 100; but this reſiduum alſo is ſoluble by adding more acid. Copper dephlogiſticated in this manner is ſoluble by adding warm water to the maſs.

465 Inflammable and vitriolic acid air obtained from ſolution of copper in vitriolic acid.

By treating 128 grains of copper in this manner, we obtain 11 cubic inches of inflammable air and 65 of vitriolic acid air. When inflammable air was obtained, however, our author tells us the acid was a little more aqueous.

466 Why this metal cannot be acted upon by dilute vitriolic acid.

The reaſon why copper cannot be dephlogiſticated by dilute vitriolic acid, or even by the concentrated kind without the aſſiſtance of heat, is its ſtrong attraction to phlogiſton, and the great quantity it contains.

An hundred grains of vitriol of copper contain 27 of metal, 30 of acid, and 43 of water; 28 of which laſt are loſt by evaporation or ſlight calcination. An hundred grains of copper, when diſſolved, afford 373 of blue vitriol.

467 Proportion of ingredients in blue vitriol.

An hundred grains of copper require 130 of pure nitrous acid for their diſſolution. If the acid be ſo far diluted that its proportion of water be as 1 to 14, the aſſiſtance of heat will be neceſſary, but not otherwiſe. This ſolution affords 67½ inches of nitrous air.—The calces of copper are ſoluble in the nitrous acid.

468 Quantity of copper diſſolved by nitrous acid.

A like quantity of this metal requires 1190 grains of real marine acid, as well as the aſſiſtance of a moderate heat, to diſſolve them; the proportion of water being as 4⅓ to 1. By employing a greater heat, more of the acid will be requiſite, as much more will be diſſipated: the concentrated acid acts more vigorouſly.—Calces of copper are likewiſe ſoluble in the marine acid, though leſs eaſily than in the nitrous.

469 In marine acid.

470 Action of the vitriolic acid in tin.

The vitriolic acid diſſolves tin but in ſmall quantity; an hundred grains of the metal requiring for their ſolution 872 of real acid, whoſe proportion to water ſhould not be leſs than 1 to 0.9. A ſtrong heat is alſo required. When the action of the acid has ceaſed, ſome hot water ſhould be added to the turbid ſolution, and the whole again heated. The metal is ſoluble in a more dilute acid, but not in ſuch quantity.—The ſolution abovementioned affords 70 cubic inches of inflammable air.—The calces of tin, excepting that precipitated from marine acid by fixed alkalies, are inſoluble in the vitriolic acid.

471 Inflammable air obtained from the ſolution.

472 Tin diſſolved in nitrous acid.

An hundred grains of tin require 1200 of real nitrous acid; whoſe proportion of water ſhould be at leaſt 25 to 1, and the heat employed not exceeding 60°. The quantity of air afforded by ſuch ſolution is only 10 cubic inches, and it is not nitrous. The ſolution

lution is not permanent; for in a few days it depoſites a whitiſh calx, and in warm weather burſts the vial. The calces of tin are inſoluble in this acid.

473 In marine acid.

Four hundred and thirteen grains of pure marine acid are required to diſſolve 100 grains of tin, the proportion of water being as $4\frac{1}{2}$ to 1. The aſſiſtance of a moderate heat is alſo required. About 90 cubic inches of inflammable, and 10 of marine air, are afforded by the ſolution; but the calces of tin are nearly inſoluble in this acid.

474 Lead with vitriolic acid.

An hundred grains of lead require 600 grains of real vitriolic acid for their ſolution, the proportion being not leſs than 1 of acid to $\frac{7}{10}$ of water; and it will ſtill be better if the quantity of water be leſs: for which reaſon, as in copper, a greater quantity of metal ſhould be employed than what is expected to be diſſolved. A ſtrong heat is alſo requiſite; and hot water ſhould be added to the calcined maſs, though in ſmall quantity, as it occaſions a precipitation.

475 Scarce ſoluble in dilute vitriolic acid.

—This metal is alſo ſoluble, but very ſparingly, in dilute vitriolic acid. Its calces are ſomething more ſoluble. An hundred grains of vitriol of lead, formed by precipitation, contain 73 of lead, 17 of real acid, and 10 of water.

476 With nitrous acid.

With ſpirit of nitre, 78 grains of real acid are required for the ſolution of 100 of lead, with the aſſiſtance of heat towards the end. The proportion of acid to that of water may be about 1 to 11 or 12. This ſolution produces but eight cubic inches of air, which is nitrous. The calces of the metal are ſoluble in this acid; but leſs ſo when much dephlogiſticated. An hundred grains of minium require 81 of real acid. An hundred grains of nitrous ſalt of lead contain about 60 of the metal.

477 With marine acid.

Six hundred grains of the real marine acid are required for the ſolution of 100 grains of lead; the ſpecific gravity of the acid being 1.141, though more would be diſſolved by a ſtronger acid.—The calces of lead are more ſoluble in this acid than the metal itſelf. An hundred grains of minium require 327 of real acid; but white lead is much leſs ſoluble. The ſame quantity of plumbum corneum, formed by precipitation, contain 72 of lead, 18 of marine acid, and 10 of water.

478 Silver with vitriolic acid.

An hundred grains of ſilver require 530 of real vitriolic acid to diſſolve them; the proportion of acid to water being not leſs than as 1 to $\frac{8}{10}$: and when ſuch a concentrated acid is uſed, it acts ſlightly even in the temperature of 60°; but a moderate heat is required in order to procure a copious ſolution. The calces of ſilver formed by precipitation from the nitrous acid with fixed alkalies are ſoluble even in dilute vitriolic acid without the aſſiſtance of heat. An hundred grains of vitriol of ſilver, formed by precipitation, contain 74 grains of metal, about 17 of real acid, and 9 of water.

479 With nitrous acid.

An hundred grains of the pureſt ſilver require for their ſolution 36 of nitrous acid, diluted with water in the proportion of one part of real acid to ſix of water, applying heat only when the ſolution is almoſt ſaturated. If the ſpirit be much more or much leſs dilute, it will not act without the aſſiſtance of heat. The laſt portions of ſilver thus taken up afford no air. Standard ſilver requires about 38 grains of real acid to diſſolve the ſame proportion of it; and the ſolution affords 20 cubic inches of nitrous air; whereas 100 grains of ſilver revived from luna cornea afford about 14.

Mr Kirwan has never been able to diſſolve ſilver in the marine acid, though Mr Bayen ſays he effected the diſſolution of three grains and a half of it by digeſtion ſome ſome days with two ounces of ſtrong ſpirit of ſalt.

480 Of the diſſolution of ſilver in marine acid.

Newman informs us alſo, that leaf-ſilver is corroded by the concentrated marine acid. It is diſſolved, however, by the dephlogiſticated ſpirit of ſalt, as well as by the phlogiſticated acid when reduced to a ſtate of vapour. An hundred grains of luna cornea contain 75 of ſilver, 18 of acid and 7 of water.

481 Beſt kind of aqua regia for diſſolving gold.

Mr Kirwan found that kind of aqua regia to ſucceed beſt in the diſſolution of gold, which was prepared by mixing together three parts of the real marine acid with one of the nitrous acid. Both of them ought alſo to be as concentrated as poſſible; though, when this is the caſe, it is almoſt impoſſible to prevent a great quantity from eſcaping, as a violent effervеſcence takes place for ſome time after the mixture. Aqua regia made with common ſalt or ſal ammoniac and ſpirit of nitre, is much leſs aqueous than that proceeding from an immediate combination of both acids; and hence it is the fitteſt for producing cryſtals of gold. Very little air is produced by the ſolution of this metal, and the operation goes on very ſlow. It is, however, better promoted by allowing it ſufficient time, than by applying heat.

482 Quantity of gold taken up by aqua regia.

An hundred grains of gold require for their ſolution 246 grains of real acid, the two acids being in the proportion abovementioned. Though ſoluble in the dephlogiſticated marine acid, it is only in very ſmall quantity, unleſs the acid be in a ſtate of vapour; for in its liquid ſtate it is too aqueous.

483 Calces of gold ſoluble in the vitriolic and nitrous acids.

In vitriolic and nitrous acids it is inſoluble, tho' the calces are ſomewhat ſoluble in the nitrous, more eaſily in the marine, but ſcarcely at all in the vitriolic acid.

484 Gold cannot, according to Kirwan, be diſſolved in nitrous acid.

Mr Kirwan ſays, that gold in its metallic ſtate may be diffuſed through the concentrated nitrous acid, tho' not diſſolved in it; contrary to the opinion of other chemiſts, who have affirmed that a true diſſolution takes place.

An hundred grains of mercury require for their ſolution 230 grains of real vitriolic acid, whoſe proportion to that of water is as 1 to $\frac{8}{10}$. A ſtrong heat is alſo requiſite, and the air produced is vitriolic. Precipitate *per ſe* is ſtill leſs ſoluble.

485 Mercury with vitriolic acid.

—An hundred grains of vitriol of mercury, produced by precipitation, contain 77 of metal, 19 of acid, and 4 of water.

486 With ſpirit of nitre.

In ſpirit of nitre, 100 grains of mercury are diſſolved by 28 of real acid, whoſe proportion to the water it contains is as 1 to $1\frac{52}{100}$. In this acid the ſolution takes place without heat; but it may alſo be diſſolved in a much more dilute acid, provided heat be applied. About 12 cubic inches of air are produced when heat is not applied; but M. Lavoiſier found the produce much greater. This, ſays Mr Kirwan, was evidently cauſed by his uſing red or yellow ſpirit of nitre, which already contains much phlogiſton. Precipitate *per ſe* is much leſs eaſily diſſolved in the nitrous acid, which Mr Kirwan ſuppoſes to be owing to the attraction of the aerial acid.

2d 486 With marine acid.

The marine acid, in its common phlogiſticated ſtate, does not act on mercury, at leaſt in its uſual ſtate of concentration; though M. Homberg, in the Paris Memoirs for the year 1700, affirms, that he diſſolved it by ſeveral months digeſtion in this acid. When dephlogiſticated, it certainly acts upon it, though very weakly while in a liquid ſtate. Precipitate *per ſe* is alſo ſoluble in the marine acid with the aſſiſtance of heat. An hundred grains of corroſive ſublimate contain 77 of mercury, 16 of real acid, and ſix of water. The like quantity of mercurius dulcis contains 86 of metal and 14 of acid and water.

487 Zinc with vitriolic acid;

Zinc requires for its ſolution an equal quantity of real vitriolic acid, whoſe proportion to that of water may be as 1 to 8, 10, or 12. Heat muſt be applied towards the end, when the ſaturation is almoſt completed. By the help of heat alſo this ſemimetal is ſoluble in the concentrated vitriolic acid, but a ſmall quantity of black powder remains in all caſes undiſſolved. An hundred cubic inches of inflammable air are produced. An hundred grains of vitriol of zinc contain 20 of zinc, 22 of acid, and 58 of water. The calces of zinc, if not exceedingly dephlogiſticated, are alſo ſoluble in this acid.

488 With nitrous acid.

An hundred and twenty-five grains of real nitrous acid, whoſe proportion to water is that of 1 to 12, are required for the ſolution of 100 grains of this ſemimetal, applying heat ſlightly from time to time.

489 Leſs metal diſſolved by concentrated than by diluted nitrous acid.

A concentrated acid diſſolves leſs of the metal, as a great quantitity of the menſtruum eſcapes during the efferveſcence. No nitrous air can be procured, the acid being partly decompoſed during the operation. The calces of zinc, if not too much dephlogiſticated, are likewiſe diſſolved by the nitrous acid.

490 With marine acid.

An hundred grains of zinc, require for their diſſolution 210 grains of real marine acid, the proportion of it to the water being as 1 to 9. If a more concentrated ſpirit of ſalt be made uſe of, a conſiderable part of it will be diſſipated during the efferveſcence, and conſequently more will be required for the ſolution. The calces of zinc are alſo ſoluble in the marine acid.

491 Biſmuth ſcarce ſoluble in vitriolic acid.

Only three grains of biſmuth were diſſolved by 200 of oil of vitriol, whoſe ſpecific gravity was 1.863, though a ſtrong heat was uſed at the ſame time. A greater quantity was indeed ſlightly dephlogiſticated; but when the gravity of the acid was reduced to 1.200, only a ſingle grain of the metal was diſſolved by 400 of it. The calces of this ſemimetal are much more ſoluble. Four cubic inches of vitriolic air were afforded by the ſolution of three grains of biſmuth.

492 Quantity diſſolved in ſpirit of nitre.

In ſpirit of nitre, 100 grains of real acid are only required to diſſolve 100 grains of the metal. The proportion of water to the acid ought to be as 8 or 9 to 1; in which caſe a gentle heat may be applied. The ſolution affords 44 cubic inches of nitrous air. The calces of biſmuth are alſo ſoluble in this acid.—

493 Scarce ſoluble in marine acids.

Only three or four grains of it were diſſolved by 400 of marine acid, whoſe ſpecific gravity was 1.220.

2d 493 Nickel with vitriolic acid;

About four grains of nickel were diſſolved in an hundred of the concentrated vitriolic acid with the aſſiſtance of a ſtrong heat; but its calces are much more ſoluble.—

494 With nitrous acid.

An hundred grains of nickel require for their ſolution 112 of real nitrous acid, whoſe proportion to water is as 1 to 11 or 12. The product of nitrous air is 79 inches. The calces are alſo ſoluble. A moderate heat is neceſſary for the diſſolution of the metal; but a concentrated acid acts ſo rapidly, that much of it is diſſipated.—Only four or five grains of nickel are diſſolved by 200 of ſpirit of ſalt whoſe ſpecific gravity was 1.220. An acid of this degree of ſtrength acts without the aſſiſtance of heat, though a weaker acid requires it, and diſſolves ſtill leſs of the metal. The calces of nickel are alſo ſoluble with difficulty in this acid.

495 With marine acid;

496 Cobalt with vitriolic acid;

Four hundred and fifty grains of real vitriolic acid, whoſe proportion to water is not leſs than 1 to $\frac{7}{10}$, are required for the diſſolution of 100 grains of cobalt, aſſiſted by a heat of 270° at leaſt. A ſolution is obtained by pouring warm water on the dephlogiſticated maſs.—The calces of cobalt, however, are more ſoluble; ſo that even a dilute acid will ſerve.—

497 With ſpirit of nitre;

In ſpirit of nitre, the like quantity of cobalt requires 220 grains of real acid, whoſe proportion to water is as 1 to 4; giving a heat of 180 towards the end.—The calces of the metal are ſoluble in the nitrous acid.—

498 With ſpirit of ſalt;

An hundred grains of ſpirit of ſalt, whoſe ſpecific gravity is 1.178, diſſolves, with the aſſiſtance of heat, two grains and a half of cobalt; and a greater quantity will be diſſolved by an acid more highly concentrated.—The calces of cobalt are more ſoluble.

499 Regulus of antimony with vitriolic acid;

An hundred grains of regulus of antimony require for their ſolution 725 grains of real vitriolic acid, whoſe proportion to water is as 1 to $\frac{7}{10}$, aſſiſted by a heat of 400°. A large quantity of regulus ſhould be put into the acid; and the reſulting ſalt requires much water to diſſolve it, as the concentrated acid lets fall much when water is added to it. A leſs concentrated acid will likewiſe diſſolve this ſemimetal, but in ſmaller quantity. The calces of antimony, even diaphoretic antimony, are ſomewhat more ſoluble.

500 With nitrous acid.

Nine hundred grains of real nitrous acid are required for the ſolution of 100 grains of regulus; the proportion of acid to the water of the ſolvent being as 1 to 12, and aſſiſted by an heat of 110°; but the ſolution becomes turbid in a few days. The calces are much leſs ſoluble in this acid.—

501 Scarce ſoluble in the marine acid.

Only one grain of the regulus is diſſolved by 100 of ſpirit of ſalt, whoſe ſpecific gravity was 1.220, with the aſſiſtance of a ſlight heat; and that which is only 1.178 diſſolves ſtill leſs; but Mr Kirwan is of opinion that the concentrated acid would, in a long time, and by the aſſiſtance of a gentle heat, diſſolve much more. The calces diſſolve more eaſily in the marine acid.

502 Regulus of arſenic with vitriolic acid;

Eighteen grains of regulus of arſenic are diſſolved in a heat of 250° by 200 grains of real vitriolic acid, whoſe ſpecific gravity is 1.871. About ſeven of theſe parts cryſtallize on cooling, and are ſoluble in a large quantity of water. The calces of arſenic are more ſoluble in this acid.—

503 With nitrous acid;

An hundred and forty grains of real nitrous acid are requiſite for the ſolution of 100 grains of regulus of arſenic; the proportion of acid to the water being as 1 to 11. The ſolution affords 102 cubic inches of nitrous air, the barometer being at 30 and the thermometer at 60. Calces of arſenic are likewiſe ſoluble in this acid.

504 With ſpirit of ſalt.

An hundred grains of ſpirit of ſalt, whoſe ſpecific gravity is 1.220, diſſolve a grain and an half of regulus of arſenic; but the marine acid, in its common ſtate, that is, when its gravity is under 1.17, does not at all affect it. The arſenical calces are leſs ſoluble in this than in the vitriolic or nitrous acids.

§ 3. *Of the Quantity of Phlogiſton contained in different Subſtances.*

Having gone through all the various baſes with which acids are uſually combined, and aſcertained the quantity

Quantity of Phlogiſton in different Subſtances.

quantity of different ingredients contained in the compounds reſulting from their union, we ought next to give an account of our author's experiments on phlogiſton; but as his ſentiments on that ſubject are taken notice of elſewhere, we ſhall content ourſelves with briefly mentioning the very ingenious methods by which he diſcovers the quantities of it contained in various kinds of air and in ſulphur.

505 Quantity of phlogiſton contained in nitrous air.

Having proved that inflammable air, in its concrete ſtate, and phlogiſton are the ſame thing, Mr Kirwan proceeds to eſtimate the quantity contained in nitrous air in the following manner.

"An hundred grains of filings of iron, diſſolved in a ſufficient quantity of very dilute vitriolic acid, produced, with the aſſiſtance of heat gradually applied, 155 cubic inches of inflammable air; the barometer being at 29.5, and the thermometer between 50° and 60°. Now, inflammable air and phlogiſton being the ſame thing, this quantity of inflammable air amounts to 5.42 grains of phlogiſton.—Again, 100 grains of iron diſſolved in dephlogiſticated nitrous acid, in a heat gradually applied and raiſed to the utmoſt, afford 83.87 cubic inches of nitrous air. But as this nitrous air contains nearly the whole quantity of phlogiſton which iron will part with (it being more completely dephlogiſticated by this than any other means), it follows, that 83,87 cubic inches of nitrous air contain at leaſt 5.42 grains of phlogiſton. But it may reaſonably be thought, that the whole quantity of phlogiſton which iron will part with is not expelled by the vitriolic acid, but that nitrous acid may expel and take up more of it. To try whether this was really the caſe, a quantity of green vitriol was calcined until its baſis became quite inſipid; after which two cubic inches of nitrous air were extracted from 64 grains of this ochre; and conſequently 100 grains, would yield 3.12 cubic inches of nitrous air. If 83.87 cubic inches of nitrous air contain 5.42 of phlogiſton; then 3.12 cubic inches of this air contain 0.2 of phlogiſton. The nitrous acid, therefore, extracts from 100 grains of iron two-tenths of a grain more phlogiſton than vitriolic acid does. Therefore 83.87 cubic inches of nitrous air, containing nearly the whole phlogiſton of the iron, have 5.62 of this ſubſtance. Hence 100 cubic inches of nitrous air contain 6.7 grains of phlogiſton."

2d 505 Quantity of phlogiſton in fixed air;

With regard to the quantity of phlogiſton in fixed air, after proving at length that it is compoſed of dephlogiſticated air united to the principle of inflammability, Mr Kirwan aſcertains the quantity of the latter in the following manner: "Dr Prieſtley, in the fourth volume of his Obſervations, p. 380, has ſatisfactorily proved, that nitrous air parts with as much phlogiſton to common air, as an equal bulk of inflammable does when fixed in the ſame proportion of common air. Now, when inflammable air unites with common air, its whole weight unites to it, as it contains nothing elſe but pure phlogiſton. Since, therefore, nitrous air phlogiſticates common air to the ſame degree that inflammable air does, it muſt part with a quantity of phlogiſton, equal to the weight of a volume of inflammable air, ſimilar to that of nitrous air. But 100 cubic inches of inflammable air weigh three grains and a half; therefore 100 cubic inches of nitrous air part with 3.5 grains of phlogiſton, when they communicate their phlogiſton to as much common air as will take it up. In this proceſs, however, the nitrous air does not part with the whole of the phlogiſton it contains, as appears by the red colour it conſtantly aſſumes when mixed with common or dephlogiſticated air; which colour belongs to the nitrous acid, combined with the remainder of its phlogiſton, whence the acid produced is always volatile.

Quantity of Phlogiſton in different Subſtances.

"One meaſure of the pureſt dephlogiſticated air and two of nitrous air occupy but $\frac{3}{100}$ of one meaſure, as Dr Prieſtley has obſerved. Suppoſe one meaſure to contain 100 cubic inches, then the whole, very nearly, of the nitrous air will diſappear (its acid uniting to the water over which the mixture is made), and 97 cubic inches of the dephlogiſticated air, which is converted into fixed air by its union with the phlogiſton of the nitrous air; therefore 97 cubic inches of dephlogiſticated air take up all the phlogiſton which 200 cubic inches of nitrous air will part with; and this we have found to be ſeven grains: therefore a weight of fixed air equal to that of 97 cubic inches of dephlogiſticated air, and 7 of phlogiſton, will contain ſeven grains of the latter. Now, 97 cubic inches of dephlogiſticated air weigh 40.74 grains; to which adding 7, we have the whole weight of the fixed air,=47.74 grains,=83.755 cubic inches; and conſequently 100 cubic inches of fixed air contain 8.357 grains of phlogiſton, the remainder being dephlogiſticated air. An hundred grains of fixed air, therefore, contain 14.661 of phlogiſton, and 85.339 of elementary or dephlogiſticated air. Hence alſo 100 cubic inches of dephlogiſticated air are converted into fixed air by 7.2165 grains of phlogiſton, and will be then reduced to the bulk of 86.34 cubic inches.

506 In vitriolic acid air.

To find the quantity of phlogiſton in vitriolic acid air, our author purſued the following method.

1. He found the quantity of nitrous air afforded by a given weight of copper, when diſſolved in the dephlogiſticated nitrous acid, and by that means how much phlogiſton it parts with.

2. He found the quantity of copper which a given quantity of the dephlogiſticated vitriolic acid could diſſolve; and obſerved, that it could not entirely ſaturate itſelf with copper without dephlogiſticating a further quantity which it does not diſſolve.

3. He found how much it dephlogiſticates what it thoroughly diſſolves, and how much it dephlogiſticates what it barely calcines.

4. How much inflammable air a given quantity of copper affords when diſſolved in the vitriolic acid to the greateſt advantage.

5. He deducts from the whole quantity of phlogiſton expelled by the vitriolic acid the quantity of it contained in the inflammable air; the remainder ſhows the quantity of it contained in the vitriolic acid air.

The concluſion deduced from experiments, conducted after this manner is, that 100 cubic inches of vitriolic air contain 6.6 grains of phlogiſton, and 71.2 grains of acid; and 100 cubic inches of this air weighing 77.8 grains, 100 of it muſt contain 8.48 grains phlogiſton, and 91.52 of acid.

507 Quantity of phlogiſton in Sulphur.

To find the quantity of phlogiſton in ſulphur, Mr Kirwan propoſed to eſtimate that of the fixed air produced during its combuſtion. For this purpoſe he firmly tied and cemented to the open top of a glaſs bell a large bladder, deſtined to receive the air expanded by combuſtion, which generally eſcapes when this

Quantity of Phlogiſton in different Subſtances.

508 Proper method of burning ſulphur.

this precaution is not uſed. Under this bell, containing about 3000 cubic inches of air, a candle of ſulphur, weighing 347 grains, was placed; its wick, which was not conſumed, weighing half a grain. It was ſupported by a very thin concave plate of tin, to prevent the ſulphur from running over during the combuſtion; and both were ſupported by an iron wire fixed in a ſhelf in a tub of water. As ſoon as the ſulphur began to burn with a feeble flame, it was covered with the bell, the air being ſqueezed out of the bladder. The inſide of the bell was ſoon filled with white fumes, ſo that the flame could not be ſeen; but in about an hour after all the fumes were thoroughly ſubſided, and the glaſs become cold, as much water entered the bell as was equal to 87.2 cubic inches; which ſpace our author concludes to have been occupied by fixed air, and which muſt have contained 7.287 grains of phlogiſton. The candle of ſulphur being weighed was found to have loſt 20.75 grains; therefore 20.75 grains of ſulphur contain 7.287 of phlogiſton, beſides the quantity of phlogiſton which remained in the vitriolic air. This air muſt have amounted to 20.75—7.287=13.463 grains, which, as already ſhown, contain 1.41 grains of phlogiſton. Therefore the whole quantity of phlogiſton in 20.75 grains of ſulphur is 8.428; of conſequence 100 grains of ſulphur contain 59.39 of vitriolic acid, and 40.61 of phlogiſton.

509 Quantity of phlogiſton in marine acid air.

The quantity of phlogiſton contained in marine acid air was found by the following method.—Eight grains of copper diſſolved in colourleſs ſpirit of ſalt afforded but 4.9 inches of inflammable air; but when the experiment was repeated over mercury, 91.28 cubic inches of air were obtained. Of theſe only 4.9 cubic inches were inflammable; and conſequently the remainder, 86.38 inches, were marine air, weighing 56.49 grains.—Now as ſpirit of ſalt certainly does not dephlogiſticate copper more than the vitriolic acid does, it follows, that theſe 4.9 cubic inches of inflammable air, and 86.38 of marine air, do not contain more phlogiſton than would be ſeparated from the ſame quantity of copper by the vitriolic acid; and ſince 100 grains of copper would yield to the vitriolic acid 4.32 grains of phlogiſton, 8.5 grains of copper would yield 0.367 grains of phlogiſton. This therefore is the whole quantity extracted by the marine acid, and contained in 91.28 cubic inches of air; and, deducting from this the quantity of phlogiſton contained in 4.9 cubic inches of inflammable air=0.171 grains, the remainder, *viz.* 0.367—0.171=0.196, is all the phlogiſton that can be found in 86.38 cubic inches of marine air. Then 100 cubic inches of it contain but 0.227 of a grain of phlogiſton, 65.173 grains being acid.—Hence we ſee why it acts ſo feebly on oils, ſpirit of wine, *&c.* and why it is not diſlodged from any baſis by uniting with phlogiſton, as the vitriolic and nitrous acids are, its affinity to it being inconſiderable.

510 Why marine acid acts ſo weakly.

§ 4. *Remarks on the Doctrines of the Quantity and ſpecific Gravity above delivered.*

2d 510 Mr Keir's objections to Kirwan's doctrines.

To this doctrine of the ſpecific gravity and quantity of acid contained in different ſubſtances, Mr Keir has made ſeveral objections. 1. Mr Kirwan ſuppoſes, that marine acid gas is the pure and ſolid marine acid diveſted of all water and other matter. Its apparent dryneſs in this reſpect, however, is no argument that it really contains no water; for water itſelf, reduced to a ſtate of vapour, poſſeſſes no moiſtening property. There is great reaſon to believe that water is a conſtituent part of ſome gaſes, and it is certain that all of them are capable of holding it in ſolution. As moiſt materials, therefore, are employed in the preparation of marine acid air, there ſeems no reaſon to believe, that in any way in which Mr Kirwan could obtain it, there was reaſon to ſuppoſe it perfectly free of water; in which caſe the denſity of the acid would be greater, and its quantity ſmaller than he ſuppoſes.

Remarks on the former Doctrines.

2. A conſiderable part of the denſity of the acid abſorbed in the experiment, probably aroſe from the condenſation which always accompanies the union of a concentrated acid with water. Mr Kirwan allows this to be the caſe with the nitrous and vitriolic acids, but thinks it too inconſiderable to deſerve notice in the marine. His reaſoning, however, does not appear ſatisfactory, or his experiments on the ſubject concluſive. He obſerves, that the length of time taken up in effecting an union between the marine gas and water, is no argument againſt their attracting one another ſtrongly when once united; and it is certain that part of this acid gas is very quickly abſorbed by water. He alſo finds fault with his accuracy in calculation; and aſſerts, that if matters are fairly ſtated, the real denſity of the marine acid gas will be conſiderably leſs than Mr Kirwan makes it.

3. A great obſtacle even to an approximation towards the real denſity of the acid, ariſes from the condenſation which the water, as well as the acids, muſt ſuffer in the proceſs: and in this caſe, where a general condenſation takes place, he aſks, “How ſhall we determine the part of the condenſation that belongs to the water, and the part that the acid ſuſtains?” This, with other conſiderations, makes Mr Keir “doubt of the poſſibility of ſolving the queſtion concerning the actual denſity of pure and ſolid acids.” The inveſtigation of the queſtion, indeed, he does not conſider as a matter of great conſequence, as every uſeful application may be obtained, by firſt inveſtigating the comparative ſtrengths of different portions of the ſame acid rendered more or leſs dilute; and then by finding out the ſtrength of the vitriolic, nitrous, and marine acids of known denſities, ſo that they may be compared together. “Homberg (ſays he) has the merit of making the firſt eſſay towards this inveſtigation. Bergman and Wenzal have ſupplied the defect of Homberg, by taking into conſideration the gas united with alkaline ſubſtances; and Mr Kirwan, by uſing determinate quantities of acid liquors of known denſities, has conſiderably improved the method of Bergman: and whoever ſucceeds theſe able chemiſts in this inquiry, may avail himſelf greatly of their labours, particularly thoſe of Mr Kirwan.” He concludes with ſtating the reſults of the inquiries made by the chemiſts abovementioned; on which he makes the following remarks.

3d 510 Great differences in the calculations of different authors.

“The diſcordancy of theſe reſults is very ſtriking, and gives but an humiliating repreſentation of the preciſion of our preſent knowledge in chemiſtry. A great part of the difference ariſes undoubtedly from the different views in which theſe authors conſidered the dryneſs or purity of the acids. Mr Kirwan, as we have ſeen, endeavoured to find their denſity and quantity in

Remarks on the former Doctrines.

a ſtate of perfect dryneſs and purity ; which he ſuppoſed to exiſt in the marine acid gas : with which he compared and inferred the denſities and quantities of the nitrous and vitriolic acids, upon the ſuppoſition that equal quantities of theſe ſeveral acids are ſaturated by a given weight of fixed alkali. Beſides the uncertainty of his principles, from which he deduces the denſity and quantity of the marine acid, his applications from thence to deduce the denſities of the pure nitrous vitriolic acids, being founded on the above ſuppoſition, muſt partake of its defects. The alkali which he happened to fix on as the ſtandard by which he compared the ſtrengths of the different acid liquors, in order to determine the quantity of real acid they contained, and thence to determine their denſity in a ſolid ſtate, was the fixed vegetable. Having found that 100 grains of his real marine acid could ſaturate 215 grains of this alkali, he infers, that the ſame proportion is applicable to the other acids : and accordingly we find that 100 grains of each of the pure and real mineral acids are ſaturated by an equal quantity, *viz.* 215 grains of this alkali. But if we examine the other columns of his table, we ſhall at once ſee, that, in other ſubſtances ſoluble by acids, this equality does not exiſt ; and that every ſuch ſubſtance has a ratio peculiar to itſelf, with reſpect to the proportions of theſe acids neceſſary for its ſaturation. It is evident, therefore, that if Mr Kirwan had fixed on the mineral alkali, the volatile alkali, lime, or any other ſubſtance, as a ſtandard, inſtead of vegetable alkali, his determination of the denſities of the real vitriolic and nitrous acids would have been different ; and as no reaſon can be aſſigned why the vegetable alkali or any other ſubſtance ſhould have the prerogative over the reſt, it is obvious that there can be no ſuch general ſtandard, but that each ſubſtance poſſeſſes ſolely the capacity of determining the proportions of the ſeveral acids neceſſary for its ſaturation.

" The other chemiſts were contented to conſider as the pure and dry acid, that which actually remains in the neutral ſalt, after this has been rendered as dry as poſſible by expoſure to a red heat : and having made their alkalies as dry as they could, they ſuppoſed theſe alkalies to retain the ſame weight in the dried neutral ſalt ; and that the augmentation of the weight gained by the alkali during the formation of the neutral ſalt ſhowed the weight of the dry acid. The uncertainty which affects this method ariſes from the different capacities which different neutral ſalts may poſſeſs of retaining more or leſs water, either as a conſtituent part of the dry ſalt, or merely by the ſtrength of adheſion or affinity. Nevertheleſs, this method being founded ſolely on experiment, without any theoretical inductions, ſeems to furniſh ſome approximation, not perhaps of the abſolute quantity of the acids in their drieſt poſſible ſtate, but of the acids as they actually exiſt in theſe ſalts comparatively with each other. Though the diſagreements between Bergman's and Wenzel's reſults are little in compariſon of the difference between them and Kirwan's, yet as their experiments were made nearly in the ſame manner, and upon the ſame grounds, there ſeems to be ſufficient reaſon to wiſh for a careful repetition of their experiments, or of others with the ſame view, and leſs liable to objections.

Remarks on the former Doctrines.

" The only difference in the methods employed by theſe two celebrated chemiſts conſiſted in the mode of ſaturation. Bergman probably uſed the common method, but Wenzel employed a very peculiar one. He added to his alkali a greater quantity of acid than was neceſſary for the ſaturation ; and after the alkali was diſſolved, he added a lump of zinc, or of oyſter-ſhell, in order to ſaturate completely the ſuperfluous acid. By obſerving how much of the zinc or oyſter-ſhell the acid diſſolved, and knowing how much of theſe ſubſtances was ſoluble in his acid by former experiments, he inferred the quantity of acid left for the ſaturation of the alkali. Having thus aſcertained the quantity neceſſary to ſaturate the alkali, he mixed together the proper proportions of theſe, and formed his neutral ſalt by evaporating the mixture and drying the ſalt with a red heat. Perhaps the difference in the reſults obtained by theſe two chemiſts might ariſe from their different modes of ſaturation. The common method of aſcertaining the point of ſaturation by means of litmus or other blue vegetable juices, appears ſufficiently exact, is ſimpler, and therefore preferable to that uſed by Wenzel.

" The ſtandard for comparing the ſtrengths of acids, and likewiſe of alkalies with one another, may be either an acid or an alkaline ſubſtance ; and if we had one of each, the proportion of whoſe quantities requiſite for their mutual ſaturation were well aſcertained, the conveniency in making the experiments would be obvious, and the certainty greater. Alkaline, and the earthy ſubſtances that are ſoluble in acids, are ſeldom pure enough for this purpoſe. They generally contain quantities, which are not conſtant, of fixed air, ſiliceous earth, magneſia, neutral ſalts, and inflammable matter, which render any of thoſe that are commonly met with unfit for the purpoſe without a very ſkilful and careful purification. The chemiſts who have made experiments to determine the proportions of acids and alkalies requiſite for each other's ſaturation, have ſcarcely been explicit enough in explaining the means of purifying the alkalies which they employed : for thoſe in commerce are quite uncertain in ſtrength and purity : and as to the general rules for making allowances for any heterogeneous ſubſtances they may contain, they are quite inapplicable to delicate experiments. No other method ſeems proper for aſcertaining the purity of alkalies but that of cryſtallization : of which both the vegetable and mineral alkalies are ſuſceptible, eſpecially the latter, which on account of its being more eaſily reducible into cryſtals, is therefore preferable. Theſe alkaline cryſtals, however, are not fit to be uſed as a ſtandard, becauſe they either are apt to be ſufficiently dried, or, upon expoſure to air, to loſe a part of the water of their cryſtallization, and to fall into powder. Even if they ſhould be taken, as is poſſible with due care, at the exact ſtate of dry but entire cryſtals, another uncertainty ariſes from a property which ſeems to be common to them all, namely, that of retaining a greater or ſmaller quantity of water, according to the degree of heat in which they were cryſtallized ; the colder the weather the greater quantity of water entering into the compoſition of the cryſtals. It ſeems poſſible, however, to make a pretty accurate ſtandard of mineral alkali in the following manner : Let the alkali be purified by repeated ſolution

4th 510
Mr Keir's method of preparing an alkaline ſtandard.

Remarks on the former Doctrines.

tion and cryſtallization, uſing only ſuch as are formed firſt, and rejecting the remaining liquors. Let the pure cryſtals be expoſed to a dry air until they have completely effloreſced or fallen into a dry white powder; which alteration may be facilitated by bruiſing the cryſtals and changing the ſurface of the powder. Let this powder be then expoſed for a certain and determinate time to a conſtant heat, as that of boiling water for 12 hours; letting the ſurface expoſed be in ſome given proportion, ſuppoſe of a ſquare inch to an ounce of the powder of cryſtals, and let it be ſtirred every two hours. When thus dried, let them be put while hot into a bottle, and well ſtopped. This powder I have found to be an uniform and conſtant ſtandard for aſcertaining the ſtrength of acids; and alſo, by compariſon by means of acids, of other alkaline ſubſtances."

With regard to an acid ſtandard, our author recommends oil of vitriol; which, he ſays, as it comes from the hands of the Britiſh manufacturers, is of the ſpecific gravity of about 1.846, but ſoon becomes weaker, unleſs carefully kept from the external air; and in general he rates it at 1.844. One part of this acid mixed with nine of water, is of a very convenient ſtrength for uſe; and as every ten grains of the mixture contain one of the ſtandard acid, the computations are thus rendered eaſy: and by theſe ſtandards, the ſtrength of all acids, alkalies, and ſubſtances ſoluble in acids, may be meaſured and compared together.

5th 510 His method of finding the ſpecific gravity of different liquors.

To determine the ſpecific gravity of liquors with accuracy, our author recommends the method of weighing them in a phial fitted with a glaſs-ſtopper, which can only enter a certain length into the neck. In this way, he obſerves, no other inconvenience can enſue than the ſlight one, that the glaſs-ſtopper, by very frequent uſe, is apt to wear itſelf and the neck of the phial alſo; ſo that after a great number of experiments, it will at laſt diminiſh, in ſome meaſure, the capacity of the phial itſelf. This, however, is but very trifling, and may be corrected at any time. Mr Keir has beſides found, that after ſome hundreds of experiments, the error amounted only to one quarter of a grain in 101 grains.

"The methods hitherto practiſed (ſays he) for aſcertaining the quantities of acids and alkalies contained in neutral ſalts, ſeem to be liable to ſeveral objections beſides thoſe abovementioned, ariſing from the different proportions of water remaining in a neutral ſalt, after expoſure to a red-heat, which heat is alſo very indefinite. In boiling the ſaturated mixture of acid and alkali to dryneſs, and afterwards in expoſing this ſalt to a red-heat, it has been ſuppoſed that nothing but water is expelled; and ſome chemiſts, who have given the reſults, have alſo determined the weight of the alkali which enters into the neutral mixture, by evaporating to dryneſs an equal quantity of the alkaline ſolution which had been employed in the ſaturation, and weighing the dry ſolution, on the ſuppoſition that nothing is expelled but water. It is certain, however, that in the evaporation both of alkalies and neutral ſalts, a conſiderable portion of the ſaline matter is elevated towards the end, when the liquor becomes concentrated and acquires a degree of heat conſiderably above that of boiling water. The following method appears beſt for determining the relative quantities of acid and alkali, or other ſubſtance exiſting in neutral ſalts.

"To a given number of grains, ſuppoſe 100 of the ſtandard vitriolic acid, or to a proportionable quantity of any other acid, add as much of the alkali or other ſoluble ſubſtance as is requiſite for the ſaturation, and note the quantity required, which ſuppoſe to be 150 grains. We have thus a ſolution of the neutral ſalt, which is the object of the experiment; the quantities of acid and baſis contained in which are known, and the general proportion of the quantity of the acid to its baſis in the neutral ſalt determined, *viz.* as 100 to 150. The next thing to be diſcovered is the weight of the dry neutral ſalt contained in this ſolution, in order to know the proportion of the dry neutral ſalt to its acid and baſis. For this purpoſe, let a given quantity of the ſame neutral ſalt, either in the ſtate of cryſtals or dried to any given degree, be diſſolved in water. Let this ſolution be brought to the ſame denſity as the former, by adding water to the heavier of the two: then, by knowing the weight of each ſolution, and the quantity of dry neutral ſalt which was actually diſſolved in one of them, the quantity contained in the other may be deduced; and thence the quantities of ſtandard acid, or of other acid proportioned to it, and of the alkali employed, or other ſoluble ſubſtance contained in a given quantity of the neutral ſalt, are determined; alſo the quantity of water contained in the neutral ſalt, that is greater or leſs than what is contained in the quantity of acid employed, will be known, over and above any water that may have been contained in the alkali or other baſis of the neutral ſalt; the quantity of which water, if any, cannot be determined.

"By this method may be aſcertained the proportion of the acid, of the baſis, and of the neutral ſalt, to each other; not indeed the quantity of acid and of alkali deprived of all water, but the quantity of acid, equal in intenſity of acidity to a known portion of the ſtandard acid; and alſo the quantity of ſuch alkali or other ſoluble ſubſtance as was employed; the relative ſtrength of which is known from its ratio to the ſtandard acid."

6th 510 Objection to Kirwan's calculation of the quantity of phlogiſton in ſulphur.

The tranſlator of Wiegleb's Syſtem of Chemiſtry totally diſagrees with Mr Kirwan's calculation of the quantity of phlogiſton contained in ſulphur; but as his objection ſeems to ariſe rather from an inclination to the antiphlogiſtic doctrine that a real diſcuſſion of the ſubject, this can have but little weight. It is poſſible indeed that Mr Kirwan may have over-rated the quantity of phlogiſton this ſubſtance contains, which is indeed larger than that allowed by other chemiſts. "Brandt (ſays the tranſlator), who has been moſt generally followed, reckons it only at $\frac{1}{16}$; and it has always appeared to me, that the weight of phlogiſton in ſulphur is almoſt infinitely ſmall." His objection proceeds on a maxim which he thinks he has demonſtrated, *viz.* that ſulphur is compoſed, not of the vitriolic acid and phlogiſton, but of the *baſe* of vitriolic acid and phlogiſton. No experiments hitherto made, however, have been able to ſhow this baſe diſtinct from the acid; nor have we any reaſon to ſuppoſe that the increaſe of weight in the vitriolic acid above the ſulphur from

from which it is produced, ariſes from any thing beſides the acceſſion of mere water, which the air parts with during the combuſtion. Hence, if the ſulphur is burnt in a very moiſt air, the quantity of acid obtained will be four or five times the weight of the ſulphur.

SECT. IV. *Earths.*

THESE are divided into five claſſes: 1. Abſorbent, alkaline, or calcareous earths: 2. Argillaceous earths or clay: 3. The flinty: 4. The fuſible earths: and, 5. The talks.

511 Quicklime.

1. The firſt claſs comprehends all thoſe that are capable of being converted into lime. They are found of various degrees of hardneſs; but none of them are capable of totally reſiſting the edge of a knife, or ſtriking fire with ſteel. They are found to conſiſt of a very friable earth, joined with a large quantity of air and ſome water. They effervеſce with an acid when poured on them; by which they are diſtinguiſhed from all other kinds of earth, except the argillaceous. When calcined by a ſtrong fire, they part with the water and air which they contained, and then acquire a great degree of cauſticity, loſe their power of effervеſcing with acids, and become what is called *quicklime*. They are ſoluble in acids, but not equally ſo in all. The vitriolic and tartareous acids form compounds with them very difficultly ſoluble; the *ſelenites*, formed by the vitriolic acid and calcareous earth, requiring, according to Mr Beaumé, an ounce of water to diſſolve a ſingle grain of it. The ſolubility of the tartareous ſelenite hath not yet been determined.—With the other mineral acids, the calcareous earths become eaſily ſoluble; and by proper management form concretes which appear luminous in the dark, and are called *phoſphori*.

512 Argillaceous.

2. The argillaceous earths differ from the calcareous, in not being convertible into quicklime. When mixed into a paſte with water, and expoſed to the fire, they ſhrink remarkably, crack in many places, and become exceſſively hard. By being gently dried in the open air before they are turned, they do not crack, and thus may be formed into veſſels of any ſhape. Of this kind of earth are formed all the brown ſort of earthen ware. The pureſt kind of argillaceous earth naturally found, is that whereof tobacco-pipes are made.

All the argillaceous earths are ſoluble in acids. With the vitriolic they diſſolve into a gelatinous tough liquor very difficultly cryſtallizable; but which, on the addition of ſome fixed or volatile alkali, may be ſhot into cryſtals of the ſalt called *alum*. With the other acids they form aſtringent ſalts of a ſimilar nature.

The attraction between the argillaceous earths and acids is very weak, yielding not only to alkaline ſalts both fixed and volatile, but even to ſome metals, particularly iron; but theſe earths have as yet been but little the ſubject of chemical examination in this way. They have a remarkable property of abſorbing the colouring matter of cochineal, Braſil-wood, *&c.* as have alſo the calces of ſome metals.

Both the calcareous and argillaceous, and indeed all earths when pure, reſiſt the utmoſt violence of fire; but when mixed together will readily melt, eſpecially if in contact with the burning fuel. Dr Lewis having made covers to ſome crucibles of clay and chalk mixed together, found that they melted into a yellow glaſs, before the mixtures in the crucibles were fuſed in the leaſt. But though they melted thus readily when in contact with the fuel, it was with great difficulty he could bring them to a tranſparent glaſs when put into a crucible.

The other ſpecies of earths, *viz.* the flinty, fuſible, and talky, being no other way the ſubjects of chemiſtry than as they are ſubſervient to the making of glaſs, all that can be ſaid of them will moſt properly come under that article. For their different ſpecies, ſee MINERALOGY.

513 Anomalous earths.

Beſides the abovementioned ſpecies of earths, there are others which may be called *anomalous*, as having ſome reſemblance of the calcareous and argillaceous, and yet being eſſentially different from them. Theſe are the white earth called *magneſia alba*, the earth of burnt vegetables, and that produced from burning animal ſubſtances.

514 Magneſia.

Magneſia alba was at firſt prepared from the thick liquor remaining after the cryſtallization of nitre; and is now found to be contained in the liquor called *bittern*, which is left after the ſeparation of common ſalt from ſea-water. In the former caſe it was united with the nitrous, in the latter with the vitriolic, acid. It is alſo found naturally in the ſoft kind of ſtone called *ſteatites* or "ſoap-ſtone;" and in the concrete uſed for taking ſpots out of cloaths, called *French chalk*. It differs from the calcareous earths, in not acquiring any cauſticity when deprived of its air, of which it contains ſo large a quantity as to loſe two-thirds of its weight when calcined. From the argillaceous it differs in not burning hard when mixed with water, nor forming a tough ductile paſte. It is eaſily ſoluble in all the acids, even the vitriolic; with which it forms the bitter purging ſalt commonly called *Epſom ſalt*, from its being firſt diſcovered in the waters of Epſom. With all the other acids it likewiſe forms purgative compounds, which are either very difficultly or not at all cryſtallizable.—Like other pure earths, it cannot be melted by itſelf; but, on proper additions, runs into a beautiful green glaſs.

515 Vegetable and animal earths.

The earth of burnt vegetables is thought by Dr Lewis to be the ſame with magneſia alba; but on trying the common wood aſhes, they were found to be very different. This kind of earth is fuſible, by reaſon of the alkaline ſalts contained in it. Animal earth is both very difficult of ſolution in acids, and impoſſible to be melted in the ſtrongeſt fire. It diſſolves, however, in acid liquors, though ſlowly; but the nature of the compounds formed by ſuch an union are as yet unknown. The ſofter parts of animals, ſuch as blood, fleſh, *&c.* are ſaid to yield a more ſoluble earth than the others. Animal earth has lately been ſuppoſed to be compounded of calcareous earth and phoſphoric acid; but this opinion is ſhown to be erroneous under the article BONES. The phoſphoric acid produced from theſe, is with reaſon ſuppoſed to be only the vitriolic acid changed.

SECT. V. *Inflammable Subſtances.*

516 Phenomena on burning.

THESE comprehend all vegetable, animal, and ſome mineral ſubſtances. They are diſtinguiſhed from all others,

others, by emitting a groſs thick ſmoke and flame, when a certain degree of heat is applied. To this, however, ſpirit of wine and all preparations from it are exceptions. They burn without the leaſt ſmoke; and if a glaſs bell is held over the burning ſpirit, no ſoot is formed, only a quantity of water is found condenſed on its ſides. Even the groſſer oils, if ſlowly burnt with a very ſmall flame, will yield no ſoot; and an exceeding great quantity of water, fully equal in weight and bulk to the oil employed, may be obtained from them. We can ſcarcely, however, credit, that ſo great a quantity of water comes from the oil; as this would be a real tranſmutation; and we know that, beſides water, the oils contain alſo ſome quantity of fixed air, as well as earth. It is probable, therefore, that, as it is impoſſible to ſuſtain flame without a decompoſition of that part of the air which ruſhes in to ſupport it, part of the water in this caſe comes from the air, which always contains moiſture in abundance.

Inflammable matters, on being burnt, generally leave behind a ſmall quantity of earthy matter called *aſhes;* but to this, ſpirit of wine, camphor, the more volatile oils, and the mineral oil called *naptha*, are exceptions.

517 On diſtillation.

Vegetable ſubſtances, when diſtilled in cloſe veſſels, give out a quantity of air, ſome acid, and an empyreumatic oil, leaving behind a black ſpongy maſs called *charcoal*. To this too there are a few exceptions, *viz.* ſpirit of wine, and the preparations from it, camphor, and perhaps ſome of the more volatile oils, or naphtha. Animal ſubſtances yield only a very fetid empyreumatic oil, and volatile alkali.

518 Treated with different acids.

In general, all inflammable matters are acted upon with ſome violence by the vitriolic and nitrous acids, excepting only camphor and naphtha. With the vitriolic acid, when in a liquid ſtate, they render it volatile and ſulphureous; if in a dry ſtate, they form actual ſulphur. With the nitrous, they firſt impart a high colour and great degree of volatility to the acid, then a violent flame enſues, if the matter is attempted to be dried. With ſpirit of wine the effects are conſiderably different; and very volatile compounds are formed, which are called *ether*, on account of their exceeding great diſpoſition to riſe in vapour. Similar compounds are likewiſe produced, but with more difficulty, from the marine acid and concentrated vinegar. The ſal ſedativus of borax mixes with ſpirit of wine, and cauſes it burn with a green flame; but does not ſeem to produce any other change upon it. How the acid of phoſphorus and of ants act upon ſpirit of wine, is not exactly known; but that of tartar by digeſtion with it, is converted into the acetous acid. With any other inflammable matter, the phoſphorine acid reproduces phoſphorus.

519 Singular productions.

There are two ſingularities obſerved among the inflammable ſubſtances. One is that bituminous matter called *amber*, which yields a volatile ſalt of an acid nature on diſtillation: When combined with alkalies, this acid is found to yield compounds ſimilar to thoſe made with the acetous acid and alkali. The other is, that gum called *benzoin*, which is uſed as a perfume, and yields by ſublimation a kind of volatile ſalt in fine ſhining cryſtals like ſmall needles, and of a moſt grateful odour. Theſe diſſolve very readily in ſpirit of wine; but not at all in water, unleſs it is made very hot: ſo that they ſeem to contain more oily than ſaline matter. Neither the nature of theſe flowers, however, nor that of the ſalt of amber, is fully known.

Sect. VI. *Metalline Subſtances.*

These are diſtinguiſhed from all other bodies by their great ſpecific gravity, exceeding that of the moſt denſe and compact ſtones. The heavieſt of the latter do not exceed the ſpecific gravity of water in a greater proportion than that of 4 to 1; but tin, the lighteſt of all the metals, exceeds the ſpecific gravity of water in the proportion of 7 to 1. They are alſo the moſt opaque of all known bodies, and reflect the rays of light moſt powerfully.

520 Metals ſoluble in acids.

Metallic bodies poſſeſs the quality of diſſolving in and uniting with acid ſalts, in common with earths and alkalies; but, in general, their union is leſs perfect, and they are more eaſily ſeparable. They efferveſce with acids, as well as calcareous earths and alkalies; but their efferveſcence is attended with very different appearances. In the efferveſcence of acids with alkalies, or with calcareous earths, there is a diſcharge of the fluid called *fixed air*, which is ſo far from being inflammable, that it will immediately extinguiſh a candle or other ſmall flame immerſed in it. The mixture alſo is notably diminiſhed in weight. When a metallic ſubſtance is diſſolved in an acid, the weight of the mixture is never very much diminiſhed, and ſometimes it is increaſed. Thus, an ounce of quickſilver being ſlowly dropped into as much aquafortis as was ſufficient to diſſolve it, and the ſolution managed ſo as to take up almoſt a whole day, the whole was found to have gained ſeven grains. There is alſo a remarkable difference between the nature of the vapour diſcharged from metals and that from alkalies; the former, in moſt caſes, taking fire and exploding with violence; the latter, as already obſerved, extinguiſhing flame.

521 Their compoſition.

The metallic ſubſtances, at leaſt ſuch as we are able to decompound, are all compoſed of a certain kind of earth, and the inflammable principle called *phlogiſton*. The earthy part by itſelf, in whatever way it is procured goes by the name of *calx*. The other principle has already been proved to be the ſame with charcoal.

522 Calcination and revivification

When theſe two principles are ſeparated from one another, the metal is then ſaid to be *calcined*. The calx being mixed with any inflammable ſubſtance, ſuch as powdered charcoal, and urged with a ſtrong fire melts into metal again; and it is then ſaid to be *reduced*, or revivificated: and this takes place whether the metal has been reduced to a calx by diſſolution in an acid or by being expoſed to a violent fire. If, however, the calcination by fire has been very violent and long continued, the calx will not then ſo readily unite with the phlogiſton of the charcoal, and the reduction will be performed with more difficulty. Whether, by this means, *viz.* a long continued and violent calcination, metallic earths might entirely loſe their property of combining with phlogiſton, and be changed into thoſe of another kind, deſerves well to be inquired into.

523 Calcination and increaſe of weight by acids.

When a metallic ſubſtance is diſſolved in any kind of acid, and an alkali or calcareous earth not deprived of its fixed air is added, the alkali will immediately be attracted by the acid, at the ſame time that the fixed ed air contained in the alkali is diſengaged, and the calx of the metal, having now no acid to keep it diſſolved, immediately joins with the fixed air of the alkali, and falls to the bottom. Something ſimilar to this happens when metals are calcined by fire. In this caſe there is a continual decompoſition of the air which enters the fire; and the fixed air contained in it, being, by this decompoſition, ſet looſe, combines with the calx; whence, in both caſes, there is a conſiderable increaſe of weight. If the air is excluded from a metal, it cannot be calcined even by the moſt violent fire.

524
Reaſon of the increaſe of weights in metalline calces.

When a metal is precipitated by a mild alkali, or by an uncalcined calcareous earth, the reaſon of the increaſe of weight is very evident; namely, the adheſion of the fixed air to the metalline calx: but, though it is not ſo much increaſed when precipitated by cauſtic alkali, or by quicklime, there is nevertheleſs a very evident increaſe, which is not ſo eaſily accounted for. M. Lavoiſier has mentioned ſome experiments made on mercury and iron diſſolved in aquafortis, which deſerve to be taken notice of, as in a great meaſure accounting for the phenomenon already mentioned of the ſolution of metalline ſubſtances gaining an addition of weight; and likewiſe ſhow the proportion of increaſe of weight with the mild, or calcined calcareous earth.

525
M. Lavoiſier's experiments.

“ Exactly 12 ounces of quickſilver (ſays he) were put into a matraſs, and 12 ounces of ſpirit of nitre poured on it. Immediately a ſpontaneous efferveſcence enſued, attended with heat. The red vapours of the nitrous acid aroſe from the mixture, and the liquor aſſumed a greeniſh colour. I did not wait till the ſolution was entirely accompliſhed before I weighed it; it had loſt one drachm 18 grains. Three hours after, the mercury was nearly all diſſolved: but having again weighed the ſolution, I was much aſtoniſhed to perceive that it had increaſed inſtead of being diminiſhed in weight; and that the loſs, which was one drachm 18 grains at firſt, was now only 54 grains. The next day the ſolution of the mercury was entirely finiſhed, and the loſs of weight reduced to 18 grains; ſo that in 12 hours the ſolution, though confined in a narrow necked matraſs, had acquired an augmentation in weight of one drachm. I added ſome diſtilled water to my ſolution, to prevent it from cryſtallizing; the total weight of it was then found to be 48 ounces 1 drachm and 18 grains.

“ I weighed ſeparately, in two veſſels, 8 ounces 15 grains of the above ſolution, each of which portions, according to the preceding experiment, ought to contain 2 ounces of nitrous acid and 2 ounces of quickſilver. On the other ſide I prepared 6 drachms 36 grains of chalk, and 4 drachms 36 grains of lime; theſe proportions having been found by former experiments juſt neceſſary to ſaturate two ounces of nitrous acid. I put the chalk in the one veſſel, and the lime in the other.

“ An efferveſcence attended the precipitation by chalk, but without heat; the mercury precipitated in a light yellow powder, at the ſame time the chalk was diſſolved in the nitrous acid. The precipitation by the lime was effected without efferveſcence, but with heat; the mercury was precipitated in a browniſh powder. When the precipitates were well ſubſided, I decanted off the liquors from them, and carefully edulcorated them. After which, I cauſed them to be dried in a heat nearly equal to that in which mercury boils.

“ The precipitate by the chalk weighed 2 ounces 2 drachms 45 grains; that by the lime weighed 2 ounces 1 drachm 45 grains.

“ Sixteen ounces of the nitrous acid, the ſame as employed in the former experiments, were placed in a matraſs, and ſome iron filings gradually added. The efferveſcence was briſk, attended with great heat, red vapours, and a very rapid diſcharge of elaſtic fluid: the quantity of iron neceſſary to attain the point of ſaturation was 2 ounces 4 drachms; after which, the loſs of weight was found to be 4 drachms 19 grains. As the ſolution was turbid, I added as much diſtilled water as made the whole weight of the ſolution to be exactly 6 pounds.

“ I took two portions, each weighing 12 ounces of the above ſolution, and containing 2 ounces of nitrous acid, and 2 drachms 36 grains of iron filings. I placed them in two ſeparate veſſels. To one were added 6 drachms 36 grains of chalk; and to the other 4 drachms 36 grains of ſlacked lime, being the quantities neceſſary to ſaturate the acid.

“ The precipitation was effected by the chalk with efferveſcence and tumefaction, that by the lime without either efferveſcence or heat. Each precipitate was a yellow brown ruſt of iron. They were waſhed in ſeveral parcels of diſtilled water, and then dried in an heat ſomewhat ſuperior to that uſed in the laſt experiment.

“ The precipitate by the chalk, when dried, was a greyiſh ruſt of iron, inclining even to white by veins. It weighed 6 drachms 35 grains. That by the lime was rather yellower, and weighed 4 drachms 69 grains.

526
Conſequences from his experiments;

“ The reſult of theſe experiments (ſays M. Lavoiſier) are, 1. That iron and mercury diſſolved in the nitrous acid acquire a remarkable increaſe of weight, whether they be precipitated by chalk or by lime. 2. That this increaſe is greater in reſpect to iron than mercury. 3. That one reaſon for thinking that the elaſtic fluid contributes to this augmentation is, that it is conſtantly greater when an earth is employed ſaturated with elaſtic fluid, ſuch as chalk, than when an earth is uſed which has been deprived of it, as lime. 4. That it is probable that the increaſe of weight which is experienced in the precipitation of lime, although not ſo great as that by chalk, proceeds in part from a portion of the elaſtic fluid which remains united to the lime, and which could not be ſeparated by the calcination.”

527
Not well founded.

But though we are naturally enough inclined to think that the increaſe of weight in the precipitates formed by lime proceeded from ſome quantity of elaſtic fluid or fixed air which remained combined with the lime, it is by far too great to be accounted for in this way, even according to the experiments mentioned by M. Lavoiſier himſelf, and which, from the manner in which they are told, appear to have been performed with the greateſt accuracy. He found, that 1 ounce 5 drachms and 36 grains of ſlaked lime contained 3 drachms and 3 quarters of a grain of water,

and

and only 16 grains and an half of elaſtic fluid were ſeparable from it. In the experiments above related, where only 4 drachms and 36 grains were employed, the quantity of elaſtic fluid could not exceed 6 or 8 grains. Yet the calx was increaſed in mercury by no leſs than 105 grains, and in iron by 203 grains; a quantity quite unaccountable from the elaſtic fluid or fixed air which we can ſuppoſe to be contained in the lime made uſe of. It is much more probable, that the increaſed weight of metallic precipitates, formed by lime, ariſes from an adheſion of part of the acid.

530 What metals are calcinable, & with what degrees of heat.

Metals are found to be compounded of a kind of earth mixed with the inflammable principle or phlogiſton; and by a diſſipation of the latter, all metallic bodies, gold, ſilver, and platina excepted, are capable of being reduced to a calx, but very different degrees of heat are required for calcining them. Lead and tin begin to calcine as ſoon as they are melted, long before they are made red-hot. The ſame happens to the ſemimetals biſmuth and zinc; the latter indeed being combuſtible, cannot bear a greater heat in open veſſels than that which is barely ſufficient to melt it. Iron and copper require a red heat to calcine them; though the former may be made partly to calcine by being frequently wetted in a degree of heat conſiderably below that which is ſufficient to make it red.

541 Ruſting of metals

Moſt metals undergo a kind of ſpontaneous calcination in the open air, which is called their *ruſting*; and which has given occaſion to various conjectures. But M. Lavoiſier has ſhown, that this ariſes from the fixable part of the atmoſphere attaching itſelf to their earthy part, and diſcharging the phlogiſton. According to him, no metallic body can ruſt but where there is an abſorption of air; and conſequently metals can be but imperfectly ruſted when kept under a receiver.

542 Fuſibility of metallic compounds.

543 Great fuſibility of compounds of tin and biſmuth.

544 One fuſible by the heat of boiling water.

If two metals are mixed together, the compound generally turns out more fuſible than either of them was before the mixture. There are indeed great differences in the degrees of heat requiſite to melt them. Thus, lead and tin melt below that degree of heat which is required to make quickſilver or linſeed-oil boil. Silver requires a full red heat, gold a low white heat, copper a full white, and iron an extreme white heat, to make it melt. The ſemimetal called biſmuth melts at about 460° of Fahrenheit's thermometer, and tin at about 422°. When mixed in equal quantities, the compound melted at 283°. When the tin was double the biſmuth, it required 334° to melt it; with eight times more tin than biſmuth, it did not melt under 392°. If to this compound lead is added, which by itſelf melts in about 540°, the fuſibility is ſurpriſingly increaſed. Mr Homberg propoſed for an anatomical injection a compound of lead, tin, and biſmuth, in equal parts; which he tells us keeps in fuſion with a heat ſo moderate that it will not ſinge paper. Sir Iſaac Newton contrived a mixture of the abovementioned metallic ſubſtances, in ſuch proportions that it melted and kept fluid in a heat ſtill ſmaller, not much exceeding that of boiling water. A compound of two parts of lead, three parts of tin, and five of biſmuth, did but juſt ſtiffen at that very heat, and ſo would have melted with very little more; and when the lead, tin, and biſmuth, were to one another in the proportions of 1, 4, and 5, the compound melted in 246°. We have ſeen, however, a piece of metal compounded of theſe three, the proportions unknown, which melted, and even underwent a ſlight degree of calcination, in boiling water, and barely ſtiffened in a degree of heat ſo gentle that the hand could almoſt bear it.

545 Solubility of metals increaſed by calcination.

A ſlight degree of calcination ſeems to give the acids a greater power over metallic ſubſtances; a greater makes them leſs ſoluble; and if long and violently calcined, they are not acted upon by acids at all. Of all the acids, the marine has the greateſt attraction for metallic calces, and volatilizes almoſt every one of them.

346 Effects of ſulphur on metals.

Sulphur readily unites with moſt metals, deſtroys their malleability, and even entirely diſſolves them. On gold and platina, however, it has no effect, till united with a fixed alkaline ſalt, when it forms the compound called *hepar ſulphuris*; which is a very powerful ſolvent, and will make even gold and platina themſelves ſoluble in water, ſo as to paſs the filter. This preparation is thought to be the means by which Moſes diſſolved and gave the Iſraelites to drink the golden calf which they had idolatrouſly ſet up.

When a metal is diſſolved in an acid, it may be precipitated, not only by means of calcareous earth and alkalies, but alſo by ſome other metals; for acids do not attract all metals with equal ſtrength; and it is remarkable, that when a metal is precipitated by another, the precipitate is not found in a calcined ſtate, but in a metallic one. The reaſon of this is, that the precipitating metal attracts the phlogiſton which is expelled from that which is diſſolving, and immediately unites with it, ſo as to appear in its proper form. The various degrees of attraction which acids have for the different metals is not as yet fully determined. The beſt authenticated are mentioned in the Table of Affinities or elective attractions (Sect. IX.)

547 Diviſion into metals and ſemimetals.

548 Properties of arſenic.

Metalline ſubſtances are divided into metals and ſemimetals. The metals which are diſtinguiſhed from the ſemimetallic ſubſtances by their malleability or ſtretching under the hammer, are in number ſeven; gold, ſilver, copper, iron, lead, tin, and platina. To theſe is added quickſilver; which Mr Brown's experiments have ſhown to be a real malleable metal, as well as others, but requiring ſo little heat to keep it in fuſion, that it is always found in a liquid ſtate. The ſemimetals are biſmuth or tin-glaſs, zinc, regulus of antimony, and cobalt, nickel, and arſenic. This laſt ſubſtance is now diſcovered to be compounded of an acid of a peculiar kind and phlogiſton; and as the quantity of the latter is great or ſmall, the arſenic aſſumes either a metallic or ſaline form. It likewiſe unites with ſulphur, with which it forms a compound of a red or yellow colour, according as more or leſs ſulphur is uſed. This compound is eaſily fuſible; though the arſenic, by itſelf, is ſo volatile as to go all off in vapour rather than melt. In common with the ſalts, it poſſeſſes the properties of diſſolving in water, and uniting itſelf to alkalies. Water will diſſolve about $\frac{1}{15}$ of its weight of pure arſenic; but if arſenic is boiled in a ſtrong alkaline lixivium, a much greater proportion will be diſſolved. Indeed ſtrong alkaline lixivia will diſſolve

CHEMISTRY
Chemical Characters or Symbols

🜂 *Fire*
🜁 *Air*
🜄 *Water*
🜃 *Earth*
f.🜁 *Fixable Air*
m.🜁 *Mephitic Air*
🜃 *Clay*
🜃 *Gypſum*
🜃;c🜃 *Calcareous Earth*
🝁;CV;🝁 *Quicklime*
🜃 *Vitrifiable or Siliceous Earths*
🜃 *Fluors or Fuſible Earths*
X *Talk*
M.🜃 *Magneſia*
A🜃;⊜ *Earth of Alum*
∴ *Sand*
☉ *Gold*
☽;🜁 *Silver*
♀ *Copper*
♃ *Tin*
♄ *Lead*
☿ *Mercury*
♂ *Iron*
Ƶ *Zinc*
B;W?♉ *Biſmuth*
♁ *Antimony*

🜬 *Regulus of Antimony*
🜺 *Arſenic*
⚲ *Regulus of Arſenic*
K;8 *Cobalt*
N. *Nickel*
S.M. *Metallic Subſtances*
C. *Calx*
⊶ *Orpiment*
🜶 *Cinnabar*
L.C. *Lapis Calaminaris*
⊗ *Tutty*
⊕ *Vitriol*
⊖;⊖ *Sea Salt*
8;⊸ *Sal Gem*
⦶ *Nitre*
🝂;🝂 *Borax*
S S *Sedative Salt*
✱;⊖✱ *Sal Ammoniac*
○;⊔ *Allum*
🜾 *Tartar*
⧖;8 *Alkali*
⊖▿;⊖▿ *Fixed Alkali*
⊖△;⊖△ *Volatile Alkali*
m.⊖▿ *Mild fixed Alkali*
c.⊖▿ *Cauſtic fixed Alkali*
m.⊖△ *Mild vol. Alkali*

c.⊖△; *Cauſtic vol. Alkali*
🝗 *Potaſh*
+;∼; ⤳; *Acids*
🜊 *Vinegar*
⊕+;⊳⊕; *Vitriolic Acid*
⦶+;⊳⦶; *Nitrous Acid*
⊖+;⊳⊖; *Marine Acid*
F;Æ; *Aquafortis*
R;Æ; *Aqua Regia*
🜍 *Vol. Sulphureous Acid*
🜍 *Phosphoric Acid*
V *Wine*
V *Spirit of Wine*
R *Rectified* V
Æ *Ether*
🜄 *Lime Water*
⊡ *Urine*
∘°;⊙;⊕;⊳ *Oil*
△;E.∘° *Eſsential Oil*
▽ *Fixed Oil*
🜍 *Sulphur*
⊖🜍 *Hepar of Sulphur*
🜍 *Phoſphorus*
🜍 *Phlogiſton*
◇ *Soap*
⊕ *Verdigriſe*
☽○ *Glaſs*
☠ *Caput Mortuum*

♁ *A Powder*
🝖 *Aſhes*
B *A Bath*
B.M;M.B; *Water bath*
A.B. *Sand bath*
V.B. *Vapor bath*
⧗ *An Hour*
♁ *A Day*
♀ *A Night*
⊠ *A Month*
aaa;🝚 *Amalgam*
🝟;🝟 *To Diſtill*
🝝 *To Sublime*
🝞 *To Precipitate*
🝪 *A Retort*
XX. *An Alembic*
+;+ble; *A Crucible*
S.S.S. *Stratum Super Stratum*
C.C. *Cornu Cervi Hartſhorn*
≈ *A Bottle*
gr.i. *A Grain*
℈i. *A Scruple*
ʒi. *A Dram*
℥i. *An Ounce*
℔i *A Pound*
dwt.i. *A Pennyweight*

Scot Philad.

ſolve a part of almoſt every metalline ſubſtance, except gold, ſilver, and platina; but, excepting copper, which may be formed into cryſtals by means of the volatile alkali, none of them will aſſume a cryſtalline form when united with alkalies. Arſenic, on the contrary, unites very readily with fixed alkalies, and ſhoots with them into a neutral ſalt. If it is mixed with nitre, it unites itſelf to the alkaline baſis of that ſalt, and expels the acid in very volatile fumes, which are difficultly condenſed into a blue liquor. The reaſon of this is the great attraction between the nitrous acid and phlogiſton, which are always diſpoſed to unite when a proper degree of heat is applied. Was the phlogiſton contained in large quantity in the arſenic, and the heat ſufficiently great, a violent deflagration would enſue; but as the acid of arſenic attracts the alkaline part of the nitre, at the ſame time that the nitrous acid attracts the phlogiſton, a double decompoſition enſues, in a leſs degree of heat than would otherwiſe be neceſſary; and the nitrous acid ariſes in a very volatile ſtate, as it always is when combined with phlogiſton, which is the occaſion of the blueneſs in aquafortis ſo produced. The arſenic is alſo decompoſed by being deprived of its proper quantity of phlogiſton; in conſequence of which its acid attaches itſelf to the fixed alkali of the nitre, and forms a neutral arſenical ſalt. For the extraction of metallic ſubſtances from their ores, and the various methods of refining them, ſee METALLURGY.

SECT. VII. *Waters.*

549 Water, how far an object of chemiſtry.

THE pure element of water, like that of fire, is ſo much an *agent* in moſt chemical operations, as to be itſelf very little the *object* of practical chemiſtry. Some late experiments, however, have ſhown that this fluid really conſiſts, in part at leaſt, of phlogiſton, and an inviſible ſubſtance which forms the baſis of pure air: and conſequently water is generated in the deflagration of dephlogiſticated air; but as the baſis of the former cannot be perceived by itſelf, we can as yet ſay nothing about it. Waters, therefore, can only be the objects of chemiſtry, in conſequence of the impurities they contain: and as theſe impurities are moſt commonly of the ſaline kind, it is impoſſible that any general theory can be given of waters, diſtinct from that of the ſalts contained in them; which all depend on the general properties belonging to ſalts, and which we have already mentioned. Any thing that can be ſaid with regard to waters, then, muſt be poſtponed to the particular conſideration of the properties of each of the ſaline bodies with which water is capable of being adulterated. We ſhall therefore refer entirely to the article WATER in the order of the alphabet, for what can be ſaid on this ſubject.

SECT. VIII. *Animal and Vegetable Subſtances.*

550 Chemical properties.

THE general chemical properties of theſe have been already taken notice of under the name of *inflammable ſubſtances*. They agree in giving out a very thick fetid oil, when diſtilled by a ſtrong fire; but in other reſpects they differ very conſiderably. Moſt kinds of vegetables give out an acid along with the oil; but all animal ſubſtances (ants, and perhaps ſome other inſects, excepted) yield only a volatile alkali. Some kinds of vegetables, indeed, as muſtard, afford a volatile alkali on diſtillation, ſimilar to that from animal ſubſtances; but inſtances of this kind are very rare, as well as of animals affording an acid. Both animal and vegetable ſubſtances are ſuſceptible of a kind of fermentation, called *putrefaction*, by which a volatile alkali is produced in great plenty: there is, however, this remarkable difference between them, that many vegetable ſubſtances undergo two kinds of fermentation before they arrive at the putrefactive ſtage. The firſt is called the *vinous*, when the ardent ſpirits are produced, which we have already mentioned when ſpeaking of inflammable ſubſtances. This is ſucceeded by the *acetous*, wherein the vegetable acid called *vinegar* is produced in plenty: and laſtly, the putrefactive ſtage ſucceeds when a volatile alkali is only produced; not the ſmalleſt veſtige either of ardent ſpirits or of vinegar remaining. On the other hand, animal ſubſtances ſeem ſuſceptible only of the putrefactive fermentation; no inſtance having ever occurred where there was the leaſt drop, either of ardent ſpirit or of vinegar, produced from a putrified animal ſubſtance. (See FERMENTATION and PUTREFACTION.)

SECT. IX. *Of the Chemical Characters, and Tables of Elective Attraction.*

551 Invention of marks or characters.

THE numerous *marks* or *characters* by which the ancient chemiſts uſed to denote many different ſubſtances were invented rather from a ſuperſtitious and fantaſtical principle than from any real neceſſity; or, perhaps, like the enigmatical language uſed by the alchemiſts, they have thereby ſought to conceal their myſteries from the vulgar. In contriving theſe marks, they affected a great deal of ingenuity; intending them as ſymbols of the qualities poſſeſſed by each of the different ſubſtances. A circle being ſuppoſed the moſt perfect figure, was therefore uſed to repreſent the moſt perfect metal in nature, that is, *gold*. Silver being likewiſe a perfect and indeſtructible metal, is placed next to gold; but, on account of its inferiority, is expreſſed only by a creſcent, as if but half gold. A circle was likewiſe uſed to denote ſalt of any kind, as being ſomething elaborate and perfect. A croſs was uſed to denote acrimony of any kind, and conſequently employed for the acrimonious ſalts of vitriol, alkali, &c. Hence all the inferior metals have the croſs ſome how or other combined with the marks deſigned to repreſent them. Thus, the mark for quickſilver denotes, that it hath the ſplendor of ſilver, the weight of gold, but its perfection is hindered by an acrimony repreſented by the croſs at bottom, &c. Fire is repreſented by an equilateral triangle, having one of its angles uppermoſt. This may be conſidered as a rude repreſentation of flame, which is always pointed at top. Water, again, is repreſented by a triangle, with an angle downwards, ſhowing the way in which that element exerts its ſtrength, &c. All theſe marks, however, as they were of no real uſe at firſt, ſo they are now becoming every day more and more neglected. Such of them, however, as may moſt readily occur in chemical books are repreſented and explained on Plate CXXXII.

552 New chemical language.

The French chemiſts have of late attempted to introduce a kind of new chemical language; and by adopting it themſelves, may perhaps make it at laſt univerſal, as it is now impoſſible to underſtand their writings ~~without~~ knowing it. See the Table at the end of this article.

553
Of tables of affinities.

Tables of affinities, or *elective attractions*, are but of late invention. They are conſequences of an improved ſtate of chemiſtry, when the different ſubſtances were found to act upon one another in moſt caſes according to a fixed and ſettled rule. The moſt approved table of this kind for a long time was that compoſed by Mr Geoffroy. It was, however, found to be very incomplete, not only as to its extent, but likewiſe as heat and ſome other circumſtances were found to vary the attractions conſiderably, and ſometimes even to reverſe them. Other tables have been conſtructed by Mr Gellert, &c. but none hath yet appeared ſo complete but that many additions may be made to it. The following is that at preſent exhibited by Dr Black in his courſe of chemiſtry.

1. VITRIOLIC ACID.

Phlogiſton
Terra ponderoſa
Fixed alkali
Calcareous earth
Zinc
Iron
Tin
Copper
Quickſilver
Silver
Volatile alkali
Magneſia
Earth of alum.

2. NITROUS ACID.

Phlogiſton
Fixed alkali
Calcareous earth
Zinc
Iron
Lead
Tin
Copper
Quickſilver
Silver
Volatile alkali.

3. MARINE ACID.

Fixed alkali
Calcareous earth
Zinc
Iron
Lead
Tin
Copper
Regulus of antimony
Quickſilver
Silver
Spirit of wine
Volatile oils
Gold.

4. SULPHUR.

Fixed alkali
Calcareous earth
Iron
Nickel
Copper
Lead
Tin
Silver
Regulus of antimony
Quickſilver
Arſenic.

5. HEPAR SULPHURIS is partially decompounded by

Quickſilver
Solution of fixed alkali
Lime-water
Volatile alkali.

6. FIXED AIR.

Calcareous earth
Fixed alkali
Magneſia
Volatile alkali.

7. ALKALINE SALTS.

Vitriolic acid
Nitrous acid
Marine acid
Acetous acid
Volatile vitriolic acid
Sedative ſalt
Fixed air
Sulphur
Expreſſed oils.

8. CALCAREOUS EARTH.

Vitriolic acid
Nitrous acid
Marine acid
Acid of tartar
Acetous acid
Sulphureous acid and ſedative ſalt
Sulphur.

9. METALLIC SUBTSANCES, Lead and Regulus of Antimony excepted.

Marine acid.
Vitriolic acid
Nirtous acid
Sulphur and acetous acid.

10. LEAD.

Vitriolic acid
Marine acid
Nitrous acid
Acetous acid
Expreſſed oils.

11. REGULUS of ANTIMONY.

Vitriolic acid
Nitrous acid
Marine acid
Acetous acid.

12. ARSENIC.

Zinc
Iron
Copper
Tin
Lead
Silver
Gold.

13. REGULUS of ANTIMONY with Metals.

Iron
Copper
Tin
Lead
Silver
Gold.

14. QUICKSILVER.

Gold
Lead and tin
Copper
Zinc, biſmuth, and regulus of antimony.

15. SILVER.

Lead
Copper
Iron.

16. WATER.

Fixed alkali
Spirit of wine
Milk, alkaline ſalts, and ſome neutrals.

17. SPIRIT of WINE.

Water
Oils and reſins.

In conſequence of heat, ſedative ſalt and the other ſolid acids decompound vitriolated tartar, nitre, and ſea-ſalt.

Double Elective Attractions; which, in ſome caſes, may be conſidered as exceptions to the foregoing table.

I. Thoſe which happen in mixtures of watery ſubſtances.

1.	Acids	Volatile alkali
	Calc. earths, or metallic ſubſtances	Fixed air.
2	Vitriolic or marine acids	Mercury, ſilver, or lead,
	Alkalies or earths	Nitrous or acetous acids.
3	Lead	Vitriol acid
	Nitrous marine, or acetous acids	Alkalies, earths, or M. S.
4.	Silver	Marine acid
	Vitriolic, nitrous, or acetous acids	Alkaline ſalts, earths, or M. S.
5.	Volatile alkali	Fixed air
	Acids	Fixed alkali.
6.	Nitrous, marine, or acetous acids	Volatile alkali, magneſia, or earth of alum
	Calcareous earths	Vitriolic acid.

II. Thoſe which happen in diſtillations or ſublimations, and require heat.

1.	Vol. alkali	Fixed air
	Acids	Calcareous earths.
2.	Vol. alkali	Nitrous, marine, or acetous acids
	Vitriol. acid	Fixed alkali.
3.	Vol. alkali	Acetous acid
	Nitrous, marine, or vitriolic acids	Fixed alkali, or abſorbent earths.

4.	Reg. of antimon.	Marine acid
	Sulphur	Quickſilver.

III. Thoſe which happen in mixtures by fuſion.

1.	Tin	Iron
	Silver	Lead.
2.	Copper	Sulphur
	Gold	Lead.
3.	M. S.	Sulphur
	Gold	Reg. of ant.

The firſt of theſe tables requires very little explanation. The names printed in ſmall capitals, are thoſe of the ſubſtances which have the affinity with or attract thoſe below them. Thus, vitriolic acid attracts moſt powerfully the phlogiſton, or inflammable principle: next, fixed alkali; then, calcareous earth; and ſo on, in the order in which they are marked. — The tables of double elective attractions cannot be made quite ſo diſtinct; though an explanation of one example will make this likewiſe eaſy to be underſtood. Thus in Table I. the firſt caſe is, "If a combination of acids with calcareous earths or metallic ſubſtances is mixed with a combination of volatile alkali and fixed air, the acids will unite themſelves to the volatile alkali, and the fixed air to the calcareous earth or metallic ſubſtance.

Sect. X. *Of the different Operations in Practical Chemiſtry, and the proper Inſtruments for performing each.*

554 Operations in chemiſtry.

The moſt remarkable operations in chemiſtry, and by which the greateſt changes are made upon thoſe bodies which are the objects of that ſcience, may be comprehended under the following names. 1. Solution. 2. Filtration. 3. Precipitation, or coagulation. 4. Evaporation. 5. Cryſtallization. 6. Diſtillation. 7. Sublimation. 8. Deflagration. 9. Calcination. 10. Fuſion. 11 Maceration, or digeſtion. To which we may add, 12. Trituration, or levigation.

555 Chemiſts how divided.

Before we proceed to a particular account of each of theſe operations, it is neceſſary to take notice, that there are two different things propoſed by thoſe who enter on the practice of chemiſtry. Some have nothing farther in view than the enlargement of their knowledge, or making improvements in arts which are to be practiſed by others for their own advantage. Others deſign to follow chemiſtry as a trade, by which they hope to enrich themſelves, or to get a comfortable livelihood. But the apparatus and utenſils neceſſary for performing the very ſame operations are exceedingly different when experiments only are to be made, from what they muſt be when theſe operations are performed with a view to profit; and ſo great is this difference, than thoſe who purſue chemiſtry with a view to advantage, will always find themſelves very conſiderable loſers if they follow the plan of an apparatus or a laboratory deſigned only for making experiments. Along with the apparatus, therefore, which is commonly deſcribed in chemical books, and proper only for experiments, we ſhall alſo give that which is neceſſary for preparing great quantities of any chemical article in the way of trade.

556 Glaſs veſſels, when to be uſed.

In general, thoſe who practice chemiſtry merely with an experimental view, ought, as much as poſſible, to make uſe of glaſs veſſels, as not being liable to be corroded by the moſt powerful ſolvents; and, by their tranſparency, giving an opportunity of obſerving what paſſes within them during the operation. But by thoſe who practiſe chemiſtry with a different view, theſe veſſels ought, with equal care, to be avoided, on account of their expence and brittleneſs. This laſt quality, indeed, is poſſeſſed by glaſs in ſo eminent a degree, that glaſs veſſels will ſometimes fly to pieces, and that with conſiderable violence, when ſtanding by themſelves, and nothing touching them. The principle objects which a chemiſt ought to have in view, in performing his operations, ought to be to ſave time and fuel, eſpecially the former; and for this purpoſe, he would find himſelf a conſiderable gainer, though he ſhould be at much greater expence in his apparatus than he would otherewiſe have occaſion for.

557 Dr Black's obſervations on chemical veſſels.

On the ſubject of chemical veſſels Dr Black obſerves, that "with regard to the material of which theſe are compoſed, we are very much at a loſs; and indeed there are no ſuch materials in nature as are capable of anſwering the purpoſes of chemiſts in abſolute perfection.—The qualities are, 1. Tranſparency to allow us to ſee the changes going on; 2. The power of reſiſting the action of acids and corroſive ſubſtances; 3. That they bear ſudden alterations of heat and cold without breaking; 4. That they be ſtrong, in order to confine elaſtic vapours; and, 5. That they bear very great heat without melting. As theſe qualities, however, are not to be met with united in any one ſubſtance, the chemiſts are obliged to have recourſe to different ſubſtances which poſſeſs ſome of them differently. Theſe are, *glaſs*, *metal*, and *earthen ware*.

558 Good and bad qualities of glaſs as a material for chemical veſſels.

Glaſs is poſſeſſed of the two firſt properties, but has the inconvenience of being apt to crack and fly in pieces, on any ſudden tranſition from heat to cold, or from cold to heat. The beſt method of remedying this defect, is to have the glaſs made very thin, and of a round figure, that it may be all heated as equally as poſſible; as it is the unequal application of the heat which cauſes it break. Another requiſite in the choice of chemical glaſſes, is that they be well annealed.

559 Extreme fragility of glaſs not well annealed.

If this is not done, the glaſs will either immediately fly to pieces, or be liable to break on the ſmalleſt accident. That ſuch glaſſes ſhould be liable to be broken on every ſlight occaſion, is a phenomenon that has hitherto received no explanation. If you touch them with a diamond, with a piece of flint, glaſs, *&c.* or expoſe them to the heat of the ſun, they break immediately. Dr Black has had great veſſels of glaſs, which broke immediately on his throwing a little ſand into them to clean them. This manifeſtly depends upon the ſame principles as the qualities of what are called *glaſs tears*.

560 Good and bad qualities of metals as materials for chemical veſſels.

Glaſs when well annealed is univerſally to be preferred, where great and ſudden changes of heat, or much ſtrength, are not required. Flint-glaſs is the beſt; but the coarſer kinds, as bottle-glaſs, are very apt to break.

The metals have the third and fourth qualities in perfection, but are deficient in all the reſt. The moſt troubleſome property is, that they are liable to be corroded by acids and other bodies, as is the caſe with iron and copper; though this is in ſome meaſure remedied by tinning; which, though it wants ſome of the qualities from its melting too ſoon, yet reſiſts the action of many acrid ſubſtances without being ſo readily injured by them; but it is not entirely free from this imperfection, and is liable to be ſomewhat corroded and ruſted. In nice operations, therefore, recourſe is had to ſilver and even to gold veſſels.

561 Of earthen ware.

Earthen ware poſſeſſes only the fifth quality in perfection, *viz.* that of bearing a violent heat without fuſion. The baſis of theſe veſſels is clay, which, when good, is very convenient for the formation of veſſels, and it has been uſed from the earlieſt ages of chemiſtry for this purpoſe. The requiſite qualities are, 1. A conſiderable degree of toughneſs when mixed with water. 2. A great degree of hardneſs when burnt in the fire with a violent degree of heat. The beſt kind of clay thus contracts a degree of hardneſs ſcarce inferior to flint, as is the caſe with that of which tobacco-pipes are made; but moſt other kinds, ſuch as that of which bricks are conſtructed, are apt to melt with a ſtrong heat into a ſpongy matter. Clay, however, can ſeldom be uſed alone; for when burnt to extreme hardneſs, the veſſels are very liable to crack. This is remedied by mixing ſand reduced to a particular degree of fineneſs, with the clay of which the veſſels are made. For this purpoſe both the fineſt and the coarſeſt particles of the ſand muſt be thrown away.

562 Black lead a valuable material for ſome purpoſes.

Another ſubſtance known by the name of black lead, uſed in the making of pencils, reſiſts the fire exceedingly. This, however, does not contain an ore of lead, but ſulphur, and ſome mineral ſubſtances; when mixed with clay, however, it makes it reſiſt the fire ſurpriſingly. But there are ſome particular caſes in which neither ſand nor black lead can be uſed as a material; for the ſand is eaſily corroded by acrid matters, and the black lead would produce other inconveniences. Clay is therefore to be taken in its unburnt ſtate, reducing it to a powder like ſand; then burning this powder with a violent heat, ſo as to convert it into ſand. Mixing it then with raw clay, it forms a compoſition which anſwers very well for making chemical veſſels, and may be employed in thoſe particular caſes where ſand would not anſwer. Pott of Berlin has written upon the different kinds of earthen ware proper to be employed in the conſtruction of chemical veſſels. There is a French tranſlation of it in four or five volumes.

563 Porcelain veſſels when to be uſed.

In caſes where the utmoſt compactneſs of texture is required, procelain veſſels are to be choſen; which is compoſed of the fineſt clay, mixed with a ſtony matter, that has the quality of melting in a violent heat, and gives more compactneſs to the clay than it is naturally capable of receiving; but theſe are rather too coſtly for moſt operations. Reaumur has taught a way of converting glaſs into porcelain.

We ſhall now proceed to a particular deſcription of each of the operations abovementioned.

564 Solution.

I. SOLUTION. By this is underſtood the diſſolving a ſolid ſubſtance in a fluid, ſo as that the ſolid ſhall totally diſappear, and become part of a tranſparent liquor. This operation applies particularly to ſalts, earths, and metals: as well as to ſeveral unctuous and inflammable ſubſtances. For performing this operation in a ſmall way, common vials are in many caſes ſufficient. Where the ſolution is attended with efferveſence and a diſcharge of vapours, the long-necked glaſſes called *matraſſes*, or *bolt-heads*, (fig. 5.), are neceſſary. Florence flaſks are indeed exceedingly well adapted for this operation, as being of the proper ſhape, and capable of bearing heat ſo well, that they may be filled with any fluid, and ſet on a common fire like a metalline veſſel. Solution is much promoted by agitating the veſſel, and by heat. In ſome caſes, indeed, it will not take place till the mixture becomes very hot; and in ſuch caſes it will be proper to make the fluid boiling hot by itſelf, and then ſlowly to add the ſubſtance to be diſſolved.

Plate CXXXIV.

When large quantities of ſaline matter are to be diſſolved, metalline veſſels muſt be uſed: but before any are made uſe of for this purpoſe, it will be neceſſary to make an experiment whether the ſalt receives any impregnation from the metal of which the veſſel intended to be made uſe of is formed; and if this is found to be the caſe, it muſt not be uſed. The metals moſt liable to be corroded by ſaline bodies are iron and copper; and indeed, unleſs it be for the ſingle purpoſe of diſſolving fixed alkaline ſalts, iron veſſels ſeem totally unfit for ſaline ſolutions of any kind. Copper veſſels are alſo very liable to be corroded, and to communicate very miſchevous qualities to the liquors which corrode them; for which reaſon, they ought never to be made uſe of for the purpoſes of ſolution. The metal leaſt liable to be corroded, next to gold and ſilver, is lead; and therefore a chemiſt ought rather to provide himſelf with leaden veſſels than thoſe of any other metal. But though lead is not apt to be corroded by many kinds of ſalts, there are ſome which are found to act upon it, and to form therewith a very dangerous poiſon. The vegetable acid of vinegar is particularly apt to receive a dangerous impregnation from this metal; and therefore no ſolution of any ſalt containing this acid ought to be made in leaden veſſels. It appears to be very little affected by the vitriolic or marine acids; and therefore any ſaline ſubſtance containing either of theſe acids may be ſafely enough diſſolved in veſſels made of lead.

In order to ſave time in making ſolutions, the veſſels ought to be as large as poſſible; though even in this there muſt be a certain limit: for two ſmall veſſels filled with water will ſooner acquire the neceſſary degree of heat than one large one; and in proportion as the veſſel is made more capacious, the ſides and bottom muſt be thicker, which conſiderably increaſes the expence. Fifteen or twenty Engliſh gallons is the utmoſt capacity of which they ever will be required; and is rather above what will on moſt occaſions be neceſſary. They ought to be of a conical figure, round at the bottom; and to have a cover of thick plate-iron all around that part which is expoſed to the action of the fire, that the lead may not bend on the application of heat, which it would otherwiſe be very apt to do. When the ſolution is to be made, the leaden veſſel is firſt to be filled up with water ſo far as to have room for the quantity of ſalt intended to be diſſolved: a fire is then to be applied ſo as to make it boil: and then the ſalt is to be added ſlowly, ſo as ſcarcely to hinder the boiling; for if a great quantity was thrown in at once, ſo as to cool the liquor very much, great part of the ſalt would concrete on the bottom, in ſuch

CHEMISTRY. Plate CXXXIII.

Chemical Characters or Symbols.

+𝓕 *Acid of Fluor*
o+o *Arsenic*
+⌂ *Borax*
+⊗ *Sugar*
+⊤ *Tartar*
+⊕ *Sorrel*
+c *Lemon*
+♀ *Benzoin*

+∞ *Amber.*
+⊚ *Sugar of Milk.*
⁜ *Vinegar.*
+⊚ *Milk.*
+ƒ *Ants.*
+8 *Fat.*
+⍋ *Phosphorus.*
🜁 *Aerial.*

+♁ *Colouring matter of Pruſſian Blue falſely called an Acid.*
+⊖ *Phlogiſticated vitriolic Acid the same w.^{t} Vol. Sulphureous Acid.*
+⊖ *Dephlogiſticated Marine Acid.*

⊖ *Fixed vegetable Alkali.*
⊖ *Mineral Alkali.*
⚶ *Ponderous Earth.*
🜁 *Pure Air.*
⊙ *Platina.*
♁ *Manganese.*
⚶ *Metallic calx.*

Fig. 1.

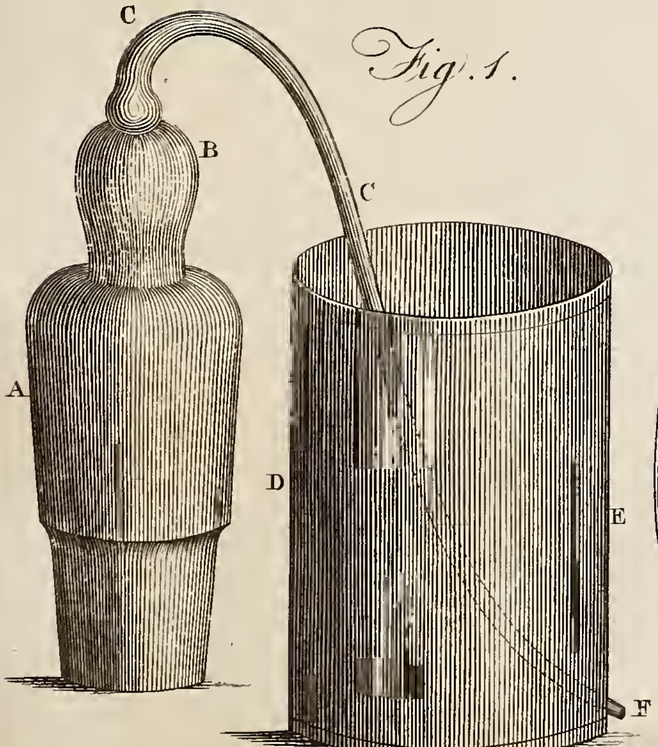

Fig. 3.

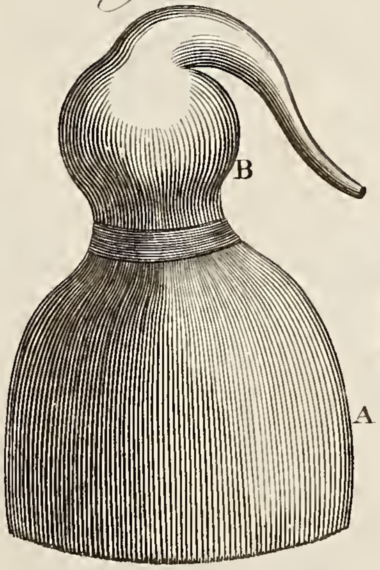

Fig. 2.

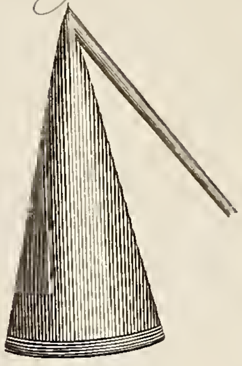

Fig. 5.

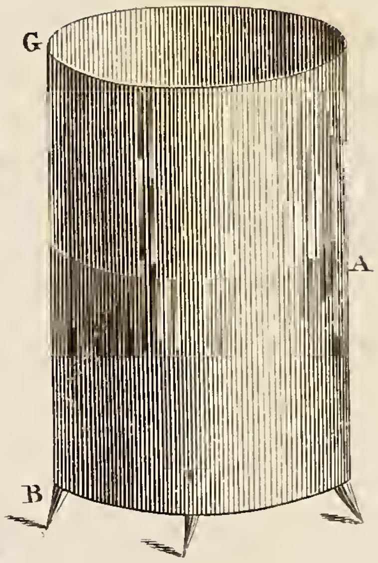

Fig. 7.

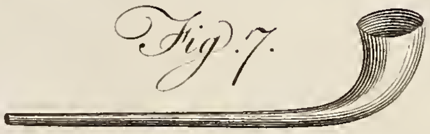

Fig. 6.

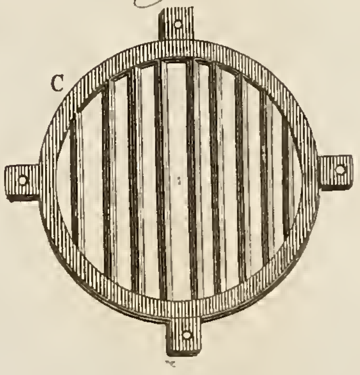

Fig. 4.

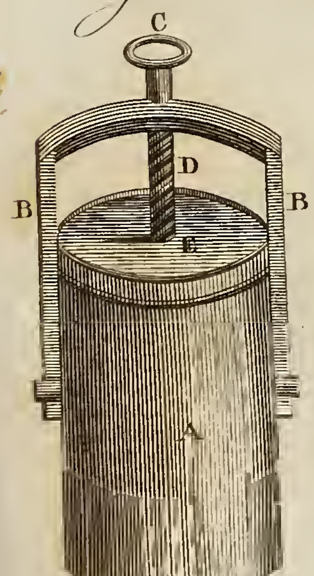

Fig. 9.

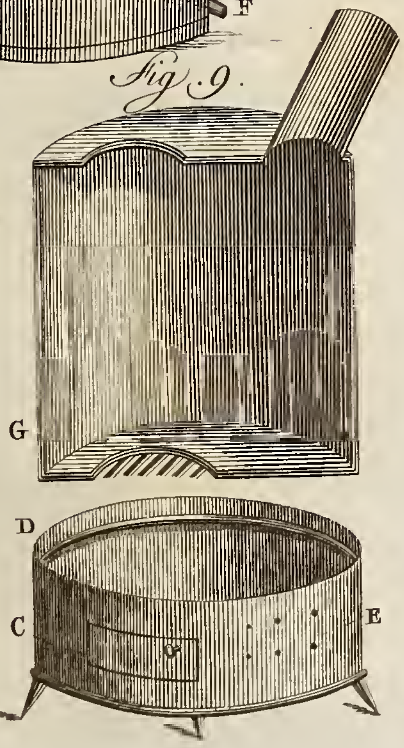

Fig. 8.

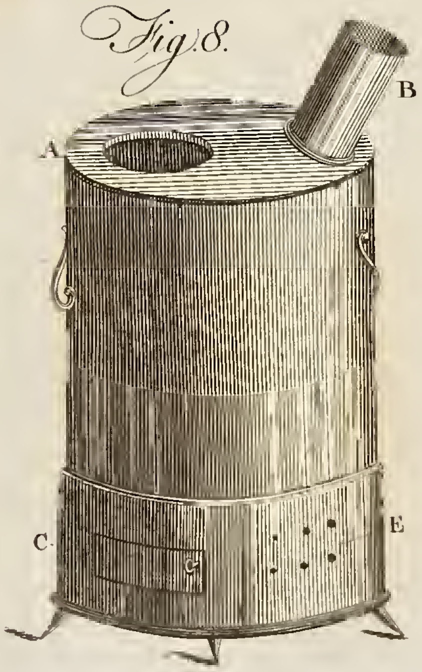

Fig. 10.

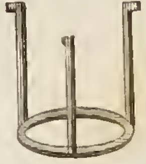

Fig. 11.

Thackara & Vallance Sculp^{t}.

a manner as not only to be very difficultly ſoluble, but even endanger the melting of the veſſel. It is of ſome conſequence alſo to avoid the hot ſteam which proceeds from the boiling water, and which iſſues with great force from a narrow-mouthed veſſel, ſuch as we have been deſcribing. That the operator may be out of the reach of this, and likewiſe diſſolve the ſalt in a regular and gradual manner, without any danger of its concreting on the bottom, it will be proper to have a leaden, or even a wooden, veſſel, with a long handle; which is to be filled with the ſubſtance to be diſſolved, then immerſed in the boiling liquor, and ſhaken about in it, till the ſalt is made into a kind of thick pap, which will be in no danger of concreting. It will alſo be proper not to ſaturate the water perfectly with ſalt; for it will in that caſe be impoſſible to hinder part of it from ſettling on the bottom, where it ſoon acquires ſuch a degree of heat as to melt the lead. Before any ſaline ſubſtance is put into water for ſolution, it ought to be pounded and ſifted through a hair ſieve.

Where large quantities of metal are to be diſſolved in acids, eſpecially the nitrous acid, glaſs veſſels are in a manner indiſpenſable; although the common ſtoneware bottles, eſpecially thoſe made in Holland, will anſwer the purpoſe very well, as not being liable to corroſion, and not ſo apt to break as the glaſs veſſels are. They may be got of ſuch a ſize as to hold three or four gallons: but no veſſel in which metalline ſolutions are made ought ever to be above half full.

In ſolutions of oily and inflammable ſubſtances, caſt iron veſſels are perhaps the moſt proper of any; though copper ones are generally preferred. The copper is exceſſively ſoluble in oil, eſpecially if it is left to cool in ſuch a veſſel; but iron is not ſoluble in any inflammable matter except ſulphur. Copper has, however, this advantage over iron, that it is ſooner cooled, as the veſſels made of copper are thinner than they can be made of caſt iron: ſo that if too great heat is applied to a copper veſſel, it may be eaſily remedied by taking it off the fire; but in a caſt iron veſſel the heat continues ſo long as may ſometimes produce dangerous conſequences, even after the fire is removed.

565
Dr Black's directions for ſolution.

Dr Black obſerves, that for the purpoſe of ſolution, if no particular nor uncommon conſequence follow the application of the two bodies to each other, and if none of them be very volatile, any glaſs or porcelain veſſel that can reſiſt the action of the ſubſtances will anſwer the purpoſe; but it often happens that they break out into violent ebullition, which produces ſteam; and here a common veſſel is not ſo proper, as we would wiſh to have the vapour confined or condenſed. We therefore chooſe a cloſe veſſel that will bear the heat ſuddenly produced by the mixture, or the heat that may be neceſſary to promote the action of ſuch bodies upon one another. Of this kind is the *phiala chemica*, or matraſs, in which the vapours will have time to circulate and to be condenſed again, without being allowed to eſcape. Where the matter is in ſmall quantity, ſmaller veſſels ſomewhat of the ſame form are uſed, as Florentine flaſks, which bear ſudden changes of heat and cold remarkably well, on account of their thinneſs. In order to promote the action of bodies, it is ſometimes neceſſary to make the fluids boil; and for this purpoſe we muſt have a matraſs with a large neck, or apply another veſſel to it that will receive theſe ſteams, and give them ſtill more room for their condenſation, and direct them to fall back again, when condenſed, into the matraſs. This is called *circulation*. Macquer deſcribes another veſſel called the *pelican*, which has been made uſe of for this purpoſe; but it is hardly ever employed, on account of its being ſo troubleſome to procure and manage it; and the advantages ariſing from it may be obtained by a more ſimple apparatus.

566
Pelican. Fig. 6.

567
Papin's digeſter. Plate CXXXIII.

To this head we muſt refer Papin's digeſter, which is repreſented Fig. 4. It is generally made of copper, very thick and ſtrong, open at the top, with a lid fitted to it, which applies very exactly. There are uſually two projections on the ſide, deſigned to make the lid go in a particular manner, but they are unneceſſary. There are other two, to which are fitted the two ſides of a croſs bar B B; in which croſs bar there is a ſtrong ſcrew D, by which the lid can be preſſed down very ſtrongly. Its uſe is to force water to bear a ſtronger heat than it can do under the ordinary preſſure of the atmoſphere. It is ſometimes furniſhed with an apparatus for letting out the ſteam, leſt it ſhould be in danger of burſting the veſſel. A pipe is paſſed through the lid which is fitted with a valve, on which paſſes a lever at a very ſmall diſtance from its centre of motion; and this can be made to preſs on the valve with different weights, according to the diſtance of theſe weights from the centre. In one conſtructed by Dr Black, there was another pipe below, into which a thermometer could be introduced, in order to meaſure the degree of heat to which the ſteam was raiſed. This machine was pretty much employed ſome time ago, and its effects were much admired; but we find that moſt things which can be diſſolved in this way, can likewiſe be diſſolved in the ordinary way by boiling water, provided it is continued for a longer time, as animal bones, from which the gelatinous parts are indeed extracted very quickly by this veſſel; but the ſame change is produced by boiling them in water for a long time in the ordinary degree of heat.

568
Filtration.

II. Filtration. This operation is generally the attendant of ſolution: very few ſubſtances, of the ſaline kind eſpecially, are capable of being diſſolved without leaving ſome impurities, from which they muſt be freed; and the doing of this, ſo as to render the ſolution perfectly tranſparent, is what is underſtood by the word *filtration*.

For purpoſes merely experimental, a glaſs funnel and piece of paper are generally ſufficient. The paper is formed into a conical cap, which being placed in the funnel with its point downwards, the funnel is then placed in the mouth of a vial; and the ſolution or other liquor to be filtered is poured into the paper cap, through which the liquor paſſes tranſparent, leaving its impurities on the paper. For the purpoſe of filtration, paper has come into ſuch general uſe, that a particular kind of it is prepared under the name of *filtering paper*. This is of a reddiſh colour; but Dr Lewis prefers the whitiſh grey paper which comes from Holland about the pill boxes, as not giving any colour to the ſolutions which paſs through it.

This operation though apparently ſo ſimple and eaſy, is nevertheleſs attended with very troubleſome circumſtances, on account of the great time it takes up. Even where very ſmall quantities of liquor are to be filtered, merely for experiment's ſake, the impurities frequently ſettle on the paper ſo ſoon, and obſtruct its pores to ſuch a degree, that the operator is often quite wearied out: often, too, the paper breaks; and thus the whole is ſpoiled, and the operation muſt be begun over again.

To avoid theſe inconveniences, another method of filtration has been propoſed; namely, to uſe a number of cotton threads, the ends of which are to be immerſed in the liquor, and the other ends are to hang over the ſide of the veſſel which contains it, and to hang lower than the ſurface of the liquor. By this means they will act as ſo many capillary ſyphons, (ſee Syphon); the liquor will ariſe in them quite pure, and be diſcharged from their lower extremities into a veſſel placed to receive it. That the liquor may flow freely into the cotton, it will be proper to wet the threads before they are uſed.

In point of efficacy, no doubt, this method excels every other; and where the operator has abundance of time and patience, may be proper for experiments; but, in the way of trade, ſuch a contrivance is evidently uſeleſs. For filtering large quantities of liquor, therefore, recourſe has been had to large funnels; earthen cullenders, or baſons full of holes in the bottom, lined with filtering paper; and to conical bags of flannel or canvas

The inconveniences attending funnels, when uſed only in the way of experiment, are much greater when they are employed for filtering large quantities of liquor; and therefore they are generally laid aſide. The earthen cullenders, too, do not anſwer any good purpoſe; nor indeed does filtration through paper in general ſucceed well. The conical flannel or canvas bags are greatly preferable: but they have this inconvenience, that the preſſure of the liquor is directed chiefly againſt one particular point, or a ſmall part of the bottom, and therefore the impurities are forcibly driven into that place; and thus the operation becomes inſufferably tedious.

The beſt method of obviating the inconveniences of filtration ſeems to be the following. Let a wooden frame of about three feet ſquare be made, having four holes, one in each corner, about three quarters of an inch in diameter. This frame is to be ſupported by four feet, the ends of which muſt project an inch or two through the holes. Thus the whole may be occaſionally ſet up and taken down ſo as to go into very little compaſs; for if the feet are properly placed, each with a little projection outwards, there will be no danger of its falling. A ſquare piece of canvas muſt alſo be procured, ſomewhat leſs than the wooden frame. On each corner of it there muſt be a very ſtrong loop, which ſlips on one of the projecting ends of the feet, ſo that the canvas may hang a little ſlack in the middle of the frame. The liquor to be filtered is now poured into the canvas, and a veſſel placed underneath to receive it. At firſt it will paſs through very foul; but being returned two or three times will become perfectly tranſparent, and will continue to run with great velocity, if the filter is kept conſtantly full. A filter of the ſize juſt now mentioned will contain ten gallons of liquid; which is a very great advantage, as the heat of ſuch a quantity of liquor is not ſoon diſſipated, and every ſolution filters much faſter when hot than when allowed to cool.

The advantages of a filter of this kind above others ariſe from the preſſure of the liquor being more equally diffuſed over a large ſpace, by which the impurities are not forced ſo ſtrongly into the cloth as to ſtop it up entirely. Yet even here, where large quantities of liquor require filtration, the cloth is apt to be ſtopped up ſo as to make the operation not a little tedious and diſagreeable. It will be proper therefore to have ſeveral cloths, that one may be applied as ſoon as another is taken off.

To promote the operation of filtration, it is very proper to let the liquors to be filtrated ſettle for ſome time; that ſo their groſſer feculencies may fall to the bottom, and thus there will be the fewer to retard the laſt part of the operation. Sometimes, however, theſe feculencies refuſe to ſettle till after a very long time; and where this happens to be the caſe, a little powdered quicklime thrown into the boiling liquor remarkably promotes the ſeparation. This, however, can only be uſed in certain caſes.

569
Schemes for filtering large quantities of water.

In ſome caſes, the diſcovery of a ready way of filtering a large quantity of liquor would be a matter of great conſequence; as where a town is ſupplied with river water, which is generally far from being clear, and often imparts a diſagreeable colour to clothes waſhed with it. Some years ago, a ſcheme was propoſed by a chemiſt for filtering muddy water in any quantity. His method was, to have a large caſk covered over in the bottom with ſtraw to the depth of ſome inches, and then filled up with ſand. This caſk was entirely open at one end, and had a hole in the other, which, by means of a leaden pipe, communicated with a large reſervoir of the water to be filtered, and which ſtood conſiderably higher than the caſk. The water which deſcended through the pipe into the caſk, having a tendency to riſe up to the ſame level with that in the reſervoir, would preſs violently againſt the ſand, and, as he thought, run over the mouth of the caſk perfectly filtrated, and free from its impurities. By this contrivance, indeed, a very violent preſſure was occaſioned, if the height of the reſervoir was conſiderable: but the conſequence was, not a filtration, but a greater degree of impurity in the water; for the ſand was forced out of the caſk along with it, and, however confined, the water always aroſe as muddy as it went in.

Where water is to be filtered in large quantity, as for the purpoſes of a family, a particular kind of ſoft ſpongy ſtones called *filtering ſtones*, are employed. Theſe, however, though the water percolates through them very fine, and in ſufficient quantity at firſt, are liable to be obſtructed in the ſame manner as paper, and are then rendered uſeleſs. A better method ſeems to be, to have a wooden veſſel, lined with lead, three or four feet wide at top, but tapering ſo as to end in a ſmall orifice at the bottom. The under part of the veſſel is to be filled with very rough ſand, or gravel, well freed from earth by waſhing. Over this, pretty fine ſand may be laid to the depth of 12 or 14 inches, but which muſt likewiſe be well freed from earthy particles. The veſſel may then be filled up to the top with water, pouring it gently at firſt, leſt the ſand ſhould be too much diſplaced. It will ſoon filter thro' the ſand, and run out at the lower orifice exceedingly tranſparent, and likewiſe in very conſiderable quantity. When the upper part of the ſand begins to be ſtopped up, ſo as not to allow a free paſſage to the water, it may occaſionally be taken off, and the earthy matter waſhed from it, when it will be equally ſerviceable as before.

570 Precipitation.

III. PRECIPITATION or COAGULATION. This operation is the very reverſe of ſolution, and is the bringing a body ſuddenly from a fluid to a ſolid ſtate. It differs from cryſtallization, in that it generally requires leſs time; and in cryſtallization the ſubſtance aſſumes regular figures, whereas precipitates are always in the form of powders.

Precipitation is generally preceded by ſolution and filtration: it is uſed for ſeparating earths and metals from the acids which had kept them ſuſpended. When a precipitation is made of the more valuable metals, glaſs veſſels are to be uſed. When earths, or the imperfect metallic ſubſtances, are to be precipitated in large quantity, wooden ones anſwer every purpoſe. If a metal is to be precipitated by an alkali, this ſalt muſt firſt be diſſolved in water, then filtered, and gradually added to the metallic ſolution. If particular circumſtances do not forbid, the ſalt for precipitation ſhould be choſen in its cauſtic ſtate, or deprived of its fixed air, becauſe then a very troubleſome efferveſcence is avoided. To promote the operation alſo, the mixture, if contained in a glaſs, is to be ſhaken; or if in any other veſſels, to be well ſtirred after every addition of alkali. If an earth is employed to precipitate a metal, the mixture muſt be in a manner conſtantly ſtirred or ſhaken, in order to promote the precipitation; and if one metal is to be precipitated by another, that which is uſed as a precipitant muſt be beaten into thin plates, that ſo they may be frequently cleaned from the precipitating metal, which would otherwiſe very ſoon totally impede the operation.

Sometimes a precipitation enſues on the addition of water or ſpirit of wine: but in moſt caſes care muſt be taken not to add too much of the ſubſtance which is uſed to precipitate the other; becauſe, in ſuch a caſe, the precipitate may be diſſolved after it has been thrown down. Thus, though volatile alkali will ſeparate copper from aquafortis, it will as effectually diſſolve the precipitate, if too much of it is uſed, as the acid itſelf. It is proper, therefore, to proceed cautiouſly, and examine a ſmall quantity of the liquor from time to time. If an addition of the precipitant throws down any more, it will be proper to add ſome more to the whole ſolution.

571 Edulcoration.

It is ſeldom or never that precipitation can be performed ſo perfectly, but that one or other of the ingredients will prevail; and though they ſhould not, a new compound, conſiſting of the acid united with the alkali, or other ſubſtance uſed for precipitation, is contained in the liquor through which the precipitate falls. It is proper, therefore, to waſh all precipitates; otherwiſe they can never be obtained perfectly pure, or free from a mixture of ſaline ſubſtances. This is beſt done by pouring the whole into a filter, and letting the fluid part run off, as long as it will drop, without ſhaking the cloth. Some water is then to be cautiouſly poured all over the ſurface of the precipitate, ſo as to diſturb it as little as poſſible. This water will puſh before it the ſaline liquor which is mixed with the powder, and render it much purer than before. A ſecond or third quantity of water may be uſed, in order to waſh off all the ſaline matter. This is called *edulcorating* the precipitate.

572 Evaporation.

IV. EVAPORATION. This operation conſiſts in diſſipating the moiſt fluid or volatile parts of any ſubſtance by means of heat. It moſt generally ſucceeds ſolution and filtration, being a preparatory for the operation of cryſtallization.

For the evaporation of ſaline ſolutions, which have been already filtered, and which it is of conſequence to preſerve from even the leaſt impurities, diſtilling veſſels are unqueſtionably the moſt proper; both as, by their means, the ſolution will be kept perfectly free from duſt, and as the quantity of liquor evaporated can be known with certainty by meaſuring that which comes over. This alſo is probably the moſt expeditious method of evaporating, and which requires the leaſt fuel. (See the detached articles EVAPORATION and DISTILLATION). With regard to veſſels for evaporation, the ſame thing muſt be applicable which was mentioned above under *Solution*. No ſaline liquor muſt be evaporated in a veſſel which would be corroded by it; and hence iron veſſels are abſolutely improper for evaporations of any kind of ſaline liquor whatever.—Lead is in this caſe the metal moſt generally uſeful. It muſt only be uſed, however, where the evaporation is not carried to dryneſs; for, on account of the great fuſibility of this metal, nothing could be exſiccated in it without great danger of its melting. Where a ſaline liquor therefore is to be perfectly exſiccated, the evaporation, if performed in lead veſſels, muſt be carried on ſo far only as to form a ſaline pellicle on the ſurface of the liquor. It is then to be drawn off; for which purpoſe, all evaporating veſſels ſhould have a cock near the bottom. The liquor muſt now be put into a number of ſtone-ware baſons, ſet on warm ſand, where the exſiccation may be finiſhed.

573 Cryſtallization.

V. CRYSTALLIZATION. This, though commonly accounted one of the proceſſes in chemiſtry, is in reality only a *natural* one, and which the chemiſt can only prepare for, leaving the operation entirely in the hands of nature.—By cryſtallization is meant the ſeparation of a ſalt from the water in which it has been diſſolved, in tranſparent maſſes regularly figured, and differently formed, according to the different nature of the ſalts.

This proceſs depends upon the conſtitution of the atmoſphere more than any other; and therefore is difficult to be performed, nor does it always ſucceed equally well; neither have there yet been laid down any rules whereby beautiful and regular cryſtals can with certainty be formed at all times.

As the different ſalts aſſume very different figures when cryſtallized, they are not ſubject to the ſame general rules in cryſtallization. Nitre, Glauber's ſalt, vitriol of iron, and many others, cryſtallize beſt on having their ſolutions ſet in a cold place after proper evaporation. Sal polychreſt, and common ſalt, require the ſolution to be kept as hot as the hand can bear it during the time of cryſtallizing. Soluble tartar too, and other deliqueſcent ſalts, require to be kept warm while this operation is going on: and there are many ſaline ſubſtances, ſuch as the combinations of calcareous earths and magneſia with acids, which can ſcarcely be cryſtallized at all.

Mr Beaumé has diſcovered, that when two or more ſalts are diſſolved in the ſame quantity of water, when one cryſtallizes, the cryſtals of that ſalt will not contain the leaſt quantity of any of the others: neither, although the liquor was acid or alkaline, will the cryſtals for that reaſon be either acid or alkaline, but will remain perfectly neutral; and the acid or alkaline liquor which adheres to the outſide of the cryſtals may be abſorbed by merely ſpreading them on filtering paper.—Hence we are furniſhed with a better method of ſhooting ſalts into large and well formed cryſtals than merely by diſſolving them in water; namely, by adding to the ſolutions, when ſet to cryſtallize, a certain quantity of acid or alkaline liquor, according to the nature of the ſalts themſelves. Theſe additions, however, are not equally proper for all ſalts; and it is not yet determined what kinds of ſalts ought to be cryſtallized in alkaline, and what in acid liquors.—Soluble tartar and Seignette's ſalt cryſtallize beſt when the liquor is alkaline. Sal ſedativus, ſal Glauberi, and ſal polychreſt, require an acid if cryſtallized in the cold; but ſal polychreſt forms into very fine and large cryſtals when the ſolution is alkaline, and kept as hot as the hand can eaſily bear.

The beſt general direction that can be given with regard to the regular cryſtallization of ſalts is, that they ought to be ſet to cryſtallize in as large a quantity at once as poſſible; and this, as far as we have obſerved, without any limit; for by this means, the cryſtals are formed much larger and better figured than they poſſibly can be by any other method hitherto known.—As to the form of the veſſels in which ſalts are to be cryſtallized, little can be ſaid with certainty. They are generally flat, and wider at top than at the bottom. The only proper material, in the large way, is lead.

574 Diſtillation.

VI. DISTILLATION. This is a kind of evaporation; only in ſuch a manner, that the part of the liquor evaporated is not diſſipated in the air, but preſerved by making the ſteam paſs through a ſpiral pipe, which goes through a large veſſel full of cold water, or into cold glaſs receivers.

This is one of the moſt common chemical operations; and as there are a variety of ſubjects which require to be diſtilled, there is conſequently a conſiderable variety both in the form of the diſtilling veſſels to be uſed on different occaſions, and likewiſe in the materials of which they are made, as well as the management of the fire during the time of the operation.

Plate CXXXIV.

The moſt ſimple and eaſily performed diſtillation is that by the common copper ſtill, (fig. 3). It conſiſts of two parts; one called the *body*, and the other the *head*. The body is a cylindrical veſſel of copper, which is ſometimes tinned over in the inſide; but where diſtillation is performed without any regard to the reſiduum, the tinning is uſeleſs. The upper part of the body terminates in a kind of arch, in the middle of which is a circular aperture, about one half, or ſomething leſs, in diameter, of the breadth of the whole body.—Into this aperture, a round head, made likewiſe of copper, is fitted, ſo as to be removeable at pleaſure. In the top, or ſometimes in the ſide of the head, is inſerted a pewter pipe, which communicates with a ſpiral one of the ſame metal, that paſſes through a large wooden veſſel, called the *refrigeratory*, filled with cold water; each of its ends projecting a little above and below. The ſtill is to be filled two-thirds full of the ſubſtance to be diſtilled, the head put on, and the junctures well cloſed with mixture of linſeed meal and water, or common flour or chalk and water will anſwer the ſame purpoſe. This mixture is called the *luting*, or *lute*. A fire being kindled under the ſtill, the vapours will ariſe; and, being condenſed by the cold water, through which the ſpiral pipe called the *worm* paſſes, will run in a ſtream more or leſs ſtrong as the fire is more or leſs haſtily urged, and is catched in a receiver ſet underneath.

This kind of diſtilling veſſels is proper for procuring the eſſential oils of vegetables, vinous ſpirits from fermented liquor, and for the rectification of theſe after they are once diſtilled. Even the acetous acid may be very conveniently diſtilled in a copper veſſel, provided the worm and all the deſcending parts of the pipe which communicates with it be of pewter, otherwiſe a miſchievous impregnation of copper would be communicated to the diſtilled vinegar. The reaſon of this is, that copper is not diſſolved by vinegar, or in very ſmall quantity, when that acid is boiled in it; but if the metal is expoſed to the action of the acid, when cold, or to its vapours, a conſiderable diſſolulution takes place. For this reaſon, too, the ſtill muſt be waſhed out after the operation while it continues hot, and muſt be very carefully freed from the leaſt remains of acid, otherwiſe it will be much corroded.

Copper-ſtills ought to be of as large a ſize as poſſible: but Dr Lewis very juſtly obſerves, that, in common ones, the width of the worm is by no means proportionable to the capacity of the ſtill: hence the vapour which iſſues from a large ſurface being violently forced through a ſmall tube, meets with ſo much reſiſtance as ſometimes to blow off the ſtill-head. This inconvenience is ridiculouſly endeavoured to be prevented by ſtrongly tying or otherwiſe forcing down the head; by which means, if the worm ſhould happen to be choaked up, a terrible exploſion would enſue: for no ligatures, or any other obſtacle whatever, have yet been found ſtrong enough to reſiſt the elaſtic force of ſteam, and the greater obſtacle it has to overcome, the greater would the exploſion be.—Dangers of this kind might be totally avoided by having the worm of a proper degree of wideneſs.

575 Mineral acids how diſtilled.

Sometimes, however, matters are to be diſtilled, ſuch as mineral acid ſpirits, which would corrode any kind of metalline veſſels; and for theſe only earths, or the cloſeſt kind of ſtone-ware, can be uſed. Theſe are more eaſily condenſed than the ſteams of aqueous or vinous liquors, and therefore do not require to be paſſed through a pipe of ſuch a length as is uſed for condenſing the ſteams from the common ſtill. In theſe caſes, where a violent heat is not neceſſary, and the

576 Retort.

diſtillation is to be performed in glaſs veſſels, the retort is uſed (fig. 4.) When a fluid is to be put into this veſſel, the retort muſt be laid upon its back on ſand, or any other ſoft matter that will ſupport it without breaking. A funnel muſt alſo be procured with a long ſtem, and a little crooked at the extremity, that the liquor may paſs at once into the belly of the retort, without touching any part of its neck; otherwiſe the quantity which adhered to the neck would paſs into the receiver when the retort was placed in a proper ſituation for diſtilling, and foul the produce. When the veſſel is properly filled, which ought never to be above two-thirds, it is to be ſet in a ſand-bath: that is, in an iron pot, of a proper thickneſs,

neſs, and covered over in the bottom, to the deph of one or two inches, with dry ſand. When the retort is put in, ſo as to ſtand on its bottom, the pot is to be filled up with ſand, as far as the neck of the retort. A glaſs receiver is then to be applied, which ought to be as large as poſſible, and likewiſe pretty ſtrong; for which reaſon it will be proper not to let the capacity of it be above what is neceſſary to hold ten gallons. In the hinder part of it ſhould be drilled a ſmall hole, which may be occaſionally ſhut by a ſmall wooden peg. The mouth of the receiver ought to be ſo wide as to let the noſe of the retort enter to the middle of it, or very near to it; for if the vapours are diſcharged very near the luting, they will act upon it much more ſtrongly than when at a diſtance. It is likewiſe proper to have the neck of the retort as wide as may be; for this has a very great effect in the condenſation, by preſenting a larger ſurface to the condenſing vapour.

577 Luting for acid ſpitits.

The luting for acid ſpirits ought to be very different from that uſed in other diſtillations; for theſe will penetrate the common lutes ſo as to make them liquid and fall down into the receiver. Some have uſed retorts the necks of which were ground to the receivers with emery; but theſe are very difficult to be procured, and are expenſive, and conſequently have never come into a general uſe. Various kinds of lutes have been propoſed, but the preference ſeems due to a mixture of clay and ſand. We are not to underſtand, however, that every kind of clay is fit for this purpoſe: it muſt only be ſuch as is not at all, or very little, affected by acids; and this quality is only poſſeſſed by that kind of which tobacco-pipes is made. Trial ought to be made of this before the diſtillation is begun, by pouring a little nitrous acid on the clay intended to be made uſe of. If a violent efferveſcence is raiſed, we may be ſure that the clay is unfit for the purpoſe. Finely powdered alabaſter would anſwer extremely well, had it the ductility of clay. As this kind of lute remains ſoft for a conſiderable time, it ought to be farther ſecured by a bit of rag ſpread with ſome ſtrong cement, ſuch as quicklime mixed with the white of an egg, *&c.* Matters, however, ought to be managed in ſuch a manner, that the luting may give way, rather than the veſſel burſt; which would not only occaſion a certain loſs of the materials, but might endanger the perſons who are ſtanding by.

578 *Balneum arenæ.*

The iron pots commonly uſed for diſtillations by the ſand-bath, or *balneum arenæ*, are commonly made very thick; and are to be ſold at large founderies, under the name of *ſand-pots*. The ſhape of theſe, however, is by no means eligible: for, as they are of a figure nearly cylindrical, if the retort is of ſuch a ſize as almoſt to fill their cavity, it cannot be put into them when full, and often pretty heavy, without great danger of touching the ſides of the pot; and in this caſe, touching and *breaking* are ſynonymous expreſſions. It is much better, therefore, to have them in the figure of a punch-bowl; and the common caſt-iron kettles, which may be had much cheaper than the ſand-pots uſually ſold, anſwer extremely well. If the diſtilling veſſel is placed in a pot filled with water, the diſtillation is ſaid to be performed in a water-bath, or *balneum mariæ*.

When the matter to be condenſed is very volatile, a number of open receivers with two necks, called *adopters* (fig. 7.) may be uſed, with a cloſe receiver at the end. Each of theſe adopters muſt be luted with as much care as when only a ſingle receiver is made uſe of. Veſſels of a ſimilar kind were formerly much uſed by chemiſts for particular ſublimations, under the name of *aludels*.

579 Adopters of aludels.

Formerly, inſtead of retorts, a veſſel called a *cucurbit*, (fig. 5, and 6.) with a head like the common ſtill, called an *alembic*, were uſed; but the more ſimple figure of the retort gives it greatly the preference. It is but ſeldom that veſſels of this kind are uſeful, which will be taken notice of when deſcribing the particular operations; and if at any time an alembic head ſhould be neceſſary, its uſe may be ſuperſeded by a crooked glaſs tube, which will anſwer the purpoſe equally well.

Sometimes a very violent fire is required in diſtillations by the retrot. Here, where it is poſſible, glaſs or earthen veſſels ſhould be avoided, and iron pots ſubſtituted in their ſtead. The hardeſt and beſt caſt iron, however, will at laſt melt by a vehement heat; and therefore there is a neceſſity for uſing earthen ware, or coated glaſs. This laſt is better than moſt kinds of earthen ware, as being leſs porous; for when the veſſel is urged by a very intenſe heat, the glaſs melts, and forms a kind of ſemivitreous compound with the inſide of the coating, ſo that its figure is ſtill preſerved, and the accidental cracks in the luting are filled up.

580 Coating of glaſſes.

For coating of veſſels, mixtures of colcothar of vitriol, ſand, iron filings, blood, chopped hair, *&c.* have been recommended. We cannot help thinking, however, that the ſimple mixture of tobacco-pipe clay and ſand is preferable to any other; eſpecially if, as Dr Black directs, that part next the glaſs is mixed with charcoal duſt.

The proportions recommended by the Doctor for luting the joints of veſſels, are four parts of ſand and one of clay; but for lining the inſides of furnaces, and we ſhould think, likewiſe for coating glaſs veſſels, he directs 6 or 7 of ſand to 1 of clay, that the contraction of the clay in drying may thereby be the more effectually prevented. Beſides this, he directs a mixture of three parts of charcoal-duſt with one of clay to be put next the furnace itſelf, as being more apt to confine the heat; but poſſibly the firſt compoſition might be ſufficient for glaſſes.

The coating of large glaſſes muſt be a very troubleſome and tedious operation; and therefore coated glaſs is never uſed but in experiments. When large diſtillations are to be performed in the way of trade, recourſe muſt be had either to iron pots, or to earthen ware. Of the moſt proper kinds of earthen ware for reſiſting violents heat, we ſhall take notice under the article *Fuſion*.

In all diſtillations by the retort, a conſiderable quantity of air, or other incondenſible vapour, is extricated; and to this it is abſolutely neceſſary to give vent, or the veſſel would be burſt, or the receiver thrown off. For this purpoſe, Dr Lewis recommends an open pipe to be inſerted at the luting, of ſuch an height as will not allow any of the vapour to eſcape; but this we cannot approve of, as by that means a conſtant communication is formed between the external atmoſphere and the matters contained in the retort and receiver, which is at all times to be avoided as much as poſſible, and in ſome caſes, as the diſtillation of phoſphorus, would be very dangerous. The having a ſmall

ſmall hole drilled in the receiver, which is to be now and then opened, muſt anſwer the purpoſe much better, although it takes more attendance; but if the operator is obliged to leave the veſſels for ſome time, it will be convenient either to leave the little hole open, or to contrive it ſo that the wooden peg may be puſhed out with leſs force than is ſufficient to break the lute.

581 Sublimation. VII. Sublimation. This, properly ſpeaking, is only the diſtillation of a dry ſubſtance; and therefore, when volatile matters, ſuch as ſalt of hartſhorn, are to be ſublimed, the operation is performed in a glaſs retort ſet in a ſand-bath; and the ſalt paſſes over into the receiver. The cucurbit and alembic were formerly much in uſe for this purpoſe; and a blind head, without any ſpout, was applied. A much ſimpler apparatus, however, is now made uſe of. A globe made of very thin glaſs, or an oblong veſſel of the ſame kind, anſwers the more common purpoſes of ſublimation. For experiments, Florence flaſks are excellent: as being both very cheap, and having the neceſſary ſhape and thinneſs requiſite for bearing the heat without cracking. The matter to be ſublimed muſt not, on almoſt any occaſion, take up more than a third part of the ſubliming veſſel. It is to be ſet in a ſand-bath, that the heat may be more equally applied than it could otherwiſe be. The heat muſt be no greater, or very little, than is neceſſary for ſublimation, or it will be in danger of flying out at the mouth of the ſubliming veſſel, or of choaking it up ſo as to burſt. The upper part of the veſſel, too, muſt by no means be kept cool, but ſlightly covered with ſand, that the matter may ſettle in a kind of half melted ſtate, and thus form a compact hard cake, which is the appearance ſublimates are expected to have. Hence this operation requires a good deal of caution, and is not very eaſily performed.

582 Deflagration. VIII. Deflagration. This operation is always performed by means of nitre, except in making the flowers of zinc. It requires open veſſels of earth or iron; the latter are very apt to be corroded, and the former to imbibe part of the matter. To perform this proceſs with ſafety, and without loſs, the nitre ought to be mixed with whatever matter is to be deflagrated with it, and thrown, by little and little into the veſſel previouſly made red-hot. If much is put in at once, a great deal will be thrown out by the violent commotion; and to perform this operation in cloſe veſſels is in a manner impoſſible, from the prodigious quantity of elaſtic vapour generated by the nitre. Care muſt alſo be taken to remove the whole mixture to ſome diſtance from the fire, and not to bring back any ſpark from the quantity deflagrating, with the ſpoon which puts it in; otherwiſe the whole would irremediably be conſumed at once.

583 Calcination. IX. Calcination. This is the ſubjecting any matter to a heat ſo violent as to diſſipate ſome part of it, without melting what remains. It is often practiſed on metallic ſubſtances, particularly lead, for obtaining the calx of that metal called *minium*, or red lead.

This operation, as indeed all other chemical ones, is beſt performed in large quantities, where a particular furnace is conſtructed on purpoſe, and a fire kept on day and night without interruption. The flame is made to play over the ſurface of the metal, and it is continually ſtirred ſo as to expoſe different parcels of it to the action of the heat.

584 Fuſion. X. Fusion. This is when a ſolid body is expoſed to ſuch a degree of heat as makes it paſs from a ſolid to a fluid ſtate; and as different ſubſtances are poſſeſſed of very different degrees of fuſibility, the degrees of melting heat are very various.

Beſides the true fuſion, there are ſome kinds of ſalts which retain ſo large a proportion of water in their cryſtals, as to become entirely fluid upon being expoſed to a very ſmall degree of heat. This is commonly called the *watery fuſion*; but is really a *ſolution* of the ſalt in that quantity of water retained by it in its cryſtalline form: for ſuch ſalts afterwards become ſolid by the evaporation of the water they contained: and then require a ſtrong red heat to melt them thoroughly, or perhaps are abſolutely infuſible.

Of all known ſubſtances, unctuous and inflammable ones become fluid with the leaſt heat: then come the more fuſible metals, lead, tin, and antimony; then ſome of the more fuſible ſalts; and then the harder metals, ſilver, gold, copper, and iron; then the mixtures for making glaſs; and laſt of all, the metal called *platina*, which has hitherto been incapable of fuſion, except by the violent action of the ſun-beams in the focus of a large burning glaſs. This ſubſtance ſeems to be the moſt refractory of all others, even the hardeſt flints melting into glaſs long before it. (See Platina.)

Fuſion of ſmall quantities of matter is uſually performed in pots called *crucibles*; which, as they are required to ſtand a very violent heat, muſt be made of the moſt refractory materials poſſible.

585 Crucibles, proper materials for. The making of crucibles belongs properly to the potter: but as a *chemiſt* ought to be the judge of their compoſition, we ſhall here give ſome account of the different attempts to make theſe veſſels of the neceſſary ſtrength.

All earthen veſſels are compoſed, at leaſt partly, of that kind which is called the *argillaceous earth* or *clay*, becauſe theſe only have the neceſſary ductility, and can be formed into veſſels of the proper form. Pure clay is, by itſelf, abſolutely unfuſible; but is exceedingly apt to crack when expoſed to ſudden changes of heat and cold. It is alſo very apt to melt when mixed with other ſubſtances, ſuch as calcareous earths, &c. When mixed in a certain proportion with other materials, they are changed with violent heat into a kind of half-melted ſubſtance, ſuch as our ſtone-bottles. They cannot be melted completely, however, by almoſt any fire; they are alſo very compact, and will contain the moſt fuſible ſubſtances, even glaſs of lead itſelf; but as they are very apt to crack from ſudden changes of heat and cold, they are not ſo much uſed; yet, on particular occaſions, they are the only ones which can be made uſe of.

The more denſe any kind of veſſels are, the more apt they are, in general, to break by a ſudden application of heat or cold: hence crucibles are not, in general, made of the greateſt denſity poſſible: which is not at all times required. Thoſe made at Heſſe, in Germany, have had the beſt reputation for a long time. Mr Pott, member of the Academy of Sciences at Berlin, hath determined the compoſition of theſe crucibles to be, one part of good refractory clay, mixed with two parts of ſand, of a middling fineneſs, from which the fineſt part has been ſifted. By ſifting the finer particles from the ſand, too great compactneſs is avoided: but

but at the ſame time this mixture renders them apt to be corroded by vitrifying matters kept a long time in fuſion; for theſe do not fail to act upon the ſand contained in the compoſition of the crucible, and, forming a vitreous maſs, at laſt run through it.

This inconvenience is prevented, by mixing, inſtead of ſand, a good baked clay in groſs powder. Of a compoſition of this kind are made the glaſs-houſe pots, which ſometimes ſuſtain the violent heat employed in making glaſs for ſeveral months. They are, however, gradually conſumed by the glaſs, and become conſtantly more and more thin.

586 Platina, a deſirable material.

As the containing veſſel, however, muſt always be expoſed to a more violent heat than what is contained in it, crucibles ought to be formed of ſuch materials as are not vitrifiable by the heat of any furnace whatever. But from the attempts made to melt platina, it appears, that of all known ſubſtances it would be the moſt deſirable for a melting veſſel. Heſſian crucibles, glaſs-houſe pots, Sturbridge clay, in ſhort every ſubſtance which could be thought of to reſiſt the moſt violent heat, were melted in ſuch a manner as even to ſtop up the pipes of large bellows, while platina was not altered in the leaſt; and Meſſrs Macquer and Beaume have ſhown, that though platina cannot be melted ſo as to caſt veſſels of it, it may nevertheleſs be cupelled with lead ſo as to become malleable, and thus veſſels might otherwiſe be made from that ſubſtance. The extreme ſcarcity of this mineral, however, leaves as yet little room to hope for any thing from it, though Mr Achard has found a method of forming crucibles from this refractory ſubſtance. It conſiſts in moulding the precipitate made with ſal ammoniac into the form of a crucible, and then applying a ſudden and very violent heat, which fuſes this calx.

587 Achard's method of making crucibles of platina.

Mr Pott has made ſo many experiments upon clays mixed with different ſubſtances, that he has in a manner exhauſted the ſubject. The baſis of all his compoſitions was clay. This he mixed in different proportions with metallic calces, calcined bones, calcareous earths, talcs, amianthus, aſbeſtus, pumice-ſtones, tripoli, and many others; but he did not obtain a perfect compoſition from any of them. The beſt crucibles, according to Scheffer, cannot eaſily contain metals diſſolved by ſulphur, in the operation of parting by means of ſulphur. They may be made much more durable and ſolid, by ſteeping them a few days in linſeed-oil, and ſtrewing powdered borax upon them before they are dried.

588 Mr Pott's directions.

The reſult of Mr Pott's experiments are: 1. Crucibles made of fat clays are more apt to crack when expoſed to ſudden heat, than thoſe which are made of lean or meagre clays. *Meagre clays* are thoſe which contain a conſiderable quantity of ſand along with the pure argillaceous earth: and *fat clays* are thoſe which contain but little. 2. Some crucibles become porous by long expoſure to the fire, and imbibe part of the contained metals. This may be prevented, by glazing the internal and external ſurfaces; which is done by moiſtening theſe with oil of tartar, or by ſtrewing upon them, when wetted with water, powdered glaſs of borax. Theſe glazings are not capable of containing glaſs of lead. 3. Crucibles made of burnt clay groſsly powdered, together with unburnt clay, were much leſs liable to crack by heat than crucibles made of the ſame materials where the burnt clay was finely powdered, or than crucibles made entirely of unburnt clay. 4. If the quantity of unburnt clay be too great, the crucible will be apt to crack in the fire. Crucibles made of 10 ounces of unburnt clay, 10 ounces of groſsly powdered burnt clay, and three drachms of calcined vitriol, are capable of retaining melted metals, but are pervaded by glaſs of lead. The following compoſition is better than the preceding: Seven ounces of unburnt clay, 14 ounces of groſsly powdered burnt clay, and one drachm of calx of vitriol. Theſe crucibles may be rendered more capable of containing glaſs of lead, by lining their internal ſurfaces, before they are baked, with unburnt clay diluted with water. They may be further ſtrengthened by making them thicker than is uſually done; or by covering their external ſurfaces with ſome unburnt clay, which is called *arming* them. 5. The compoſition of crucibles moſt capable of containing the glaſs of lead, was 18 parts of groſsly powdered burnt clay, as much unburnt clay, and one part of fuſible ſpar. Theſe crucibles muſt not, however, be expoſed too ſuddenly to a violent heat. 6. Crucibles capable of containing glaſs of lead very well, were made of 24 parts of unburnt clay, four parts of burnt clay, and one part of chalk. Theſe require to be armed. 7. Plume alum powdered, and mixed with whites of eggs and water, being applied to the internal ſurface of a Heſſian crucible, enabled it to retain for a long time glaſs of lead in fuſion. 8. One part of clay, and two parts of Spaniſh chalk, made very good crucibles. The ſubſtance called *Spaniſh chalk* is not a calcareous earth, but appears to be a kind of ſteatites. 9. Two parts of Spaniſh chalk, and one part of powdered tobacco-pipes, made good lining for common crucibles. 10. Eight parts of Spaniſh chalk, as much burnt clay, and one part of litharge, made ſolid crucibles. 11. Crucibles made of black lead are fitter than Heſſian crucibles for melting metals; but they are ſo porous, that fuſed ſalts paſs entirely thro' them. They are more tenacious than Heſſian crucibles, are not ſo apt to burſt in pieces, and are more durable. 12. Crucibles placed with their bottoms upwards, are leſs apt to be cracked during the baking, than when placed differently. 13. The paſte of which crucibles are made, ought not to be too moiſt; elſe, when dried and baked, they will not be ſufficiently compact: hence they ought not to be ſo moiſt as to be capable of being turned on a potter's lathe; but they muſt be formed in braſs or wooden moulds.

589 Materials moſt capable of reſiſting glaſs of lead.

590 Dr Lewis's obſervations.

On this ſubject Dr Lewis hath alſo made ſeveral obſervations; the principal of which are, 1. Pure clay ſoftened to a due conſiſtence for being worked, not only coheres together, but ſticks to the hands. In drying, it contracts 1 inch or more in 12; and hence it is very apt to crack, unleſs it is dried exceeding ſlowly. In burning, it is ſubject to the ſame inconvenience, unleſs very ſlowly and gradually heated. When thoroughly burnt, if it has eſcaped thoſe imperfections, it proves ſolid and compact; and ſo hard as to ſtrike fire with ſteel. Veſſels made of it are not penetrated by any kind of liquid; and reſiſt ſalts and glaſſes brought into the thinneſt fuſion, excepting thoſe which by degrees corrode and diſſolve the earth itſelf, as glaſs of lead; and even this penetrating glaſs is reſiſted by it better than by almoſt any other earth; but, in counterbalance to theſe good qualities, they cannot be heated or cooled, but with ſuch precautions as can rarely be complied with in the way of buſineſs, without cracking, or flying in pieces.

2. Clay that has been once expoſed to any conſiderable degrees of heat, and then powdered, has no longer any tenacity. Freſh clay, divided by a due proportion of this powder, proves leſs tenacious than by itſelf; not ſticking to the hands, though cohering ſufficiently together. It ſhrinks leſs in drying, is leſs apt to crack, and leſs ſuſceptible of injury from alterations of heat and cold; but at the ſame time is leſs ſolid and compact. Conſiderable differences are obſerved in theſe reſpects; not only according to the quantity of dividing matter, but according as it is in finer or coarſer powder.

3. Veſſels made with a moderate proportion of fine powder, as half the weight of the clay, are compact and ſolid, but ſtill very apt to crack, from ſudden heat or cold: thoſe with a larger proportion, as twice or thrice the quantity of the clay, are free from that imperfection, but ſo friable as to crumble between the fingers. Nor does there appear to be any medium between a diſpoſition to crack and to crumble; all the compounds made of clay and fine powders having the one or the other, or both imperfections. Coarſer powders of the ſize of middling ſand, form, with an equal weight of clay, compounds ſufficiently ſolid, and much leſs apt to crack than the mixtures with fine powders. Two parts of coarſe powder, and one of clay, prove moderately ſolid, and but little diſpoſed to crack: a mixture of three parts and one, tho' heated and cooled ſuddenly, does not crack at all, but ſuffers very fluid ſubſtances to tranſude through it; ſolidity, and reſiſtance to quick viciſſitudes of heat and cold, ſeeming here alſo to be incompatible.

4. Pure clay, mixed with pure clay that has been burnt, is no other than one ſimple earth; and is neither to be melted nor ſoftened, nor made in any degree tranſparent with the moſt intenſe fires.

5. Mixtures of clay with gypſeous earths burn whiter than clay alone; in certain proportions, as two parts of clay to three of gypſum, they become, in a moderate fire, ſemi-tranſparent, and in a ſtrong one they melt.

6. Calcareous earths in ſmall proportion bake tolerably compact and white; and added to other compoſitions, ſeem to improve their compactneſs. If the quantity of the calcareous earth nearly equals that of the clay, the mixture melts into a yellow glaſs; if it conſiderably exceeds, the product acquires the qualities of quicklime.

7. Veſſels made from clay and ſand, in whatever proportion, do not melt in the ſtrongeſt fire; but they ſometimes bend or ſoften, ſo as to yield to the tongs. Glaſſes in thin fuſion penetrate them by diſſolving the ſand. If gypſeous or calcareous earths e urged in ſuch crucibles with a vehement heat, the veſſels and their contents run all into one maſs. In moderate fires, theſe veſſels prove tolerably compact, and retain moſt kinds of ſalts in fuſion: but they are liable to crack, eſpecially when large; and do not long ſuſtain melted metals, being burſt by their weight. Such are the Heſſian crucibles.

8. Mixtures of clay and black-lead, which ſeems a ſpecies of talc, are not liable to crack from alternations of heat and cold; but are extremely porous. Hence black-lead crucibles anſwer excellently for the melting of metals, and ſtand repeated fuſions; whilſt ſalts flowing thin, tranſude through them almoſt as water through a ſieve: ſulphureous bodies, as antimony, corrode them.

9. Pure clay, ſoftened with water, and incruſtated on earthen veſſels, that have been burnt, does, not adhere to them, or ſcales off again upon expoſure to the fire; applied to unburnt veſſels, it adheres and incorporates. Divided clay unites with them in both ſtates. Vitreous matters, melted in veſſels of pure clay, adhere ſo firmly as not to be ſeparated; from veſſels of divided clay they may be knocked off by a hammer.

10. The ſaline fluxes which promote the fuſion of clay, beſides the common ones of all earths, alkali and borax, are chiefly arſenic fixed by nitre, and the fuſible ſalt of urine; both which have little effect on the other earths though mixed in a lager proportion. Nitre, which readily brings the cryſtalline earths into fuſion, and ſal mirabile and ſandiver, powerful fluxes for the calcareous earths, do not perfectly vitrify with clay. Burnt clay does not differ in theſe reſpects from ſuch as has not been burnt; nor in that ſingular property of vitrifying with gypſeous or calcareous earths, without any ſaline or metallic addition; the utmoſt vehemence of fire ſeeming to deſtroy only its ductility, or that power by which it coheres when its parts are moiſtened with water.

591 More perfect veſſels to be hoped for from porcelain.

But though it ſeems impoſſible to make perfect veſſels from mixtures of clay in its two different ſtates, of burnt and unburnt, more is to be hoped from the mixtures which are employed in making porcelain. Manufactories of this kind of ware have been attempted in different countries, (ſee PORCELAIN); and in ſome places the qualities requiſite for chemical veſſels have been given to it in a very ſurpriſing degree. The count de Lauraguais, a French nobleman, and member of the academy of ſciences, has diſtinguiſhed himſelf in a very eminent manner by attempts of this kind. The tranſlator of the chemical dictionary aſſures us, that he had it from a gentleman of undoubted veracity, that this nobleman having heated a piece of his porcelain red hot, threw it into cold water, without breaking or cracking it.

592 Mr Reaumur's porcelain.

The moſt uſeful attempt, however, for the purpoſes of chemiſtry, ſeems to be the diſcovery by Mr Reaumur of converting common green glaſs into porcelain. This was publiſhed as long ago as the year 1739; yet we have ſcarce heard of any chemiſt, no not Dr Lewis himſelf, who has made trial of chemical veſſels formed of this ſort of porcelain, although the very uſe to which Mr Reaumur thought the preparation could be applicable was that of bringing chemical veſſels to a degree of perfection which could not otherwiſe be done. The following is the reſult of Mr Reaumur's experiments.

Green glaſs, ſurrounded with white earthy matters, as white ſand, gypſum, or plaſter of Paris, *&c.* and expoſed to a conſiderable heat not ſtrong enough to alter its figure, as that of a potter's furnace, acquires different ſhades of blue, and by degrees begins to grow white. On breaking the glaſs, the white coat appears to be compoſed of fine, white, gloſſy, ſatin-like fibres, running tranſverſely, and parallel to one another; the glaſs in the middle being ſcarcely altered. On continuing the cementation, the change proceeds further and further, till at length the white fibrous parts

parts from both ſides meet in the middle, and no appearance of glaſs remains. By this means, entire veſſels of glaſs may be changed into procelain.

The ſubſtance into which glaſs is thus converted, is opaque, compact, internally of great whiteneſs, equal to that of the fineſt china-ware; but, externally, of a much duller hue. It is conſiderably harder than glaſs, much leſs fuſible in the fire, and ſuſtains alterations of heat and cold without injury. Veſſels of it, cold, bear boiling liquors; and may be placed on the fire at once, without danger of their cracking. "I have put a veſſel of this porcelain (ſays the author) into a forge, ſurrounded it with coals, and kept vehemently blowing for near a quarter of an hour; I have melted glaſs in this veſſel, without its having ſuffered any injury in its figure." If means could be found of giving the outſide a whiteneſs, equal to the internal part, glaſs veſſels might thus be converted into a valuable kind of porcelain ſuperior to all that have hitherto been made. Chemiſtry, ſays he, may receive from this diſcovery, in its preſent ſtate, ſuch veſſels as have been long wanted; veſſels which, with the compactneſs and impenetrability of glaſs, are alſo free from its inconveniences.

The common green glaſs bottles yield a procelain of tolerable beauty; window-glaſſes, and drinking-glaſſes, a much inferior one; while the finer kinds of cryſtalline glaſſes afforded none at all. With regard to the cementing materials, he found white ſand and gypſum, or rather a mixture of both, to anſwer beſt. Coloured earths generally make the external ſurface of a deeper or lighter brown colour; ſoot and charcoal, of a deep black, the internal part being always white.

593 Dr Lewis's experiments.

The account of this kind of porcelain given by Mr Reaumur, induced Dr Lewis, who had alſo obſerved the ſame changes on the bottom of glaſs-retorts expoſed to violent heat in a ſand-bath, to make further experiments on this matter; an account of which he has publiſhed in his *Philoſophical Commerce of Arts*. The reſults of his experiments were, 1. Green glaſs, cemented with white ſand, received no change in a heat below ignition. 2. In a low red heat, the change proceeded exceeding ſlowly; and in a ſtrong red heat, approaching to white, the thickeſt pieces of glaſs bottles were thoroughly converted in the ſpace of three hours. 3. By continued heat, the glaſs ſuffered the following progreſſive changes: firſt, its ſurface became blue, its tranſparency was diminiſhed, and a yellowiſh hue was obſervable when it was held between the eye and the light. Afterwards it was changed a little way on both ſides into a white ſubſtance, externally ſtill bluiſh; and, as this change advanced ſtill further and further within the glaſs, the colour of the vitreous part in the middle approached nearer to yellow: the white coat was of a fine fibrous texture, and the fibres were diſpoſed nearly parallel to one another, and tranſverſe to the thickneſs of the piece: by degrees the glaſs became white and fibrous throughout, the external bluiſhneſs at the ſame time going off, and being ſucceeded by a dull whitiſh or dun colour. By a ſtill longer continuance in the fire, the fibres were changed gradually from the external to the internal part, and converted into grains; and the texture was then not unlike that of common porcelain. The grains, at firſt fine and ſomewhat gloſſy, became by degrees, larger and duller; and at laſt the ſubſtance of the glaſs became porous and friable, like a maſs of white ſand ſlightly cohering. 4. Concerning the qualities of this kind of porcelain, Dr Lewis obſerves, that, while it remained in the fibrous ſtate, it was harder than common glaſs, and more able to reſiſt the changes of heat and cold than glaſs, or even porcelain; but, in a moderate white heat, was fuſible into a ſubſtance not fibrous, but vitreous and ſmooth, like white enamel; that when its texture had become coarſely granulated, it was now much ſofter and unfuſible: and laſtly, that when ſome coarſely granulated unfuſible pieces, which, with the continuance of a moderate heat, would have become porous and friable, were ſuddenly expoſed to an intenſe fire, they were rendered remarkably more compact than before; the ſolidity of ſome of them being ſuperior to that of any other ware.

594 This ſubject ſtill imperfect.

It ſeems ſurpriſing that this able chemiſt, who on other occaſions had the improvements of the arts ſo much at heart, did not put ſome veſſels of this kind of porcelain to other ſevere trials, beſides attempting to fuſe it by itſelf with a violent fire: for though pieces of it were abſolutely unfuſible, we are not ſure but they might have been corroded by alkaline ſalts, acids, calcareous earths, or glaſs of lead; nay, it ſhould ſeem very probable that they would have been ſo: in which caſe they would not be much ſuperior to the veſſels made from earthy materials. When a firſt-rate chemiſt publiſhes any thing in an imperfect ſtate, inferior ones are diſcouraged from attempting to finiſh what he has begun; and thus, notwithſtanding that theſe experiments have been ſo long publiſhed, nobody has yet attempted to inveſtigate the properties of this kind of porcelain, by getting chemical veſſels made of it, and trying how they anſwer for crucibles, or retorts.

All that has been ſaid concerning the proper materials for crucibles, muſt likewiſe be applicable to the materials for retorts, which are required to ſtand a very violent heat. Mr Reaumur's porcelain bids faireſt for anſwering the purpoſe of retorts as well as crucibles. The great diſadvantage of the common, earthen ones, is, that they ſuffer a quantity of volatile and penetrating vapours to paſs through them. This is very obſervable in the diſtillation of phoſphorus; and though this ſubſtance has not hitherto been uſed for any purpoſe in medicine, and very little in the arts, its acid only being ſometimes uſed as a flux, if veſſels could be made capable of confining all the ſteams and at the ſame time bearing the heat neceſſary for its diſtillation, phoſphorus, perhaps, might be obtained in ſuch quantity, as to ſhow that it is a preparation not altogether uſeleſs.

595 [596] Stone-ware veſſels corroded.

With regard to ſtone-ware veſſels, and all thoſe into which the compoſition of ſand or flint enters, we ſhall only further obſerve, that they will be corroded by fixed alkaline ſalts, eſpecially of the cauſtic kind, in a very moderate heat. Dr Black, having evaporated ſome cauſtic ley in a ſtone-ware baſon, and then melted the dry ſalt in the ſame veſſel, found it ſo corroded, as afterwards to be full of ſmall holes; and he found nothing to reſiſt the action of this ſalt ſo well as ſilver.

597 Wedgewood's ware.

On the ſubject of chemical veſſels, we have now, however, to add the improved earthen ware of Mr Wedgewood; in which the properties of compactneſs, infuſibility and the power of reſiſting ſudden changes of heat and cold, are ſaid to be united, ſo that it promiſes to be a very valuable addition to the chemical apparatus.

598 Maceration.

11. Maceration, or Digestion. This is the mixing two bodies, generally a ſolid and a fluid, together, and then expoſing them to a moderate degree of heat for a conſiderable length of time, that ſo they may have the better opportunity of acting upon one another. Digeſtion is uſually performed in the glaſſes already mentioned, called *matraſſes* or *bolt-heads;* and is done in a ſand-heat. When any of the ſubſtances are very volatile, as ſpirit of wine; or when the matter requires to be heated ſo conſiderably that a quantity of vapour will be raiſed, the necks of the bolt-heads ought to be pretty long; or a tin pipe may be inſerted, of ſufficient length to prevent the eſcape of any part of the ſteam.

599 Levigation.

12. Levigation. This is the reducing any body to a very fine powder, which ſhall feel quite ſoft between the fingers or when put into the mouth. It is performed by grinding the ſubſtance upon a flat marble ſtone, with ſome water, or by rubbing it in a marble mortar. In the large way, levigation is performed by mills drawn by horſes, or driven by water; ſome of them are ſo ſmall as to be turned by the hand. They conſiſt of two ſmooth ſtones, generally of black marble, or ſome other ſtone equally hard, having ſeveral grooves in each, but made to run in contrary directions to one another when the mill is ſet in motion. The matter being mixed with water, is put in by a funnel, which is fixed into a hole in the upper ſtone, and turns along with it. The under milſtone has round it a wooden ledge, whereby the levigating matter is confined for ſome time, and at length diſcharged, by an opening made for that purpoſe, when it has accumulated in a certain quantity.

In this operation, when the matters to be levigated are very hard, they wear off a part of the mortar, or ſtones on which they are levigated; ſo that a ſubſtance perfectly hard, and which could not be worn by any attrition, is as great a deſideratum for the purpoſes of levigation, as one which could not be melted is for thoſe of fuſion. Dr Lewis propoſes the porcelain of Mr Reaumur as an improvement for levigating planes, mortars, *&c.* becauſe, while in its fibrous ſtate, it is conſiderably harder than glaſs, and conſequently much leſs liable to abraſion by the harder powders.

In many caſes levigation is very much accelerated by what is called *elutriation*. This is the method by which many of the painters colours are prepared of the requiſite fineneſs; and is performed by mixing any ſubſtance not totally reduced to the neceſſary degree of fineneſs, with a ſufficient quantity of water, and ſtirring them well together. The finer parts of the powder remain ſome time ſuſpended in the water, while the groſſer particles fall to the bottom. The ſeparation is then eaſily made, by pouring off the water impregnated with theſe fine parts, and committing the reſt to the levigating mill, when it may again be waſhed; and this may be repeated till all the powder is reduced to the utmoſt fineneſs. Subſtances ſoluble in water cannot be levigated in this manner.

Of Chemical Furnaces.

The two general diviſions we have already mentioned of thoſe who practice chemiſtry, namely, thoſe who have no other view than mere experiment, and thoſe who wiſh to profit by it, render very different kinds of furnaces neceſſary. For the firſt, thoſe furnaces are neceſſary which are capable of acting upon a ſmall quantity of matter, yet ſufficient for all the changes which fire can produce from ſimple digeſtion to the moſt perfect vitrification. For the others, thoſe are to be choſen which can produce the ſame changes upon very large quantities of matter, that as much may be done at once as poſſible.

600 Portable furnace.

To avoid the trouble and expence of a number of furnaces, a portable one hath long been a deſideratum among thoſe chemiſts who are fond of making experiments. One of the beſt of thoſe, if not the very beſt, that hath yet appeared, is that deſcribed in Shaw's edition of Boerhaave's chemiſtry, and repreſented fig. 1. Plate CXXXIV.

This furnace is made of earth; and, as the workmanſhip of a furnace requires none of the neatneſs or elegance which is required in making potters veſſels, any perſon may eaſily make a furnace of this kind for himſelf, who has time and patience for ſo doing. With regard to the moſt proper materials, all that we have ſaid concerning crucibles and retorts muſt be applicable to the materials for conſtructing a furnace; only here we need not care ſo much for the poroſity, or diſpoſition to crumble, as when crucibles or other diſtilling veſſels are to be made.

Plate iron is commonly directed for the outſide of portable furnaces; but we cannot help thinking this is a very needleſs expence, ſeeing the coating which it neceſſarily requires on the inſide may be ſuppoſed to harden to ſuch a degree as ſoon to ſupport itſelf, without any aſſiſtance from the plate-iron. This will be the leſs neceſſary, if we conſider, that, for the thickneſs of the walls of any furnace where a conſiderable heat is wanted, two or three inches are by no means ſufficient. When the inſide of a furnace is heated, the walls, if very thin, are ſoon penetrated by the heat, and great part of it by this means diſſipated in the air. If they are of a ſufficient thickneſs, the heat cannot penetrate ſo eaſily; and thus the inner part of the furnace preſerves the heat of the fuel, and communicates it to the contained veſſel. In the conſtruction of a portable furnace, therefore, it will be convenient to have all parts of it ſix inches thick at leaſt. This will alſo give it a ſufficient degree of ſtrength; and, as it is formed of ſeveral different peices, no inconvenience can follow from the weight of each of them taken ſeparately.

In Boerhaave's chemiſtry, this furnace is repreſented as narrower at the bottom than at the top; but we cannot ſuppoſe any good reaſon for ſuch a form, ſeeing a cylindrical one muſt anſwer every purpoſe much better, as allowing a larger quantity of air to paſs through the fuel, and likewiſe not being ſo apt to be overturned as it neceſſarily muſt be where the upper part is conſiderably heavier than the lower. We have, therefore, given a repreſentation of it as of a cylindrical form.

The furnace conſiſts of five or more parts. C, repreſents the dome, or top of the furnace, with a ſhort earthen funnel E for tranſmitting the ſmoke. B, B, B, are moveable cylinders of earth, each provided with a door D, D, D. In Boerhaave's chemiſtry theſe doors are repreſented as having iron hinges and latchets; but they may be formed to more advantage of ſquare pieces of earth, having two holes in the middle, by which they may be occaſionally taken out, by introducing an iron fork. In like manner, the domes and cylinders,

cylinders, in Boerhaave's chemiſtry, are repreſented with iron handles; but they may be almoſt as eaſily taken off by the cheaper contrivance of having four holes in each, two directly oppoſite to one another, into which two ſhort forks may be introduced when the parts are to be ſeparated.

In the lowermoſt cylinder is to be placed an iron-grate, a little below the door, for ſupporting the fire. In the under part is a ſmall hole, big enough for introducing the pipe of a pair of good perpetual bellows when the fire is to be violently excited. Dr Lewis prefers the organ-bellows to any other kind.

When the bellows is uſed, the whole muſt ſtand upon a cloſe cylinder A, that the air may be confined, and made to paſs through the fuel. By having more bellows, the fire may be excited to a moſt intenſe degree. In this caſe, the pipe of every one of them muſt enter the cylinder B.

Each of the cylinders ſhould have, in its upper part a round hole, oppoſite to its door, for carrying off the ſmoke, by means of a pipe inſerted into it, when the furnace is uſed for diſtillations by the ſand-bath. Each cylinder ought likewiſe to have a ſemicircular cut in the oppoſite ſides, both above and below, that when the under cut of the upper cylinder is brought directly above the upper cut of the lower one, a perfect circle may be formed. Theſe are for giving a paſſage to the necks of retorts, when diſtillation by the retort is to be performed. The holes may be occaſionally filled with ſtopples made of the ſame materials with the body of the furnace.

The moſt convenient ſituation for a furnace of this kind would be under a chimney, the vent of which might be eaſily ſtopped up by a broad plate of iron, in which a hole ought to be cut for the reception of the earthen tube of the dome. By this means the uſe of a long tube, which at any rate muſt be very troubleſome, might be eaſily avoided, and a very ſtrong blaſt of air would paſs through the fuel. If it is found convenient to place the furnace at ſome diſtance from the chimney, a plate-iron pipe muſt be procured to fit the earthen pipe of the dome, and carry the ſmoke into the chimney. This pipe will alſo be of uſe, when the furnace is uſed for diſtillations by the ſand-bath; it muſt then be inſerted into the hole oppoſite to the door of any of the cylinders, and will convey away the ſmoke, while the mouth of the cylinder is totally covered with a ſand-pot.

601
Dr Lewis's portable furnaces.

For portable furnaces, Dr Lewis greatly recommends the large black crucibles, marked n° 60, on account of their reſiſting a violent heat, and being very eaſily cut by a knife or ſaw, ſo that doors, &c. may be formed in them at pleaſure. The bottom of one of theſe large ones being cut out, a grate is to be put into the narrow part of it. For grates, the doctor recommends caſt iron-rings, having each three knobs around them. Theſe knobs go into correſponding cavities of the outer rings, and the knobs of the outermoſt reſt on the crucible, which is to be indented a little to receive them, that ſo the grate may reſt the more firmly, and the furnace not be endangered from the ſwelling of the iron by heat. When this is to be made uſe of as a melting-furnace, and a violent heat to be excited, another crucible muſt be inverted on that which contains the fuel, which ſerves inſtead of the dome of the laſt mentioned furnace: and as whatever is ſaid of it muſt likewiſe be applicable to the two crucibles when placed above one another, we need give no farther deſcription of the doctor's portable furnace.

602
Objection to their uſe in ſome caſes.

No doubt, the great experience of Dr Lewis, in chemical matters muſt give very conſiderable weight to any thing he advances; and the warmth with which he recommends the furnaces muſt convince us, that he has found them abundantly anſwer the purpoſes of experiments. We cannot help thinking, however, that where a very great and laſting heat is to be given, the thickneſs, and even the *form*, of theſe crucibles, is ſome objection to their uſe. It is certain that ſuch a permanent, or, as the workmen call it, a *ſolid* heat, can never be given where the walls of a furnace are thin, as when they are of ſufficient thickneſs. They are alſo very apt to burſt with great heat; and, for this reaſon, Dr Lewis deſires his furnace to be ſtrengthened with copper hoops. This diſpoſition to burſt proceeds from the inner parts which are more intenſely heated than the outer, expanding more than theſe do, and conſequently burſting them. Hence the doctor deſires his furnace to be ſtrengthened alſo by putting it within another crucible of a larger ſize, and the intermediate ſpace to be filled up with a mixture of ſifted aſhes and water. For moſt chemical proceſſes, where only a ſmall degree of heat is requiſite, theſe furnaces anſwer beyond any thing that has hitherto been attempted. The whole is to be ſupported by an iron ring with three feet

2d 602
Dr Black's furnace deſcribed. Plate CXXXIII fig. 5, 8, 9.

Dr Black has contrived a furnace in which all theſe inconveniences are avoided. Two thick iron plates, above and below, are joined by a thinner plate, forming the body of the furnace, which is of an oval form. The upper part is perforated with two holes; the one A, pretty large, which is the mouth of the furnace, and which is of a circular form: the other behind it, B, of an oval form, and deſigned for faſtening the end of the vent which is ſcrewed down upon it. The undermoſt thick plate has only the large circular opening G near to the middle, but not altogether ſo, being nearer to one ſide of the ellipſe than the other, where the round hole in the top is placed; ſo that a line paſſing this circular hole has a little obliquity forwards. The aſh-pit C E is likewiſe made of a nelliptical form, and a very ſmall matter widened; ſo that the bottom of the furnace is received within the ellipſe. A little below, there is a border D that receives the bottom of the furnace; and except the holes of the damping-plate E, the parts are all cloſed by means of ſoft lute, upon which the body of the furnace is preſſed down; by which means the joining of the two parts, and of all the different pieces, are made quite tight; for the body, fire place, aſh-pit, vent, and grate, are all ſeparable from one another. As the furnace comes from the workman, the grate is made to apply to the outſide of the lower part. It conſiſts of a ring laid on its edge, and then bars likewiſe laid on their edges; and from the outer ring proceed four pieces of iron, by means of which it may be ſcrewed down; ſo it is kept out of the cavity of the furnace, and preſerved from the extremity of the heat. Thus it laſts much longer, and indeed hardly liable to any decay; for by being expoſed to the cool air, it is kept ſo cool, that it is never hurt by the heat of the fuel. The ſides, which are made of plate iron muſt be luted within, to confine the heat, and preſerve them from its action.

603 How adapted to the various operations of chemiſtry.

To adapt this to the various operations of chemiſtry, we may obſerve, that for a melting furnace it is very convenient; we need only provide a cover for the opening above, which is made the door; and which being immediately over the grate, is convenient for introducing the ſubſtances to be acted upon, and for allowing us to look into the veſſel and take it out. This cover may be a piece of tile, or two bricks rendered flat and ſquare. Dr Black commonly uſes a kind of lid with a rim containing a quantity of lute; and to augment the heat, we may increaſe the height of the vent. It can be employed in moſt operations in the way of eſſaying; and the ſituation of the door allows us to ſee the ſubſtances very readily. It does not admit the introduction of the muffle; but can be employed in all thoſe operations where the muffle is made uſe of; and in Cornwall in England ſuch a furnace is made uſe of for eſſaying of metals. To preſerve the ſubſtance from the contact of the fuel, they cut off about a third part of the length of a brick, and then put it on one end on the middle of the grate. They chooſe their fuel of large pieces, that the air may have free paſſage through it, and open a little of the door, which occaſions a ſtream of air to flow in; and this ſtrikes upon the ſubſtance and produces the effect deſired; ſo that it may be uſed in the calcination of lead to convert it into litharge. It alſo anſwers very well in operations for producing vapour. If we deſire to employ it in diſtillations which require an intenſe heat, the earthen retort is to be ſuſpended by means of an iron ring having three branches ſtanding up from it, and which hangs down about half a foot from the hole; ſo that the bottom of the retort reſts upon the ring, and is immediately hung over the fuel: and the opening between the mouth of the furnace and retort is filled up with broken crucibles and potſherds, which are covered over with aſhes that tranſmit the heat very ſlowly; ſo it anſwers for diſtillations performed with the naked fire. Dr Black has ſometimes cauſed them be provided with a hole in the ſide, from which the neck of the retort may be made to come out; and in this way has diſtilled the phoſphorus of urine, which requires a very ſtrong heat. For diſtillations with retorts performed with the ſand-bath, there is an iron pot fitted for the opening of the furnace, which is ſet on and employed as a ſand-pot. The vent of the furnace then becomes the door; and it anſwers very well for that purpoſe; and is more eaſily kept tight than if it were in the ſide, and may be kept cloſe with a lid of charcoal and clay. In like manner it anſwers well for the common ſtill, which may be adapted to it; part of it being made to enter the open part of the furnace, and hang over the fire, as in Plate CXXXIII. fig. 8. and 9. that the bottom part of that ſtill may be made to enter; and the vent becomes the door, by which freſh fuel may be added. Indeed it is ſeldom neceſſary to add freſh fuel during any operation. In the ordinary diſtillations it is never neceſſary; and even in diſtilling mercury, phoſphorus, &c. it generally contains enough to finiſh the operation; ſo effectually is the heat preſerved from loſs or diſſipation, and ſo very ſlow is the conſumption of the fuel.

604 Luting proper for his furnace.

For luting this and other furnaces, the doctor finds nothing perferable to a ſimple mixture of ſand and clay. The proportions for ſtanding 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.

605 Method of applying the lute.

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 portion of 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 beat 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 beat 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.

2d 605 Melting furnace.

When furnaces are uſed in the large way, they are always built of brick, and each particular operation has a furnace allotted for itſelf. The melting-furnace, where very large quantities of matter are not to be melted at once, requires only to be built of brick in ſuch a form as we have already deſcribed; only, as it would perhaps be troubleſome to procure a dome of the proper figure, the forepart of it may be left entirely open for the admiſſion of melting veſſels. The opening may be cloſed up with bricks and earth during the operation. There is no neceſſity for having the inſide of a circular form; a ſquare one will anſwer the purpoſe equally well. According to the author of the Chemical Dictionary, when the internal diameter D C of ſuch a furnace is 12 or 15 inches, the diameter of the tube G I 8 or 9 inches, and its height 18 or 20 feet, and when the ſurface is well ſupplied with fuel, and extreme heat is produced; in leſs than an hour the furnace will be white and dazzling like the ſun; its heat will be equal to the ſtrongeſt glaſs-houſe furnace; and in leſs than two hours will be melted whatever is fuſible in furnaces. The hotteſt part is at H F, 4 or 6 inches above the grate. A plate-iron tube may be advantageouſly ſupplied by a ſhort chimney of bricks, built under a pretty high vent, ſo as the whole may eaſily be ſtopped, except that paſſage which tranſmits the ſmoke of the furnace. By this means a very ſtrong current of air will be made to paſs through the fuel.

Plate CXXXIV. fig. 2.

606 Mr Pott's melting furnace deſcribed.

On this ſubject Dr Black informs us, that Mr Pott of Berlin employs one almoſt ſimilar to the above, for

for making experiments on earthen ware; by which he ſhowed that many ſubſtances formerly rekoned infuſible, might nevertheleſs be melted by fire raiſed to a very intenſe degree; and that ſeveral of theſe bodies, when mixed together, form compounds which may be melted without any difficulty. From this a tube ariſes to ſome height, and there is an additional tube which may be put on to the height of above 10 feet.

607 Reaſons for making the fire-place of a roundiſh form.

The fire-place is narrow below, but widens towards the middle, and contracts again at top, for the ſake of the veſſels which are put into it, and which are wider at top than at bottom. Thus the veſſel is equally heated, and there is room above for containing a quantity of fuel, which deſcends as faſt as it is conſumed. Different reaſons have been aſſigned for this form: thus Dr Boerhaave imagines that the melting furnace ſhould be made of a parabolic form, and Macquer, that it ſhould be in the form of an ellipſe; and that the crucible ſhould be placed in one of the foci, where they imagined the heat would be concentrated; but it is very plain, that the materials are ſuch as are not capable of reflecting the rays of heat in a regular manner; and even though they could do ſo, it would be to no purpoſe, becauſe the heat and light do not come from any ſingle point, but from a great number, ſtriking the furnace in all poſſible directions, and which muſt conſequently be reflected in directions as numerous. The furnace is made of iron lined with clay; and as it is difficult to beat out the iron into this roundiſh form, it may as well be made cylindrical; and it is eaſy to give the inſide what form we pleaſe by means of a luting of clay; neither need the dome have the roundiſh form, but may be ſimply made conical. The vent ſhould be made about two-thirds of the diameter of the furnace, or ſuch as will give an area of about one-half the grate. A ſmall portable furnace of this kind is very convenient for ordinary crucibles; the largeſt of which are only about four or five inches high; the wideſt part of the furnace may be beat out about 10 inches diameter; and when made of thin plate iron, and lined within, are very convenient, and may be heated at very little expence of fuel. But for heating much larger veſſels, it is proper to conſtruct them of brick, when they have pretty much the ſame form; only it is neceſſary to make them ſquare, and round on the inſide with a luting of ſand and clay. The top is generally made flat, and covered over with two or three bricks; the vent goes a little backwards, and then is raiſed to a proper height. Where the veſſel to be heated is very large, it is common to leave the front open for putting in the veſſel; and then to build it up with bricks, clay, and ſand; which can be eaſily pulled down again when the operation is over.

608 When bellows are neceſſary.

There are ſome caſes in which it is neceſſary to have a rapidity of inflammation even beyond what this furnace can give; and in theſe we have recourſe to bellows of various conſtructions, by which the air can be compreſſed and made to enter the fuel with great velocity. Theſe again are ſometimes wrought by water; but there is another machine which produces a greater effect, viz. the *water-blaſt* deſcribed by Lewis in his *Commercium Philoſoph. Technicum.*

609 In what caſes the eolipile may be made uſe of.

The eolipile too may be employed for driving air into fuel. The effect of this has been conſidered as a proof that air acts by its elaſticity in animating fuel, as an elaſtic fluid vapour from the eolipile produces, the ſame effect. But when we contrive to ſend ſteam inſtead of air, the ſame effect is not produced; and the true manner in which this inſtrument increaſes the inflammation is by driving air through the fuel: the ſteam from the veſſel ſpreading and mixing with the air, and driving it before it, makes it ſtrike upon the fuel.

Chemiſts have generally believed that a wide and high aſh-hole greatly increaſes the power of a melting furnace; but this advantage is found to be merely imaginary, as well as that of introducing the air through a long tube to the aſh-hole; unleſs where the furnace is placed in a cloſe room, ſo that it is neceſſary to furniſh a greater blaſt of air than can otherwiſe have acceſs.

For the form of the furnaces neceſſary in eſſaying and ſmelting of ores or making glaſs, ſee ESSAYING GLASS, and SMELTING.

610 Stills, ſand-pots &c. how to ſet.

When large ſtills, ſand-pots, &c. are to be fixed with a view to daily uſe, it is a matter of no ſmall conſequence to have them put up in a proper manner. The requiſites here are, 1. That the whole force of the fire ſhould be ſpent on the diſtilling veſſel or ſand-pot, except what is neceſſarily imbibed by the walls of the furnace. 2. That the veſſel ſhould be ſet in ſuch a manner as that they may receive heat even from the furnace walls; for a ſtill which contains any liquid can never be made ſo hot as a piece of dry brick. 3. It is abſolutely neceſſary that the force of the fire be not allowed to collect itſelf upon one particular part of the veſſel; otherwiſe that part will ſoon be deſtroyed. 3. The draught of air into furnaces of this kind ought to be moderate; only ſo much as will prevent ſmoke. If a ſtrong blaſt of air enters, not only a great part of the heat will be waſted by going up the chimney, but the outſide of the veſſel will be calcined every time the fire is kindled, and thus muſt be ſoon rendered unfit for uſe.

There are few of the common workmen that are capable of building furnaces properly; and it is very neceſſary for a chemiſt to know when they are properly done, and to make the workmen act according to his directions. As the ſtill, or whatever veſſel is to be fixed, muſt have a ſupport from the furnace on which it is built, it is evident the *whole* of its ſurface cannot be expoſed to the fire. For this reaſon many of theſe veſſels have had only their bottom expoſed to the fire, no more ſpace being left for the action of the heat, than the mere circular area of the ſtill bottom; and the fire paſſing directly through a hole in the back part of the building, which communicated with a chimney, and conſequently had a ſtrong draught, ſcarce ſpent any of its force on the ſtill, but went furiouſly up the chimney. By this means an extraordinary waſte of fuel was occaſioned; and that part of the ſtill-bottom which was next the chimney receiving the whole force of the flame, was ſoon deſtroyed. Attempts were made to remedy this inconvenience, by putting the fire ſomething forward, that it might be at greater diſtance from the chimney, and conſequently might not ſpend its force in the air. This too was found to avail very little. A contrivance was then fallen upon to make the vent paſs round the body of the ſtill in a ſpiral form. This was a conſiderable improvement; but had the inconvenience of making the fire ſpend itſelf uſeleſsly on the walls of the furnace, and beſides waſted that part of the ſtill which touched

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the under part of the vent. A much better method is to build the back part of the furnace entirely cloſe, and make the fire come out through a long narrow opening before; after which it paſſes out through a flue in the back and upper part of the furnace into the chimney.

The only convenience of this form is, that the vent muſt either be very wide, or it is apt to choak up with ſoot, which laſt is a very troubleſome circumſtance. If the vent is made very wide, a prodigious draught of air ruſhes through the fuel, and increaſes the heat to ſuch a degree as to calcine the metal of which the ſtill is made; and, on the other hand, nothing can be more diſagreeable than to have the vent of a furnace ſtopped up with ſoot. Theſe inconveniences, however, are totally avoided by making two ſmall vents, one on each ſide of the diſtilling veſſel, which may communicate with a chimney by means of two tubes either of plate-iron or formed with clay or bricks, which may be occaſionally taken off if they happen to be choaked up. The veſſel is to be ſuſpended by three trunnions, ſo that the whole ſurface may be expoſed to the fire, excepting a ring the thickneſs of a brick all round; ſo that a very ſtrong heat will be communicated although the furnace draws but little. The two ſmall vents on each ſide will draw the flame equally; and by this means the moſt equable heat can be preſerved, and may be puſhed ſo far as to make the whole bottom and ſides of the veſſel intenſely red. Such a conſtruction as this is more eſpecially uſeful for ſand-pots, and thoſe which are uſed for diſtilling alkaline ſpirits from bones.

In the uſe of the furnaces hitherto deſcribed, the attendance of the operator is neceſſary, both for inſpecting the proceſſes, and for ſupplying and animating the fuel. There are ſome operations, of a ſlower kind, that require a gentle heat to be continued for a length of time; which demand little attendance in regard to the operations themſelves, and in which, of conſequence, it is extremely convenient to have the attendance in regard to the fire as much as poſſible diſpenſed with. This end has been anſwered by the furnace called *athanor*; but the uſe of it has been found attended with ſome inconveniences, and it is now gerally laid aſide.

611 Lamp furnace.

Sundry attempts have been made for keeping up a continued heat, with as little trouble as in the athanor, by the flame of a lamp; but the common lamp-furnaces have not anſwered ſo well as could be wiſhed. The lamps require frequent ſnuffing, and ſmoke much; and the ſoot accumulated on the bottom of the veſſel placed over them, is apt, at times, to fall down and put out the flame. The largeneſs of the wick, the irregular ſupply of oil from the reſervoir by jets, and the oil being ſuffered to ſink conſiderably in the lamp, ſo that the upper part of the wick burns to a coal, appeared to be the principal cauſes of theſe inconveniences; which accordingly were found to be in great meaſure remedied by the following conſtruction.

Plate CXXXIV. fig. 8.

The lamp conſiſts of a braſs pipe 10 or 12 inches long, and about a quarter of an inch wide, inſerted at one end into the reſervoir of the oil, and turned up at the other to an elbow, like the bole of a tobacco-pipe, the aperture of which is extended to the width of near two inches. On this aperture is fitted a round plate, having 5, 6, or 7 ſmall holes, at equal diſtances, round its outer part, into which are inſerted as many pipes about an inch long: into theſe pipes are drawn threads of cotten, all together not exceeding what in the common lamps form one wick: by this diviſion of the wick, the flame expoſes a larger ſurface to the action of the air, the fuliginous matter is conſumed and carried off, and the lamp burns clear and vivid.

The reſervoir is a cylindric veſſel, eight or ten inches wide, compoſed of three parts, with a cover on the top. The middle partition communicates, by the lateral pipe, with the wicks; and has an upright open pipe ſoldered into its bottom, whoſe top reaches as high as the level of the wick; ſo that, when this part is charged with oil, till the oil riſes up to the wicks in the other end of the lamp, any further addition of oil will run down through the upright pipe into the lower diviſion of the reſervoir. The upper diviſion is deſigned for ſupplying oil to the middle one; and, for that purpoſe, is furniſhed with a cock in the bottom, which is turned more or leſs, by a key on the outſide, that the oil may drop faſt enough to ſupply the conſumption, or rather faſter, for the overplus is of no inconvenience, being carried off by the upright pipe; ſo that the oil is always, by this means, kept exactly at the ſame height in the lamp. For common uſes, the middle diviſion alone may be made to ſuffice; for, on account of its width, the ſinking of the oil will not be conſiderable in ſeveral hours burning. In either caſe, however, it is expedient to renew the wicks every two or three days; oftener or ſeldomer according as the oil is more or leſs foul; for its impure matter, gradually left in the wicks, occaſions the flame to become more and more dull. For the more convenient renewing of them, there ſhould be two of the perforated plates; that when one is removed, another, with wicks fitted to it, may be ready to ſupply its place.

One of the black-lead pots, recommended by Dr Lewis for his portable furnace, makes a proper furnace for the lamp. If one is to be fitted up on purpoſe for this uſe, it requires no other aperture than one in the bottom for admitting air, and one in the ſide for the introduction of the elbow of the lamp. The reſervoir ſtands on any convenient ſupport without the furnace. The ſtopper of the ſide aperture conſiſts of two pieces, that it may be conveniently put in after the lamp is introduced; and has a round hole at its bottom fitting the pipe of the lamp. By theſe means, the furnace being ſet upon a trevet or open foot, the air enters only underneath, and ſpreads equally all around, without coming in ſtreams, whence the flame burns ſteady. It is not adviſeable to attempt raiſing the heat higher than about the 450th degree of Fahrenheit's thermometer; a heat ſomewhat more than ſufficient for keeping tin in perfect fuſion. Some have propoſed giving a much greater degree of heat in lamp-furnaces, by uſing a number of large wicks; but when the furnace is ſo heated the oil emits copious fumes, and its whole quantity takes fire. The balneum or other veſſel including the ſubject-matters, is ſupported over the flame by an iron ring, as already deſcribed in the ſand-bath and ſtill: a bath is here particularly neceſſary, as the ſubject would otherwiſe be very unequally heated, only a ſmall part of the veſſel being expoſed to the flame. Since the new invention of Argand's lamps, which perfectly conſume the oil, attempts have been made to

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conſtruct lamp-furnaces on their principles; though, on the whole, it is to be doubted whether they are preferable to the above conſtruction or not.

Explanations of the Plates.

Plate CXXXIII. fig. 1. ſhows the figure of the ſtill recommended by Dr Black; the bottom formed in ſuch a manner as to go into his furnace. A, the body; B, the head; C C, the tube conveying the ſteam into the worm; D F, the figure of the worm; E, the worm-tub.

Fig. 2. A head taller than the common, proper for rectifying ardent ſpirits.

Fig. 3. Another kind of ſtill for a common furnace, having a concave bottom for receiving the flame. A, the body; B, the head.

Fig. 4. Papin's digeſter. See CHEMISTRY, nº 567. A, the body; B B, the croſs-bars; C D, the ſcrew; E, the lid.

Fig. 5. The outer caſe of Dr Black's furnace without the luting. A, the body; B, the feet; I G, the opening at top.

Fig. 6. C, the grate of the ſame, with four projections, having holes in them to faſten it by nails to the inſide of the furnace.

Fig. 7. A crooked funnel for putting matters into a retort without touching the ſides or neck.

Fig. 8. Dr Black's furnace put together in readineſs for chemical operations. A the mouth; B, the chimney; C, the door of the aſh-hole. E, the regiſters for admitting air.

Fig. 9. A ſection of the ſame, ſhowing its inſide ſtructure. F, the top-cover; G, the body, with part of the grate; D, the receptacle for the aſhes; C, its door; E, the regiſters.

Fig. 10. An iron ſupport for a crucible.

Fig. 11. The figure of a crucible.

Plate CXXXIV. fig. 1. Dr Boerhaave's portable furnace. See CHEMISTRY, nº 600.

Fig. 2. Macquer's melting-furnace. AA, the door of the aſh-pit; B, the ſpace betwixt the top of the aſh-pit and fire-place; D C, the bars; G H E F, the fire-place; I, the funnel. *Ibid.* 2d nº 605.

Fig. 3. Dr Lewis's portable furnace fitted with a ſtill, *Ibid.* nº 601, 602.

Fig. 4. Shows the figure of retorts of different kinds. A, the body; B, the neck.

Fig. 5. A matraſs and alembic head, with a cucurbit and alembic head made of one piece. A, the body; B, the long neck of the matraſs; C, the alembic head. A, the body of the cucurbit; B, the head; C, an opening in the head for putting in the matter to be diſtilled; D, a glaſs ſtopple fitted to the opening juſt mentioned; E, the opening of the cucurbit mouth.

Fig. 6. The pelican and cucurbit now in diſuſe. A, the body of the pelican; B, the head; C, an opening fitted with a ſtopple; D D, the arms. A, the body of the cucurbit; B, the head; C, the neck; D, the ſpout.

Fig. 7. A row of adopters or aludels.

Fig. 8. Dr Lewis's lamp-furnace. *Ibid.* nº 611.

PART II. PRACTICE.

SECT. I. *Salts.*

§ 1. *Of the* VITRIOLIC *Acid, and its Combinations.*

612 Never found pure. THE vitriolic acid is never found pure, but always united with ſome proportion, either of phlogiſton or metallic and earthy ſubſtances. Indeed there is ſcarce any kind of earth which does not contain ſome portion of this acid, and from which it may always ſome way or other be ſeparable. When pure, the vitriolic acid appears in the form of a tranſparent colourleſs liquor. By diſtilling in a glaſs retort, the aqueous part ariſes, and the liquor which is left becomes gradually more and more acid. 613 Rectification. This operation is generally called the *rectification*, or *dephlegmation*, of the acid. After the diſtillation has gone on for ſome time, the water adheres more ſtrongly to what remains in the retort, and cannot be forced over without elevating part of the acid along with it. The remaining acid, being alſo exceedingly concentrated, begins to loſe its fluidity, and puts on the appearance of a clear oil. This is the ſtate in which it is uſually ſold, and then goes by the name of *oil of vitriol*. If the diſtillation is ſtill farther continued, with a heat below 600° of Fahrenheit's thermometer, the acid gradually loſes more and more of its fluidity, till at laſt it congeals in the cold, and becomes like ice. In this ſtate it is called the *icy oil of vitriol*. Such exceedingly great concentration, however, is only practiſed on this acid for curioſity. If the heat be ſuddenly raiſed to 600°, the whole of the acid riſes, and generally cracks the receiver. Clear oil of vitriol is immediately turned black by an admixture of the ſmalleſt portion of inflammable matter.

614 Attracts moiſture from the air. The icy oil of vitriol, and even that commonly ſold, attracts the moiſture of the air with very great force. Newmann relates, that having expoſed an ounce of this acid to the air, from September 1736 to September 1737, at the end of the twelvemonth it weighed ſeven ounces and two drachms; and thus had attracted from the air above ſix times its own weight of moiſture. This quantity, however, ſeems extraordinary; and it is probable, that in ſo long a time ſome water had been accidentally mixed with it; for Dr Gould, profeſſor at Oxford, who ſeems to have tried this matter fully, relates, that three drachms of oil of vitriol acquired, in 57 days, an increaſe only of ſix drachms and an half. The acid was expoſed in a glaſs of three inches diameter; the increaſe of weight the firſt day was upwards of one drachm; in the following days leſs and leſs, till, on the fifty-ſixth, it ſcarce amounted to half a grain. The liquor, when ſaturated with humidity, retained or loſt part of its acquired weight according as the atmoſphere was in a moiſt or dry ſtate; and this difference was ſo ſenſible as to afford an accurate hygrometer. Hoffman having expoſed an ounce and two ſcruples in an open glaſs-diſh, it gained ſeven drachms and a ſcruple in 14 days.

615 Productive both of cold and heat. This acid, when mixed with a large quantity of water, makes the temperature ſomething colder than before; but if the acid bears any conſiderable proportion to the water, a great heat is produced, ſo as to make the veſſel inſupportable to the hand; and therefore

fore ſuch mixtures ought very cautiouſly, or rather not at all, to be made in glaſs veſſels, but in the common ſtone-bottles, or leaden veſſels, which are not apt to be corroded by this acid. The greateſt heat is produced by equal parts of acid and water.

616 Quantity of alkali ſaturated by it.

Though the vitriolic acid unites itſelf very ſtrongly with alkalies, both fixed and volatile, it does not ſaturate near ſo much of the latter as of the former. A pound of oil of vitriol will ſaturate two of the common fixed alkali, but ſcarce one of volatile alkali. The ſpecific gravity of good oil of vitriol is to water as 17 to 8.

617 Effects on the human body.

If the concentrated acid is applied ſlightly and ſuperficially to the ſkin of a living animal, it raiſes a violent burning heat and pain; but a larger quantity preſſed on, ſo as to prevent the ingreſs of aerial moiſture, occaſions little pain or eroſion. If diluted with a little water, it proves corroſive in either caſe. Largely diluted with water, this acid is employed medicinally for checking putrefaction, abating heat, and quenching thirſt; in debilities of the ſtomach, and heartburn. To perſons of weak and unſound lungs, to women who give ſuck, to hydropic or emaciated perſons, it is injurious. Some recommend it as a collyrium for ſore eyes; but as it coagulates the animal juices, corroding and indurating the ſolids, it ſeems very unfit for being applied to that tender organ.

618 Difficulty of procuring it by itſelf.

The vitriolic acid is ſo much uſed in different arts and manufactures, that the making of it has become a trade by itſelf; and the procuring it in plenty, and at a cheap rate, would be a very advantageous piece of knowledge to any perſon who could put it in practice. This, however, is very far from being eaſily done; for though it exiſts in almoſt every mineral ſubſtance, the attraction betwixt this acid and the baſes with which it unites, is found to be ſo ſtrong, that we can only decompoſe ſuch combinations by preſenting another ſubſtance to the acid, to which it has a greater attraction than that one wherewith it is joined. Thus the firſt combination is indeed diſſolved, but we have another from which it is eqally difficult to extricate the acid by itſelf. Thus, if we want to diſengage the vitriolic acid from any metallic ſubſtance, ſuppoſe iron, this may be eaſily done by throwing a calcareous earth into a ſolution of green vitriol. We have now a compound of vitriolic acid with the calcareous earth, which is known by the name of *gypſum* or *ſelenites*. If we want to decompoſe this we muſt apply a volatile or or a fixed alkali; and the reſult of this will conſtantly be a new combination, which we are as unable to decompoſe, and indeed more ſo, than the firſt. There are two general methods which have been in uſe for procuring the vitriolic acid in ſuch quantity as to ſupply the demands of trade. The one is from pyrites, and the other from ſulphur.

I. From *Pyrites*, with the making of Copperas, and obtaining the pure Oil of Vitriol from it.

619 Pyrites, where found.

Pyrites are found in large quantity in the coal-mines of England, where moſt of the copperas is made. They are very hard and heavy ſubſtances, having a kind of braſſy appearance, as if they contained that metal; and hence they are called *braſſes* by the workmen. A very large quantity of theſe is collected, and ſpread out upon a bed of ſtiff clay to the depth of three feet. After being ſome time expoſed to the air, the uppermoſt ones loſe their metallic appearance, ſplit, and fall to powder. The heaps are then turned, the under part uppermoſt, ſo as to expoſe freſh pyrites to the air. When they are all reduced to powder, which generally requires three years, the liquor, which is formed by the rain-water running from ſuch a large maſs, becomes very acid, and has likewiſe a ſtyptic vitriolic taſte. It is now conveyed into large ciſterns lined with clay, whence it is pumped into a very large flat veſſel made of lead. This veſſel, which contains about 15 or 20 tons of liquor, is ſupported by caſt-iron plates about an inch thick, between which and the lead a bed of clay is interpoſed. The whole reſts upon narrow arches of brick, under which the fire is placed. Along with the liquor, about half a ton or more of old iron is put into the evaporating veſſel. The liquor, which is very far from being ſaturated with acid, acts upon the iron, and, by repeated filling up as it evaporates, diſſolves the whole quantity. By the time this quantity is diſſolved, a pellicle is formed on the ſurface. The fire is then put out; and as ſuch a prodigious quantity of liquor does not admit of filtration, it is left to ſettle for a whole day, and then is let off by a cock placed a little above the bottom of the evaporating veſſel, ſo as to allow the impurities to remain behind. It is conveyed by wooden ſpouts to a large leaden ciſtern, five or ſix feet deep, ſunk in the ground, and which is capable of containing the whole quantity of liquor. Here the copperas cryſtallizes on the ſides, and on ſticks put into the liquor. The cryſtallization uſually takes up three weeks. The liquor is then pumped back into the evaporating veſſel; more iron, and freſh liquor from the pyrites, are added; and a new ſolution takes place.

Copperas is uſed, in dyeing, for procuring a black colour; and is an ingredient in making common ink. It is alſo uſed in medicine as a corroborant, under the name of *ſalt of ſteel;* but before it is uſed with this intention, it is rediſſolved in water, and cryſtallized, with the addition of a little pure oil of vitriol. Whether it is at all mended by this ſuppoſed purification, either in appearance or quality, is very doubtful.

This proceſs furniſhes us firſt with a very impure vitriolic acid, which could not be applied to any uſeful purpoſe; afterwards with an imperfect neutral ſalt, called *green vitriol,* which is applicable to ſeveral purpoſes where the pure acid itſelf could not be uſed; but ſtill the acid by itſelf is not to be had without a very troubleſome operation.

620 Diſtillation of vitriolic acid from copperas.

Though this acid adheres very ſtrongly to iron, it is capable of being expelled from it by fire; yet not without a very violent and long-continued one. If we attempt to diſtil green vitriol in a retort, it ſwells and boils in ſuch a manner by the great quantity of water contained in its cryſtals, that the retort will almoſt certainly crack; and though it ſhould not, the ſalt would be changed into an hard ſtony maſs, which the fire could never ſufficiently penetrate ſo as to extricate the acid. It muſt therefore be calcined previous to the diſtillation. This is beſt done in flat iron-pans, ſet over a moderate fire. The ſalt undergoes the watery

Fig. 1

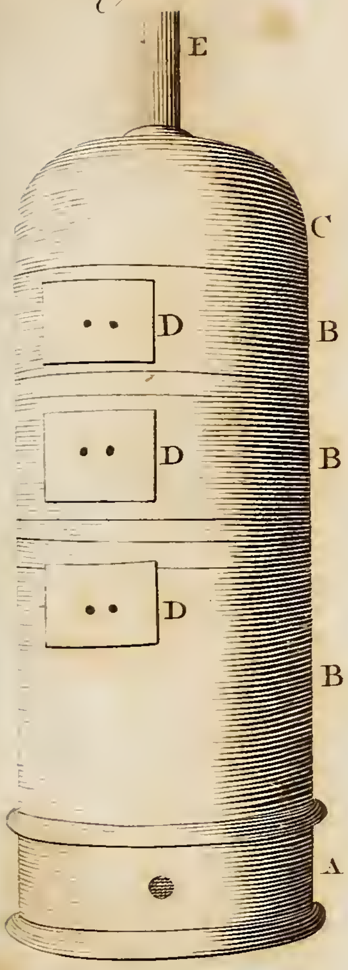


Fig. 8

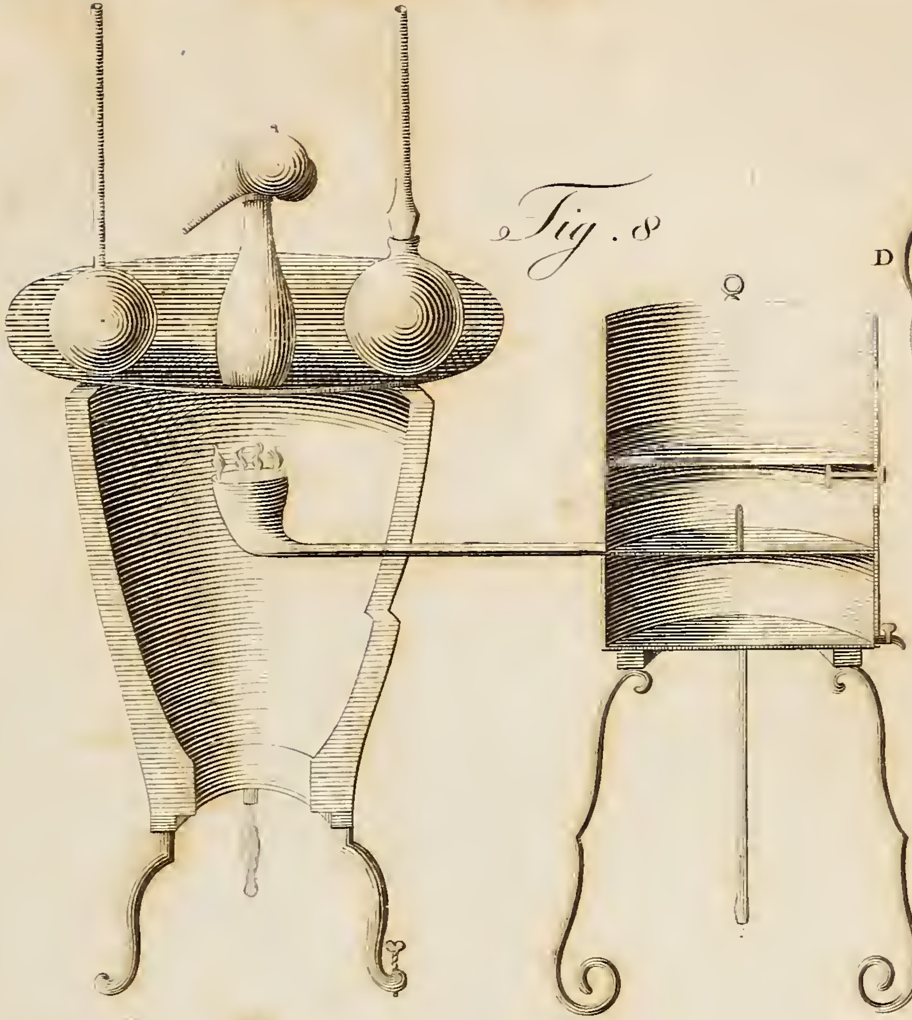
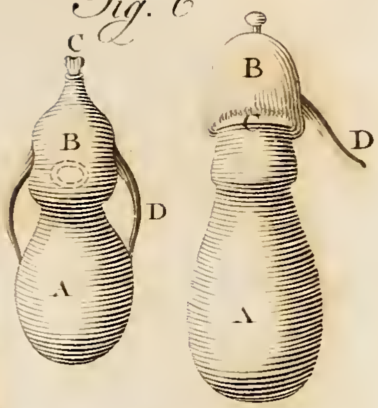


Fig. 6



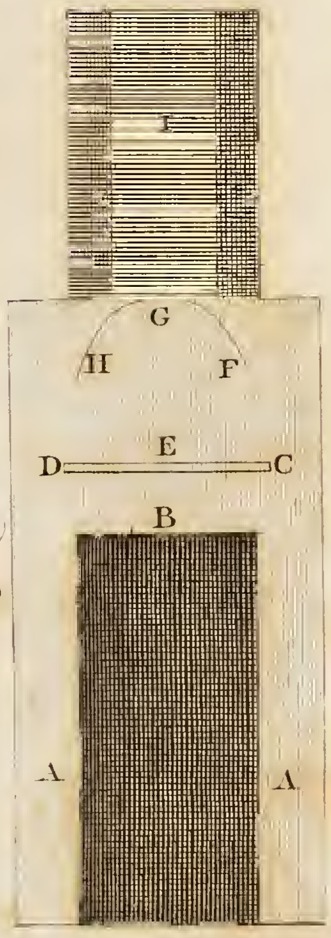


Fig. 2

Fig. 9

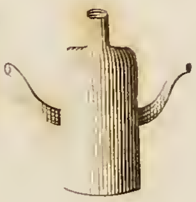


Fig. 3

Fig. 5

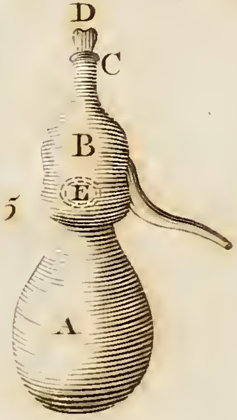
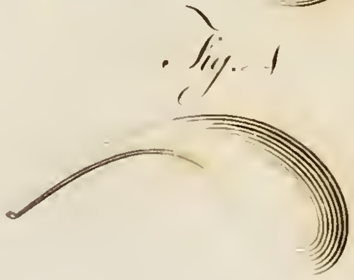


Fig. 7

Fig. 4



Scot Philada sc

tery fuſion, (See Fusion); after which it becomes opaque and white. By a continuance of the fire, it becomes brown, yellow, and at laſt red. For the purpoſes of diſtillation, it may be taken out as ſoon as it has recovered its ſolidity.

The dry vitriol, being now reduced to powder, is to be put into an earthen retort, or rather long neck (a kind of retort where the neck iſſues laterally, that the vapours may have little way to aſcend), which it may nearly fill. This retort muſt be placed in a furnace capable of giving a very ſtrong heat, ſuch as the melting furnace we have already deſcribed. A large receiver is to be fitted on; and a ſmall fire made in the furnace to heat the veſſels gradually. White fumes will ſoon come over into the receiver, which will make the upper part warm. The fire is to be kept of an equal degree of ſtrength, till the fumes begin to diſappear, and the receiver grows cool. It is then to be increaſed by degrees; and the acid will become gradually more and more difficult to be raiſed, till at laſt it requires an extreme red, or even white, heat. When nothing more will come over, the fire muſt be ſuffered to go out, the receiver be unluted, and its contents poured into a bottle fixed with a glaſs ſtopper. A ſulphureous and ſuffocating fume will come from the liquor, which muſt be carefully avoided.

621 Preſervatives of wood.

In the retort, a fine red powder will remain, which is uſed in painting, and is called *colcothar of vitriol*. It is uſeful on account of its durability; and, when mixed with tar, has been employed as a preſervative of wood from rotting; but Dr Lewis prefers finely powdered pit-coal. As a preſervative for maſts of ſhips, he recommends a mixture of tar and lampblack; concerning which he relates the following anecdote.

"I have been favoured by a gentleman on board of a veſſel in the Eaſt-Indies, with an account of a violent thunder-ſtorm, by which the main-maſt was greatly damaged, and whoſe effects on the different parts of the maſt were pretty remarkable. All the parts which were greaſed or covered with turpentine were burſt in pieces: thoſe above, between, and below the greaſed parts, as alſo the yard-arms, the round-top or ſcaffolding, coated with tar and lamp-black, remained unhurt."

622 Rectification.

Oil of vitriol, when diſtilled in this manner, is always of a black colour, and muſt therefore be rectified by diſtillation in a glaſs retort. When the acid has attained a proper degree of ſtrength, the blackneſs either flies off, or ſeparates and falls to the bottom, and the liquor becomes clear. The diſtillation is then to be diſcontinued, and the clear acid which is left in the retort kept for uſe.

This was the firſt method by which the vitriolic acid was obtained; and from its being diſtilled from vitriol has ever ſince retained the name of *oil of vitriol*. Green vitriol is the only ſubſtance from which it is practicable to draw this acid by diſtillation; when combined with calcareous earths, or even copper (though to this laſt it has a weaker attraction than to iron), it reſiſts the fire moſt obſtinately. When diſtillation from vitriol was practiſed, large furnaces were erected for that purpoſe, capable of containing an hundred long necks at once: but as it has been diſcovered to be more eaſily procurable from ſulphur, this method has been laid aſide, and it is now needleſs to deſcribe theſe furnaces.

II. To procure the Vitriolic Acid from *Sulphur*.

623 Quantity of acid in ſulphur.

This ſubſtance contains the vitriolic acid in ſuch plenty, that every pound of ſulphur, according to Mr Kirwan's calculation, contains more than one-half of pure acid; which being in a ſtate perfectly dry, is conſequently of a ſtrength far beyond that of the moſt highly rectified oil of vitriol. Common oil of vitriol requires to be diſtilled to one-fourth of its quantity before it will coagulate when cold; and even in this ſtate it undoubtedly contains ſome water.

624 Quantity produced from it.

No method, however, has as yet been fallen upon to condenſe all the ſteams of burning ſulphur, at leaſt in the large way, nor is any other profitable way of decompoſing ſulphur known than that by burning; and in this way the moſt ſucceſsful operators have never obtained more than 14 ounces of oil from a pound of ſulphur.

625 Methods of obviating the difficulties in this proceſs.

The difficulties here are, that ſulphur cannot be burnt but in an open veſſel; and the ſtream of air, which is admitted to make it burn, alſo carries off the acid which is emitted in the form of ſmoke. To avoid this, a method was contrived of burning ſulphur in large glaſs globes, capable of containing an hogſhead or more. The fume of the burning ſulphur was then allowed to circulate till it condenſed into an acid liquor. A greater difficulty, however, occurs here; for though the ſulphur burns very well, its ſteams will never condenſe. It has been ſaid, that the condenſation is promoted by keeping ſome warm water continually ſmoking in the bottom of the globe; and even Dr Lewis has aſſerted this: but the ſteam of warm water immediately extinguiſhes ſulphur, as we have often experienced; neither does the fume of burning ſulphur ſeem at all inclinable to join with water, even when forced into contact with it. As it ariſes from the ſulphur, it contains a quantity of phlogiſton, which in a great meaſure keeps it from uniting with water; and the deſideratum is not ſomething to make the ſulphur burn freely, but to deprive the fumes of the phlogiſton they contain, and render them miſcible with water. For this purpoſe nitre has been advantageouſly uſed. This conſumes a very large quantity of the phlogiſton contained in ſulphur, and renders the acid eaſily condenſible: but it is plain that few of the fumes, comparatively ſpeaking, are thus deprived of the inflammable principle; for the veſſel in which the ſulphur and nitre are burnt, remains filled with a volatile and moſt ſuffocating fume, which extinguiſhes flame, and iſſues in ſuch quantity as to render it highly dangerous to ſtay near the place. It has been thought that nitre contributes to the burning of the ſulphur in cloſe veſſels; but this too is a miſtake. More ſulphur may be burnt in an oil of vitriol globe without nitre than with it, as we have often experienced; for the acid of the ſulphur unites with the alkaline baſis of the nitre, and forms therewith an uninflammable compound, which ſoon extinguiſhes the flame, and even prevents a part of the ſulphur from being burnt either at that time or any other.

626 Effervеſcence between the nitrous and ſulphureous fumes.

In the condenſation of the fumes of ſulphur by means of nitre, a remarkable effervеſcence happens, which naturally leads us to think that the condenſation is produced by ſome ſtruggle between the vitriolic and nitrous acids.—Dr Lewis is of opinion, that the acid thus obtained is perfectly free from an admixture of the nitrous acid: but in this he is certainly miſtaken; for, on rectifying the acid produced by ſulphur and nitre, the firſt fumes that come over are red, after which they change their colour to white. How the nitrous acid ſhould exiſt in the liquor, indeed, does not appear; for this acid is totally deſtructible by deflagration with charcoal: but it does not follow, that becauſe the nitrous acid is deſtroyed when deflagrated with charcoal, it muſt likewiſe be ſo if deflagrated with ſulphur. Indeed it certainly is not; for the clyſſus of nitre made with ſulphur is very different from that made with charcoal.

The proportions of nitre to the ſulphur, uſed in the large oil of vitriol works, are not known, every thing being kept as ſecret as poſſible by the proprietors. Dr Lewis reckons about ſix pounds of nitre to an hundred weight of ſulphur; but from ſuch experiments as we have made, this appears by far too little. An ounce and an half, or two ounces, may be advantageouſly uſed to a pound of ſulphur. In greater proportions, nitre ſeems prejudicial.

627 Lead veſſels, an improvement.

A very great improvement in the apparatus for making oil of vitriol, lies in the uſing lead veſſels inſtead of glaſs globes. The globes are ſo apt to be broken by accident, or by the action of the acid upon them, that common prudence would ſuggeſt the uſe of lead to thoſe who intend to prepare any quantity of vitriolic acid, as it is known to have ſo little effect upon the metal. The leaden veſſels, according to the beſt accounts we have been able to procure, are cubes of about three feet, having on one ſide a door about ſix inches wide. The mixture of ſulphur and nitre is placed in the hollow of the cube, in an earthen ſaucer, ſet on a ſtand made of the ſame materials. The quantity which can be conſumed at once in ſuch a veſſel is about two ounces. To prevent the remains from ſticking to the ſaucer, it is laid on a ſquare bit of brown paper. The ſulphur being kindled, the door is to be cloſe ſhut, and the whole let alone for two hours. In that time the fumes will be condenſed. The door is then to be opened; and the operator muſt immediately retire, to eſcape the ſuffocating fumes which iſſue from the veſſel. It will be an hour before he can ſafely return, and introduce another quantity of materials, which are to be treated preciſely in the ſame manner.

Where oil of vitriol is made in large quantities, the ſlowneſs of the operation requires a great number of globes, and conſtant attendance day and night. Hence the making of this acid is very expenſive: The apparatus for a large work uſually coſts L.1500. ſterling.

Vitriolic Acid COMBINED,

628 Vitriolated tartar.

I. *With Fixed Alkali.* Dilute a pound of oil of vitriol with ten times its quantity of water; diſſolve alſo two pounds of fixed alkaline ſalt in ten pounds of water, and filter the ſolution. Drop the alkali into the acid as long as any efferveſcence ariſes; managing matters ſo that the acid may prevail. The liquor will now be a ſolution of the neutral ſalt, called *vitriolated tartar*, which may be procured in a dry form, either by exſiccation or cryſtallization. In caſe the latter method is made uſe of, ſome more alkali muſt be added when it is ſet to evaporate, for this ſalt cryſtallizes beſt in an alkaline liquor.

629 [630] Different methods of preparing vitriolated tartar.

Other methods, beſides that above deſcribed, have been recommended for preparing vitriolated tartar; particularly that of uſing green vitriol inſtead of the pure vitriolic acid. In this caſe the vitriol is decompoſed by the fixed alkali: but as the alkali itſelf diſſolves the calx of iron after it is precipitated, it is next to impoſſible to procure a pure ſalt by ſuch a proceſs; neither is there occaſion to be ſolicitous about the preparation of this ſalt by itſelf, as the materials for it are left in greater quantity than will ever be demanded, after the diſtillation of ſpirit of nitre.

631 Uſes.

Vitriolated tartar is employed in medicine as a purgative; but is not at all ſuperior to other ſalts which are more eaſily prepared in a cryſtalline form. It is very difficultly ſoluble in water, from which proceeds the difficulty of cryſtallizing it: for if the acid and alkali are not very much diluted, the ſalt will be precipitated in powder, during the time of ſaturation.—It is very difficult of fuſion, requiring a ſtrong red heat; but, notwithſtanding its fixedneſs in a violent fire, it ariſes with the ſteam of boiling water in ſuch a manner as to be almoſt totally diſſipated along with it by ſtrong boiling.—This ſalt has been uſed in making glaſs; but with little ſucceſs, as the glaſs wherein it is an ingredient always proves very brittle and apt to crack of itſelf.

632 Glauber's ſalt.

If, inſtead of the vegetable fixed alkali, the vitriolic acid is ſaturated with the foſſile one called the *ſalt of Soda*, a kind of neutral ſalt will be produced, having very different properties from the vitriolated tartar. This compound is called *Glauber's ſalt*. It diſſolves eaſily in water, ſhoots into long and beautiful cryſtals, which contain a large quantity of water, in conſequence of which they undergo the aqueous fuſion when expoſed to heat. They are alſo more eaſily fuſible than vitriolated tartar.—This kind of ſalt was formerly much recommended as a purgative, and from its manifold virtues was intitled by its inventor *ſal mirabile*. It is, however, found to poſſeſs no virtue different from that of other purgative ſalts: and its uſe is, in many places, entirely ſuperſeded by a ſalt prepared from the *bittern*, or liquor which remains after the cryſtallization of ſea-ſalt, which ſhall be afterwards deſcribed.

633 Glauber's ſecret ſalt ammoniac.

II. *With volatile alkali.* Take any quantity of volatile alkaline ſpirit; that prepared with quicklime is perferable to the other, on account of its raiſing no efferveſcence. Drop into this liquor, contained in a bottle, diluted oil of vitriol, ſhaking the bottle after every addition. The ſaturation is known to be complete by the volatile ſmell of the alkali being entirely deſtroyed. When this happens, ſome more of the ſpirit muſt be added, that the alkali may predominate a little, becauſe the exceſs will fly off during the evaporation. The liquor, on being filtered and evaporated, will ſhoot into fine fibrous plates like feathers. This ſalt, when newly prepared, has a ſulphureous ſmell, and a penetrating pungent taſte. It readily diſſolves in water, and increaſes the coldneſs of the liquor; on ſtanding for a little time, it begins to ſeparate from the water, and vege-

vegetate, or ariſe in efflorefcences up the ſides of the glaſs. It eaſily melts in the fire; penetrates the common crucibles; and if ſublimed in glaſs veſſels, which requires a very conſiderable heat, it always becomes acid, however exactly the ſaturation was performed.

This ſalt has been dignified with the names of *Glauber's ſecret ſal ammoniac*, or *philoſophic ſal ammoniac*, from the high opinion which ſome chemiſts have entertained of its activity upon metals: but from Mr Pott's experiments, it appears, that its effects have been greatly exaggerated. It diſſolves or corrodes in ſome degree all thoſe metals which oil of vitriol diſſolves, but has no effect upon thoſe on which that acid does not act by itſelf.

634
Properties of the ſalts.

Gold is not touched in the leaſt, either by the ſalt in fuſion, or by a ſolution of it: the ſalt added to a ſolution of gold in aqua-regia occaſions no precipitation or change of colour. On melting the ſalts with inflammable matters, it forms a ſulphureous compound, which diſſolves gold in fuſion, in the ſame manner as compoſitions of ſulphur and fixed alkaline ſalt. Melted with ſilver, it corrodes it into a white clax, which partially diſſolves in water: it likewiſe precipitates ſilver from its ſolution in aquafortis. It acts more powerfully on copper; elevates a part of the metal in ſublimation, ſo as to acquire a bluiſh colour on the ſurface; and renders the greateſt part of the reſiduum ſoluble in water. This ſolution appears colourleſs, ſo that it could not be ſuppoſed to hold any copper; but readily diſcovers that it abounds with that metal, by the blue colour it acquires on an addition of volatile alkali, and the green calx which fixed alkalies precipitate. In evaporation it becomes green without addition. Iron is corroded by this ſalt in fuſion, and diſſolved by boiling in a ſolution of it. Zinc diſſolves more freely and more plentifully. Lead unites with it, but does not become ſoluble in water. Tin is corroded, and a part of the calx is ſoluble in boiling water. Of regulus of antimony alſo a ſmall portion is made ſoluble. Alkalies precipitate from the ſolution a bluiſh powder. Calcined biſmuth-ore treated with its equal weight of the ſalt, partly diſſolved in water into a pale red liquor, which became green from heat, in the ſame manner as tinctures made from that ore by aqua-regia. The undiſſolved part yielded ſtill, with frit, a blue glaſs. On treating mangaueſe in the ſame manner, aluminous cryſtals were obtained: the undiſſolved part of the manganeſe gave ſtill a violet colour to glaſs.

635
Gypſum.

III. *With Calcareous Earth*. This combination may be made by ſaturating diluted oil of vitriol with chalk in fine powder. The mixture ought to be made in a glaſs; the chalk muſt be mixed with a pretty large quantity of water, and the acid dropped into it. The glaſs muſt be well ſhaken after every addition, and the mixture ought rather to be over ſaturated with acid; becauſe the ſuperfluous quantity may afterwards be waſhed off; the *ſelenite*, as it is called, or *gypſum*, having very little ſolubility in water.

This combination of vitriolic acid with chalk or calcareous earth, is found naturally in ſuch plenty, that it is ſeldom or never made, unleſs for experiment's ſake, or by accident. Mr Pott indeed ſays, that he found ſome ſlight differences between the natural and artificial gypſum, but that the former had all the eſſential properties of the latter.

The natural gypſums are found in hard, ſemitranſparent maſſes, commonly called *alabaſter*, or *plaſter of Paris*. (See ALABASTER, GYPSUM, and PLASTER.) By expoſure to a moderate heat, they become opaque, and very friable. If they are now reduced to fine powder, and mixed with water, they may be caſt into moulds of any ſhape: they very ſoon harden without ſhrinking; and are the materials whereof the common white images are made. This property belongs likewiſe to the artificial gypſum, if moderately calcined.

636
Beaume's obſervations.

Mr Beaumé has obſerved, that gypſum may be diſſolved in ſome meaſure by acids; but is afterwards ſeparable by cryſtallization in the ſame ſtate in which it was before ſolution, without retaining any part of the acids. This compound, if long expoſed to a pretty ſtrong heat, loſes great part of its acid, and is converted into quicklime. In glaſs veſſels it gives over no acid with the moſt violent fire. It may be fuſed by ſuddenly applying a very intenſe heat. With clay it ſoon melts, as we have obſerved when ſpeaking of the materials for making crucibles. A like fuſion takes place when pure calcareous earth is mixed with clay; but gypſum bubbles and ſwells much more in fuſion with clay than calcareous earth.

From natural gypſum we ſee that vitriolated tartar may be made, in a manner ſimilar to its preparation from green vitriol. If fixed alkaline ſalt is boiled with any quantity of gypſum, the earth of the latter will be precipitated, and the acid united with the alkali. If a mild volatile alkali is poured on gypſum contained in a glaſs, and the mixture frequently ſhaken, the gypſum will in like manner be decompoſed, and a *philoſophic* ſal ammoniac will be formed. With the cauſtic volatile alkali, or that made with quicklime, no decompoſition enſues.

637
Alum of the ancients different from ours.

IV. *With Argillaceous Earth*. The produce of this combination is the aſtringent ſalt called *alum*, much uſed in dyeing and other arts. It has its name from the Latin word *alumen* called στυπτηρια by the Greeks; though by theſe words the ancients expreſſed a ſtalactitic ſubſtance containing very little alum, and that entirely enveloped in a vitriolic matter. The alum uſed at preſent was firſt diſcovered in the oriental parts of the world; though we know not when, or on what occaſion. One of the moſt ancient alum-works of which we have any account was that of *Roccho*, now Edeſſa, a city of Syria: and from this city was derived the appellation of *Roch-alum*; an expreſſion ſo little underſtood by the generality, that it has been ſuppoſed to ſignify *rock-alum*. From this, and ſome works in the neighbourhood of Conſtantinople, as well as at Phocaea Nova, now Foya Nova, near Smyrna, the Italians were ſupplied till the middle of the 15th century, when they began to ſet up works of a ſimilar kind in their own country. The firſt Italian alum-work was eſtabliſhed about 1459 by Bartholomew Perdix, or Pernix, a Genoeſe merchant, who had diſcovered the proper matrix, or ore of alum, in the iſland of Iſchia. Soon after the ſame material was diſcovered at Tolfa by John de Caſtro, who had viſited the alum manufactories at Conſtantinople. Ha-

638
Whence the name of rock alum is derived.

639
Alum-works ſet up in Italy.

ving obſerved the ilex aquilifolium to grow in the neighbourhood of the Turkiſh manufactories, and finding the ſame near Tolfa, he concluded that the materials for alum were to be found there alſo; and was quickly confirmed in his ſuſpicions by the taſte of the ſtones in the neighbourhood. Theſe alum-works proſpered exceedingly, and their ſucceſs was augmented by an edict of Pope Pius II. prohibiting the uſe of foreign alum.

640 In Spain, England, and Sweden.

In the 16th century an alum manufactory was erected at Alamaron, in the neighbourhood of Carthagena, where it ſtill continues. Several others were erected in Germany; and in the reign of Queen Elizabeth one was erected in England by Thomas Chaloner. The preparation of this ſalt was not known in Sweden till the 17th century.

641 Its component parts firſt diſcovered by Meſſ. Boulduc and Geoffroy.

The component principles of this ſalt were long unknown; but at laſt Meſſrs Boulduc and Geoffroy diſcovered, that it conſiſted of argillaceous earth ſuperſaturated with vitriolic acid. This is confirmed by the experiments of other chemiſts. It is found to redden the tincture and paper of turnſole; and on taking away the ſuperabundant acid, it loſes its ſolubility and all the other properties of alum. Mr Morveau, indeed, will not admit of a ſuperabundance of acid in alum, which he thinks would neceſſarily be ſeparated by edulcoration and cryſtallization; and he is of opinion with Mr Kirwan, that the turning vegetable juices red is not any unequivocal ſign of the preſence of an acid. In the preſent caſe, however, we certainly know that there is a ſuperabundance of acid, and that a certain portion of the vitriolic acid adheres to the clay leſs tenaciouſly than the remainder. If we put a piece of iron into a ſolution of alum, it will attract this portion of acid; and the vitriolated clay when deprived of the ſuperfluous quantity, will fall down to the bottom in an inſoluble powder.

642 Miſtake of Morveau detected by Mr Kirwan.

643 Alum deprived of its ſuperfluous acid inſoluble in water.

Alum in its ordinary ſtate contains a conſiderable quantity of water, and cryſtallizes by proper management into octohedral and perfectly tranſparent and colourleſs cryſtals. When expoſed to a moderate fire, it melts, bubbles, and ſwells up; being gradually changed into a light, ſpongy, white maſs, called *burnt alum*. This, with the addition of ſome vitriolic acid, may be cryſtallized as before. The principles it contains, therefore, are water, vitriolic acid, and argillaceous earth. The proportions may be aſcertained in the following manner. 1. The water and ſuperfluous vitriolic acid may be diſſipated by evaporation, or rather diſtillation; and the loſe of weight ſuſtained by the ſalt, as well as the quantity of liquid which comes over into the receiver, ſhows the quantity of aqueous phlegm and unſaturated acid. 2. By combining this with as much cauſtic fixed alkali as is ſufficient to ſaturate the acid which comes over, we know its proportion to the water; and by rediſtilling this new compound, we have the water by itſelf. 3. The earth may be obtained by precipitation with an alkali in its cauſtic ſtate, either fixed or volatile: but this part of the proceſs is attended with conſiderable difficulty; for the alkalies firſt abſorb the ſuperfluous acid, after which the earth combined to ſaturation with the acid falls to the bottom, and the digeſtion with the alkaline ſalt muſt be continued for a very conſiderable time before the acid is totally ſeparated. By analyſing alum in this manner, Mr Bergman determined the principles of alum to be 38 parts of vitriolic acid, 18 of clay, and 44 of water, to 100 of the cryſtallized ſalt.

644 Bergman's method of finding the ingredients and their proportions.

645 Difficulty in obtaining the pure earth of alum.

646 Proportions of ingredients according to Mr Bergman.

It has been a queſtion among chemiſts, whether the earth of alum is to be conſidered as a pure clay or not. The ſalt was extracted from common clay by Meſſrs Hellot and Geoffroy. The experiment was repeated with ſucceſs by Mr Pott; but he ſeemed to conſider it rather as the production of a new ſubſtance during the operation, than a combination of any principle already exiſting with the vitriolic acid. Margraaf, however, from ſome very accurate experiments, demonſtrated, that all kinds of clay conſiſt of two principles mechanically mixed: one of which conſtantly is the pure earth of alum. This opinion is eſpouſed by Bergman; who concludes, that ſince an equal quantity of it may be extracted from clay by all the acids, it can only be mixed with theſe clays; for if it was generated by the menſtrua during the operation, it muſt be procured in different quantities, if not of different qualities alſo, according to the difference of the ſolvents made uſe of. Notwithſtanding this, the matter ſeems to be rendered ſomewhat obſcure by an experiment of Dr Lewis. "Powdered tobacco-pipe clay (ſays he) being boiled in a conſiderable quantity of oil of vitriol, and the boiling continued to dryneſs, the matter when cold diſcovers very little taſte, or only a ſlight acidulous one. Expoſed to the air for a few days, the greateſt part of it was changed into lanuginous effloreſcences taſting exactly like alum. The remainder, treated with freſh oil of vitriol, in the ſame manner exhibits the ſame phenomena till nearly the whole of the clay is converted into an aſtringent ſalt." Hence he concludes, that the clay is in ſome degree changed before the aluminous ſalt is produced. Without this ſuppoſition, indeed, it is difficult to ſee why the ſalt ſhould not be produced immediately by the combination of the two principles. An hundred parts of cryſtallized alum requires, according to Mr Bergman, in a mean heat 1412 parts of diſtilled water, but in a boiling heat only 75 of the ſame parts for its ſolution. The ſpecific gravity of alum, when computed from the increaſe of bulk in its ſolution, is 2.071 when the air-bubbles are abſtracted; but if they are ſuffered to remain, it is no more than 1.757. Theſe bubbles conſiſt of aerial acid, but cannot be removed by the air-pump, though they fly off on the application of heat.

647 Whether the earth of alum be a pure clay or not.

648 Component parts of all kinds of clay inveſtigated by Margraaf.

649 Lewis's experiment, tending to ſhow that clay undergoes ſome change in being converted into earth of alum.

650 Solubility of alum in warm and in cold water.

651 Bergman's account of the Swediſh ores of alum.

The ores from which alum is prepared for ſale, according to Mr Bergman, are of two kinds: one containing the alum already formed, the other its principles united by roaſting. What he calls the aluminous ſchiſt, is nothing but an argillaceous ſchiſt impregnated with a dried petroleum, from whence the oil is eaſily extracted by diſtillation; but by applying proper menſtrua it diſcovers ſeveral other ingredients, particularly an argillaceous martial ſubſtance, frequently amounting to $\frac{3}{4}$ of the whole; a ſiliceous matter amounting to $\frac{1}{6}$; and commonly alſo a ſmall proportion of calcareous earth and magneſia; the reſt being all pyritous. By roaſting this ore the bituminous part is deſtroyed and the pyrites decompoſed; on which part of the vitriolic acid adheres to the iron of the pyrites, and the reſt to the pure clay of the ſchiſt, forming green vitriol with the former, and alum with the latter. If any calcareous earth or magneſia are preſent, gypſum and Epſom ſalt will be produced at the ſame time. No ſalt is obtained by

652 Component parts of the aluminous ſchiſt.

653 How changed by roaſting.

654 The preſence of pyrites only neceſſary for the production of alum.

by lixiviating this ſchiſt before calcination, though Mr Bergman thinks nothing more is neceſſary for the production of the ſalt but the preſence of a pyrites. This, he tells us, is generally diſperſed through the maſs in form of very minute particles, though it ſometimes appears in ſmall nuclei. The goodneſs of the ore, therefore, depends on the proper proportion of the pyrites to the clay, and its equal diſtribution through the whole. The moſt denſe and ponderous is moſt eſteemed, while that which contains ſo much pyrites as to be viſible is rejected as having too much iron. The ore which produces leſs than four pounds of alum from 100 of the ore does not pay the expence of manufacturing in Sweden. Sometimes this kind of ore produces ſalts without the application of fire; but this muſt be attributed to a kind of ſpontaneous calcination.

655 Ores containing alum ready formed, only to be met with in volcanic countries.

That ſpecies of ore which contains the principles already united into alum, according to Mr Bergman, is to be met with only in volcanic countries; and of this kind are the principal Italian ores of alum, particularly that employed at Tolfa near Cincelles, for boiling the Roman alum. Mr Monnet, however, is of opinion, that even this ore does not contain alum perfectly formed, but a combination of nearly equal parts of clay and ſulphur, which by expoſure to air during calcination, is converted into alum. He found a little martial earth alſo contained in it, to which he aſcribes the reddiſh colour of that alum. The aluminous ore at Solfatara in Italy conſiſts of old lava whitened by the phlogiſticated vitriolic acid. The clay thus becomes a component part of the aluminous ſalt, and the maſs effloreſces in the ſame manner, and for the ſame reaſon, as the maſs left after boiling tobacco-pipe clay in oil of vitriol mentioned by Dr Lewis. Mr Bergman, who examined this ore, found, that 100 pounds of it contained eight of pure alum, beſides four of pure clay; and that the remainder was ſiliceous. This proportion, however, muſt be very variable, according to the quantity of rain which falls upon the ore.

656 Aluminous ore at Solfatara in Italy.

657 Analyzed by Mr Bergman.

658 Aluminous ores in Haſſia, Bohemia, and Scania.

A variety of aluminous ores are to be met with in different parts of the world. In Haſſia and Bohemia this ſalt is obtained from wood impregnated with bitumen. At Helſingborg in Scania, a turf is found conſiſting of the roots of vegetables mixed with nuts, ſtraw, and leaves, often covered with a thin pyritous cuticle, which, when elixated, yields alum: Even the ſulphureous pyrites is generally mixed with an argillaceous matter, which may be ſeparated by menſtrua. In ſome places, ſulphur, vitriol, and alum are extracted from the ſame material. The ſulphur riſes by diſtillation; the reſiduum is expoſed to the air till it effloreſces, after which a green vitriol is obtained by lixiviation, and alum from the ſame liquor, after no more vitriol will cryſtallize. The *alum ſlate*, from which ſalt is made near York in England, contains a conſiderable quantity of ſulphur; and therefore produces alum on the principles already mentioned.

659 Alum, ſulphur, and vitriol extracted from the ſame ore.

660 Alum ſlate found at York in England.

661 Bergman's directions for the preparation of alum.

Mr Bergman has given very particular directions for the preparation of this ſalt from its ores, and minutely deſcribes the ſeveral operations which they muſt undergo. Theſe are.

662 Uſe of roaſting the ore.

1. ROASTING. This is abſolutely neceſſary in order to deſtroy the pyrites; for on this the formation of the alum entirely depends; as the ſulphur of the pyrites will not part with its phlogiſton without a burning heat in the open air. By long expoſure to the air, indeed, the ſame effect will follow; but unleſs the ore be of a particular kind, and looſe in texture, ſo that the air can freely pervade it, the proceſs we ſpeak of cannot take place. The hard ores, therefore, cannot be treated in this manner; and the earthy ores are not only unfit for ſpontaneous calcination, but for roaſting alſo, as they will not allow the air to pervade them and extinguiſh the fire. Such as are capable of ſpontaneous calcination, ſhould be ſupplied with ſome quantity of water, and laid on a hard clay bottom, as directed for making green vitriol. The roaſting is performed in Sweden in the following manner. Small pieces of the ore are ſtrewed upon a layer of burning ſticks to the thickneſs of half a foot. When the ſticks are conſumed, theſe are covered, nearly to the ſame thickneſs, with pieces burned before and four times lixiviated: Thus ſtrata are alternately laid of ſuch a thickneſs, and at ſuch intervals of time, that the fire may continue, and the whole maſs grow hot and ſmoke, but not break out into flame. The upper ſtrata may ſometimes be increaſed to a double thickneſs on account of the long continuance of the fire. When eight ſtrata are laid, another row is placed contiguous to the former; when this is finiſhed, a third; and ſo on until the heap be of a proper ſize, which rarely requires more than three rows. When the ore is once roaſted, it ſtill contains ſo much phlogiſton that water acts but little upon it; but after the operation is two or three times repeated, the ore yields its principles more freely: the roaſting may even be repeated to advantage till the whole be reduced to powder. The bitumen keeps up the fire; for which reaſon alternate layers of the crude ore are uſed; and in rainy weather theſe layers of unburnt ore ſhould be thicker. An heap, 20 feet broad at the baſe, two feet at the top, and conſiſting of 26 rows, is finiſhed in three weeks, but requires two or three months to be well burned, and three weeks to cool. The greater pyritous nuclei explode like bombs. In this proceſs the ſulphur of the pyrites is ſlowly conſumed, and the phlogiſticated acid penetrating the maſs, is fixed; after which the remaining phlogiſton is gradually diſſipated. The chief art conſiſts in moderating the heat in ſuch a manner as to avoid with ſafety the two extremes; for too ſmall a fire would not be capable of forming the ſalt, while a heat too ſtrong would deſtroy it by melting the ore. The ſcoria are inſoluble in water, and therefore thrown away as uſeleſs. They are produced by violent winds, or by a ſtrong heat too much cloſed up; for it is neceſſary to make holes in the red ſtrata, that the fire may reach the back ſtratum which is to be laid on. Another method of burning was invented by the celebrated Rinman, and is practiſed at a place called *Garphyttan* in Sweden. There the ore itſelf is ſet on fire; and after burning is boiled, and yields alum in the ſame manner as the former. The heaps are formed in the following manner: Firſt the ſchiſt, burning from the furnace, is laid to the depth of four feet; if the fire be ſlow, then wood is added; after that a thin ſtratum of elixated ſchiſt; the third conſiſts of ſchiſt not burned; and the fourth of elixated ſchiſt a foot and a half thick; after that the burning ſchiſt, and ſo on. This method, however, is attended with ſome inconveniences. The vitriolic acid is partly diſſipated by the fire, and thus

663 Expoſure to the air has ſometimes the ſame effect.

664 Earthy ores unfit for both operations.

665 Method of roaſting the ore in Sweden.

666 How often the operation is to be repeated.

667 Danger of raiſing the heat too much.

668 Rinman's method of burning the ore at Garphyttan.

the quantity of alum is diminiſhed: ſo much ſchiſt alſo is requiſite in this method that it cannot all be elixated; and thus the heap muſt be perpetually increaſing. The hard ores containing bitumen, ſuch as thoſe of Tolfa, are burned upon wood for ſome hours like limeſtone, until they become pervious to water, and effloreſce. The fire is extinguiſhed as ſoon as the flame becomes white, and the ſmell of ſulphureous acid begins to be perceived. When the ore cools, thoſe particles which were neareſt to the fire are placed outermoſt, and thoſe which had been outermoſt within, the fire being again lighted. The ore is ſufficiently burned when it can be broken with the hands. It is then heaped up near certain trenches, and watered five times a-day, particularly when the ſun ſhines clear; the operation being deſtroyed by a continued rain and cloudy ſky. In ſome places the ore is firſt burned and afterwards elixated; neither is there any way of knowing the proper methods of managing it but by experiment.

699 Method of burning the hard ores at Tolfa in Italy.

670 Method of elixating the burned ore at Garphyttan with cold water.

2. Elixation. This is performed in ſome places with hot, and at others with cold, water. At Garphyttan in Sweden, where the latter method is choſen, the receptacles, in the year 1772, were of hewn ſtone, having their joints united by ſome cement capable of reſiſting the liquor. Every ſet conſiſted of four ſquare receptacles diſpoſed round a fifth, which was deeper than the reſt. The firſt receptacle is filled with roaſted ſchiſt, and the ore lies in water for 24 hours; the water is then drawn off by a pipe into the fifth; from thence into the ſecond, containing ſchiſt not yet waſhed; from that in like manner, after 24 hours, through the fifth into the third, and ſo into the fourth The lixivium is then conveyed to the fifth, and allowed to ſtand in it; and laſtly is drawn off into a veſſel appropriated for its reception.—In other places the water paſſes over the ſchiſt that has been waſhed three times for ſix hours; then that which has been twice waſhed, next what has been once waſhed, and laſtly, the ore which has been newly roaſted. Thoſe who ſuperintend the alum manufactories are of opinion that the alum is deſtroyed by paſſing the water firſt over the newly burnt ore, and then over that which has been previouſly elixated.

671 Other methods.

672 Singular circumſtance by which the alum may be deſtroyed.

673 Of the proper ſtrength of the lixivium before boiling.

The lixivium, before boiling, ought to be as richly impregnated with alum as poſſible, in order to ſave fuel, though this is frequently neglected. In ſome places the taſte is uſed as the only criterion; but in others the weight of water which fills a ſmall glaſs bottle is divided into 64 equal parts, each of which is called in Sweden a *panning*; and the quantity by which the ſame bottle, full of lixivium, exceeds it when filled with water, is ſuppoſed to indicate the quantity of ſalt diſſolved.—This method may undoubtedly be reckoned ſufficiently accurate for work conducted on a large ſcale: and though Mr Bergman gives formulae by which the matter may be determined to a ſcrupulous exactneſs, it does not appear that ſuch accuracy is either neceſſary or indeed practicable in works conducted in a great way.

Thoſe who manage the alum manufactories aſſert, that the cold lixivium ought to be made no richer than when the weight of the bottle filled with lixivium exceeds it when filled with water by $4\frac{1}{5}$ pannings, which ſhows the water to be loaded with $\frac{1}{3.7}$ of its weight of alum. If the overplus amounts to ſix pannings, which indicates its containing $\frac{1}{5.4}$ of ſalt, cryſtals are then depoſited.—Congelation is of no uſe to concentrate the aluminous lixivium; for water ſaturated with alum freezes almoſt as readily as pure water.

674 Conſtruction of the evaporating veſſel.

3. Boiling the ley for chrystallization. The ley being firſt brought from the pits through canals made for the purpoſe, is put into a leaden boiler, at the back of which is a reſervoir, out of which the loſs ſuſtained by evaporation is conſtantly ſupplied, ſo that the ſurface of that in the boiler continues always nearly at the ſame height. Various ſigns are uſed by different manufacturers to know when the ley is properly evaporated: ſome determining the matter by the floating of a new laid egg; others by dropping a ſmall quantity on a plate, and obſerving whether it cryſtallizes on cooling; and laſtly, others weigh the lixivium in the bottle abovementioned. The boiling is ſuppoſed to be finiſhed if the increaſe of weight be equal to 10 pannings; that is, if the water be loaded with $\frac{1}{1.69}$ of its own weight. It might, however, take up above $\frac{1}{3}$ of its weight, or nearly 27 pannings; but as it has to be depurated by ſtanding quiet before the cryſtals are formed, the liquor muſt not be fully ſaturated with ſalt.

675 Proper ſtrength of the evaporated liquor.

676 Of the firſt cryſtallization.

The lixivium, when ſufficiently concentrated by evaporation, flows through proper channels into coolers, where it is allowed to reſt for about an hour to free it from the groſſer ſediment; after which it is put into wooden or ſtone receptacles to cryſtallize. In eight or ten days the remaining liquor, commonly called *mother ley*, or *magiſtral water*, is let off into another veſſel. A great number of cryſtals, generally ſmall and impure, adhere to the bottom and ſides of the veſſel, which are afterwards collected and waſhed in cold water.

677 Depuration of the cryſtals.

When a ſufficient quantity of the ſmall cryſtals are collected, thy muſt then be put into the boiler for depuration. They are now diſſolved in as ſmall a quantity of water as poſſible; after which the lixivium is poured into a great tub containing as much as the boiler itſelf. In 61 or 81 days the hoops of the tub are looſed, and the aluminous maſs bound with an iron ring; and in 28 days more the reſiduum of the ſolution is let out through a hole, and collected in a trench; after which the ſaline maſs, which at Garphyttan in Sweden amounts to 26 tons, is dried and ſold as depurated alum. The boiler emptied for the firſt cryſtallization is next filled two-thirds full with the magiſtral lixivium; and as ſoon as the liquor arrives at the boiling point, the other third is filled with crude lixivium, with which the evaporation is alſo conſtantly ſupplied. A certain quantity of the aluminous impurities left by waſhing the ſalts of the firſt cryſtallization in water is then added, and the above deſcribed proceſs repeated. Only the firſt boiling in the ſpring is performed with the crude lixivium alone, the reſt are all done as juſt now related.—Mr Bergman remarks, that the time required for cryſtallization may undoubtedly be ſhortened. The reſervoirs uſed in Sweden for this purpoſe (he ſays), are deep and narrow at the top; on which account they are not only long

678 Bergman's remarks on the proper form of the coolers.

long in cooling, but the evaporation, which is abſolutely neceſſary for the cryſtallization, goes on very ſlowly, excepting in extremely warm weather, at the ſame time that the doors and windows are diſpoſed in ſuch a manner as to direct a current of air along the ſurface. In Italy he tells us that conical reſervoirs are uſed with the wide part uppermoſt.

679
Alum cannot be formed by merely evaporating and cooling the ley, on account of the exceſs of acid.

It is remarkable, that pure alum cannot be obtained in very conſiderable quantity by merely evaporating and cooling the ley. The reaſon of this is, that the lixivium ſometimes acquires ſuch a conſiſtence, that it both cryſtallizes with difficulty, and produces impure cryſtals. The cauſe was unknown till the time of Mr Bergman, who has ſhown that it proceeds from an exceſs of vitriolic acid. Hence alſo we may ſee the reaſon why alkaline ſalts, volatile alkali in its pure ſtate, or even putrefied urine, when added to this thick ſolution, produce good cryſtals of alum when they cannot be obtained otherwiſe.

680
This exceſs cannot be removed by mineral alkali, though it may be by vegetable and volatile alkalies, and beſt of all by pure clay.

It is remarkable that this impediment to cryſtallization is not removed by mineral alkali, though it is ſo by the vegetable and volatile alkalies, which is a phenomenon hitherto unexplained. According to our author, however, an addition of pure clay, to abſorb the ſuperabundant acid, is preferable to any other; and indeed it is reaſonable to think ſo, as the union of vitriolic acid and pure clay forms the ſalt deſired, which is not the caſe with any of the alkalies. To aſcertain this, he made the following experiments.

681
Experiment ſhowing that an exceſs of vitriolic acid impedes the cryſtallization of alum.

1. He diſſolved 215 grains of pure alum in diſtilled water, in a ſmall cucurbit, and evaporated it over the fire till the ſurface of the liquor ſtood at two marks, which indicated, in a former evaporation, that it was fit for cryſtallization. 2. Having poured out this into a proper glaſs veſſel, he diſſolved other 215 grains, and added to the ſolution 24¼ grains of concentrated vitriolic acid. 3. This ſolution being likewiſe poured out, the experiment was repeated a third time, with the addition of 53 grains of vitriolic acid; and the glaſſes being at laſt ſet in a proper place for cryſtallization, the firſt yielded 155¾, the ſecond 130, and the third 100¼ grains of alum.

682
Experiment to determine the uſefulneſs of adding clay to the ley.

This ſhows that an exceſs of vitriolic acid impedes the cryſtallization of the alum; but to determine how far this could be remedied by the addition of clay, farther experiments were neceſſary. Having therefore employed a magiſtral reſiduum, in which the exceſs of acid was nearly in the proportion already related, he added two drachms of clay in fine powder to a kanne, or Swediſh cantharus, of the liquor: he boiled the mixture for ten minutes; and on ſeparating the clay that remained, he found that 25½ grains were diſſolved, which indicates an increaſe of 141 grains of alum. On gently boiling the liquor for half an hour, 75 grains of the clay were diſſolved, which indicated an increaſe of 416 grains of alum.

683
Advantages of uſing clay rather than alkalies.

The addition of clay muſt therefore be much preferable to that of alkaline ſalts, not only as the former produces a conſiderable increaſe of alum, but alſo as there is no danger of adding too much; for we have already ſhown, that when the liquor is entirely deprived of its ſuperabundant acid, the neutrallized clay is inſoluble in water. The earth itſelf, however, diſſolves ſo ſlowly, that there is not the leaſt danger of the acid being overſaturated by ſimply boiling them together.

684
Alum generally contaminated by dephlogiſticated vitriol.

Alum, as commonly made, though depurated by a ſecond cryſtallization, yet is almoſt always found contaminated by dephlogiſticated vitriol; whence it grows yellow, and depoſits an ochre in ſolution when old. This is equally uſeful in ſome arts with the pureſt kind, and is even ſo in dyeing where dark colours are required; but where the more lively colours are wanted, every thing vitriolic muſt be avoided. This is done by the addition of pure clay, which precipitates the iron, and produces an alum entirely void of any noxious or heterogeneous matter.

685
This defect remedied by the addition of pure clay.

Nor is this contrary to the laws of chemical attraction; for though iron is diſſolved by a ſolution of alum, and the earthy baſe of alum precipitated, and though in a ſolution of vitriol and alum the white earth falls firſt on an addition of alkali, and then the ochre; this happens only in conſequence of employing phlogiſticated or metallic iron, or ſuch as is but very little dephlogiſticated; for if the inflammable principle be any further diminiſhed, the attraction is thereby ſo much weakened, that the clay has a greater attraction for the vitriolic acid than the iron. The truth of this may be proved in many different ways. Thus, let a portion of alum be diſſolved in a ſolution of highly dephlogiſticated vitriol, and an alkali then added, the ochre of the vitriol will be firſt depoſited and then the clay: and provided there be a ſufficient quantity of the latter, the iron will all be precipitated; and hence we ſee that an aluminous ſolution mixed only with one of dephlogiſticaeated vitriol may readily be freed from it

686
Perfect vitriol cannot be deſtroyed by clay.

But a ſolution of alum containing perfect vitriol cannot be freed from it effectually either by clay or alkali; for the former effects no decompoſition, and the latter, although it can deſtroy the vitriol, will undoubtedly decompoſe the alum in the firſt place. As long, therefore, as the ſolution is rich in alum, in may be employed in the common manner; but when the vitriolic ſalt begins to predominate, it muſt either be cryſtallized in its proper form, or be deſtroyed in ſuch a manner as to produce alum, which may be accompliſhed in the following manner.

687
How the phlogiſton may be abſtracted from the vitriol.

Let the lixivium be reduced to a tenacious maſs with clay, and formed into cakes, which muſt be expoſed in an houſe to the open air. Thus the phlogiſton, which is powerfully attracted by the dephlogiſticated part of the atmoſphere, by degrees ſeparates from the iron, while the clay is taken up by its ſuperior attraction for the acid. The calcination is accelerated by fire; but it muſt be cautiouſly employed, leſt the acid ſhould be expelled.

688
Epſom ſalt may be produced from the mother liquor.

In the alum manufactories in Sweden, a conſiderable quantity of vitriolated magneſia, or Epſom ſalt, is mixed with the alum. Mr Bergman directs this to be ſeparated by means of an uncalcined calcareous earth, which entirely deſtroys both the alum and vitriol; falling down to the bottom with the acid in form of a ſelenitic matter. This muſt be added to the boiling liquor gradually, leſt the effervеſcence ſhould cauſe the maſs to ſwell and run over the top of the veſſel. A juſt proportion deſtroys both the aluminous and vitriolic ſalt, on being properly agitated and heated; neither is there any danger of the Epſom ſalt being decompoſed in this proceſs, the uncalcined earth being unable to ſeparate the magneſia from the acid. Were this method followed in the Swediſh manufactories, he is of opinion, that as much Epſom ſalt might be produced from them as would ſupply the conſumpt of that kingdom.

689 Superfluous acid might be advantageouſly diſtilled.

With regard to the quantity of ſuperfluous acid found in the magiſtral lixivium, Mr Bergman informs us, that it amounted to five ounces in one kanne; ſo that in a ſingle boiler there is nearly 250 lb. But vitriol, when well dephlogiſticated, retains its acid ſo looſely that it may eaſily be ſeparated by fire. He has no doubt, therefore, that if the ſurface of ſuch a lixivium were firſt increaſed in order to let the phlogiſton evaporate, the liquor might afterwards be advantageouſly committed to diſtillation for the ſake of its acid.

From what has been above delivered the neceſſity will be ſufficiently apparent of not continuing the coction even with pure clay to perfect ſaturation of the liquor: and this is further confirmed by M. Beaumé, who relates, that having boiled four ounces of earth of alum with two ounces of the ſalt, in a ſufficient quantity of water, the acid became ſaturated to ſuch a degree with earth, that the liquor loſt its aluminous taſte entirely, and aſſumed that of hard ſpring water. After filtration and evaporation, only a few micaceous cryſtals, very difficult of ſolution, were formed by letting the liquor ſtand for ſome months.—Dr Sieffert informs us, that by boiling half an ounce of alum with half a drachm of ſlaked lime, cubical cryſtals of alum may be obtained.

690 Epſom ſalt.

V. *With Magneſia.* The earthy ſubſtance called *magneſia alba* is never found by itſelf, and conſequently this combination cannot originally take place by art. The vitriolic acid, however, is found combined with magneſia in great plenty in the bitter liquor which remains after the cryſtallization of common ſalt; from whence the magneſia is procured by precipitating with a fixed alkali. If this liquor, which, when the common ſalt is extracted, appears like clean oil of vitriol, is ſet by for ſome time in a leaden veſſel, a large quantity of ſalt ſhoots, very much reſembling Glauber's ſal mirabile. This ſalt is in many places ſold inſtead of the true Glauber's ſalt; and is preferred to it, becauſe the true ſal mirabile calcines in dry air, which the ſpurious kind does not. If after the firſt cryſtallization of the bittern, the remainder is gently evaporated farther, a freſh quantity of Glauber's ſalt will ſhoot; and if the liquor is then haſtily evaporated, a ſalt will ſtill be cryſtallized; but inſtead of large regular cryſtals, it will concrete into very ſmall ones, having ſomething of the appearance of ſnow when taken out of the liquid. Theſe ſalts are eſſentially the ſame, and are all uſed in medicine as purgatives. The ſalt ſhot into ſmall cryſtals is termed *Epſom ſalt,* from its being firſt produced from the purging waters at Epſom in England. The bittern affording this kind of ſalt in ſuch great plenty, theſe waters were ſoon neglected, as they yielded it but very ſparingly, and the quantity prepared from them was inſufficient for the demand. Neumann ſays, that having inſpiſſated 100 quarts of Epſom water, he ſcarce obtained half an ounce of ſaline matter.—According to Mr Scheele's experiments, if a ſolution of Epſom and common ſalt be mixed together, a double decompoſition enſues, and the mixture contains Glauber's ſalt and a combination of magneſia with marine acid. From this lixivium the Glauber's ſalt may be cryſtallized in winter, but not in ſummer; a great degree of cold being neceſſary for this purpoſe. From twelve pounds of Epſom ſalt and ſix of common ſalt, Mr Scheele obtained, in a temperature three degrees below the freezing point, ſix pounds of Glauber ſalt; but in a degree of cold conſiderably greater, the produce was ſeven pounds and three quarters.

691 With ſilver.

VI. *With Silver.* Oil of vitriol boiled on half its weight of ſilver-filings, corrodes them into a ſaline maſs. This ſubſtance is not uſed in medicine nor in the arts. The only remarkable property of it is, that it has a very ſtrong attraction for mercury; coagulating and hardening as much quickſilver as the acid weighed at firſt. If the hard concrete be diluted with freſh acid, it melts eaſily in the fire, and does not part with the mercury in the greateſt heat that glaſs veſſels can ſuſtain. The vitriolic acid, by itſelf, ſtrongly retains mercury, but not near ſo much as when combined with ſilver.

Silver thus corroded by the vitriolic acid, or precipitated by it from the nitrous, may in great part be diſſolved, by cautiouſly applying a very little water at a time; and more effectually by boiling in freſh oil of vitriol.

692 Copper.

VII. *With Copper.* With this metal the vitriolic acid cannot be combined, unleſs in its concentrated ſtate, and ſtrongly heated. If pure oil of vitriol is boiled on copper filings, or ſmall pieces of the metal, it diſſolves it into a liquor of a deep blue colour, which eaſily cryſtallizes. The cryſtals are of a beautiful blue colour, and are ſold under the name of *blue vitriol,* or *Roman vitriol.*

693 Blue vitriol, how made.

Where ſulphur is found in great plenty, however, Roman vitriol is made by ſtratifying thin plates of copper with ſulphur; and upon ſlowly burning the ſulphur, its acid corrodes the copper. The metal is then to be boiled in water, that the ſaline part may be diſſolved. The operation is to be repeated till all the copper is conſumed; and all the ſaline liquors are to be evaporated together to the cryſtallizing point. By this method, however, a great part of the acid is loſt; and in Britain, where the ſulphur muſt be imported, we ſhould think the pure acid preferable for thoſe who prepare blue vitriol.

694 Phenomena on diſtillation.

This ſalt, on being expoſed to the fire, firſt turns white, then of a yellowiſh red colour. On urging it with a ſtrong fire, the acid ſlowly exhales, and a dark red calx of copper remains. The whole of the vitriolic acid cannot be expelled from copper by heat: as much of it ſtill remains as to render a part of the metal ſoluble in water. After this ſoluble part has been extracted, a little acid is ſtill retained amounting to about $\frac{1}{4}$ of the calx.

695 Uſes.

Vitriol of copper is employed in medicine as a cauſtic, in which reſpect it is very uſeful; but when uſed internally, is dangerous, as indeed all the preparations of copper are found to be. It has, nevertheleſs, according

cording to Neumann, been recommended in all kinds of intermittents, and the lepra. The ſmalleſt portion, he ſays, occaſions a ſickneſs and nauſea; a ſomewhat larger, reaching and violent vomitings, accompanied often with convulſions. If the quantity taken has been conſiderable, and is not ſoon diſcharged by vomiting, the ſtomach and inteſtines are corroded, intenſe pains, inflammations, and death, ſucceed.

696 Iron.

VIII. *With Iron.* The vitriolic acid does not act upon this metal till conſiderably diluted. Common oil of vitriol requires to be mixed with ten or twelve times its quantity of water before it will act briſkly on the metal. In this ſtate it efferveſces violently with iron filings, or ſmall bits of the metal, and a great quantity of inflammable vapour is diſcharged (ſee Air). The liquor aſſumes a fine green colour; and by evaporation and ſlow coolings, very beautiful rhomboidal cryſtals are formed. Theſe are named *ſalt of ſteel*, and are uſed in medicine; but for the ſalt made of the pure acid and iron, the common copperas, made with the impure acid extracted from pyrites, is commonly ſubſtituted. This is generally eſteemed a venial fraud, and no doubt is ſo in medicinal reſpects; but when it is conſidered, that, by this ſubſtitution, common copperas is impoſed on the ignorant, at the price of 2 *s per* pound, the affair appears in a different light.

697 Salt of Steel

698 Precipitation of iron from the vitriolic acid.

Pure vitriol of iron is originally of a much more beautiful appearance than common copperas, and retains its colour much better; the reaſon of which is, that the ſalt thus prepared has more phlogiſton than the copperas. If either of the kinds, however, are expoſed to the air for a ſufficient length of time, part of the acid is diſſipated, and the vitriol becomes yellowiſh or browniſh. If the ſalt is now diſſolved in water, a brown precipitate falls, which is part of the iron in a calcined ſtate. If the liquor is ſeparated from this precipitate by filtration, a ſimilar one forms in a ſhort time, and by long ſtanding a conſiderable quantity ſubſides. According to Dr Lewis, the precipitation is greatly expedited by a boiling heat; by which more of the metal ſeparates in a few minutes than by ſtanding without heat for a twelvemonth. This change takes place in no other metallic ſolutions.

699 Yellow for houſe painting.

The calx of iron, precipitated by quicklime from green vitriol, appears, when dry of a yellow colour; and it is recommended in the Swediſh tranſactions, inſtead of yellow ochre, as a colour for houſe-painting.

700 Preſervative for wood.

Solutions of green vitriol are alſo recommended for preſerving wood, particularly the wheels of carriages, from decay. When all the pieces are fit for being joined together, they are directed to be boiled in a ſolution of vitriol for three or four hours; and then kept in a warm place for ſome days to dry. By this preparation, it is ſaid, wood becomes ſo hard, that moiſture cannot penetrate it; and that iron nails are not ſo apt to ruſt in this vitriolated wood as might be expected, but laſt as long as the wood itſelf.

701. Tin.

IX. *With Tin.* This metal cannot be diſſolved in the vitriolic acid, but in the ſame manner as ſilver; namely, by boiling concentrated oil of vitriol to dryneſs upon filings of the metal. The ſaline maſs may then be diſſolved in water, and the ſolution will cryſtallize. The ſalt, however, formed by this union, is not applied to any uſeful purpoſe. A ſalt of tin, indeed, formed by the union of vitriolic acid with this metal, has been recommended for ſome medical purpoſes, and proceſſes are given for it in the diſpenſatories; but they have never come much into practice.

702 Lead.

X. *With Lead.* While lead is in its metallic ſtate, the vitriolic acid acts very little upon it, either in a diluted or concentrated ſtate; but if the metal is diſſolved in any other acid, and oil of vitriol added, a precipitation immediately enſues, which is occaſioned by the combination of vitriolic acid with the lead. This precipitate will be more or leſs white as the metal is more or leſs deprived of its phlogiſton by calcination before ſolution. If a little ſtrong ſpirit of nitre is poured upon *litharge*, which is lead calcined to the greateſt degree poſſible without vitrification, the acid unites itſelf to the metal with conſiderable efferveſcence and heat. Some water being now poured on, and the phial containing the mixture ſhaken, a turbid ſolution of the litharge is made. If a little oil of vitriol is then added, it throws down a beautifully white precipitate; and the acid of nitre, being left at liberty to act upon the remaining part of the litharge, begins anew to diſſolve it with efferveſcence. When it is again ſaturated, more oil of vitriol is to be dropped in, and a white precipitate is again thrown down. If any of the litharge is ſtill undiſſolved, the nitrous acid, being ſet at liberty a ſecond time, attacks it as at firſt; and by continuing to add oil of vitriol, the whole of the litharge may be converted into a moſt beautiful and durable white. Unfortunately this colour cannot be uſed in oil, though in water it ſeems ſuperior to any. If the proceſs is well managed, an ounce of ſpirit of nitre may be made to convert ſeveral pounds of litharge into a white of this kind.

703 A beautiful white colour.

704 Quickſilver.

XI. *With Quickſilver.* The diſſolution of quickſilver in vitriolic acid cannot be performed but by a concentrated oil and ſtrong boiling heat. The metal is firſt corroded into a white calx, which may afterwards be eaſily diſſolved by an addition of freſh acid. Every time it is diſſolved, the mercury becomes more and more fixed and more difficult to dry. If the exſiccation and diſſolution has been repeated ſeveral times, the matter becomes at laſt ſo fixed as to bear a degree of red heat. This combination is the baſis of a medicine formerly of ſome repute, under the name of *turbith mineral*. The proceſs for making turbith mineral is given by the author of the Chemical Dictionary as follows.

705 Turbith mineral.

“Some mercury is poured into a glaſs retort, and upon it an equal quantity of concentrated oil of vitriol, or more, according to the ſtrength of the acid. Theſe matters are to be diſtilled together, in the heat of a ſand-bath, till nothing remains in the retort but a dry ſaline maſs, which is a combination of the vitriolic acid and mercury. The acid which paſſes into the receiver is very ſuffocating and ſulphureous; which qualities it receives from the phlogiſton of the mercury. The white ſaline maſs which is left at the bottom of the retort is to be put into a large veſſel; and upon it are to be poured large quantities of hot water at ſeveral different times. The water weakens the acid, and takes it from the mercury; which is then precipitated towards the bottom of the veſſel, in form of a very ſhining yellow powder. The water with which it is waſhed contains the acid that was united with the mercury, and likewiſe a little mercury rendered ſoluble by means of the very large quantity of acid

Moſt chemiſts have believed, that a portion of vitriolic acid remains united with the turbith mineral, only too little to render it ſoluble in water. But Mr Beaumé, having examined this matter, affirms, that turbith mineral contains no acid, when it has been ſufficiently waſhed; and that, by frequently boiling this preparation in a large quantity of diſtilled water, not a veſtige of acid will adhere to it."

706 Dr Lewis's directions. Dr Lewis, who is of opinion that the whole of this mercurial calx is ſoluble in a very large quantity of water, deſires the water with which it is waſhed to be impregnated with ſome alkaline ſalt; which makes the yield of turbith greater than when pure water is uſed. The author of the Chemical Dictionary alſo obſerves, that the precipitate remains white till well freed from the acid; and the more perfectly it is waſhed, the deeper yellow colour it acquires.

707 Zinc. XII. *With Zinc.* This ſemimetal is not acted upon by the vitriolic acid in its concentrated ſtate; but, when diluted, is diſſolved by it with effervеſcence, and with the extrication of an inflammable vapour in the ſame manner as iron. Neumann obſerves, that, during the diſſolution, a grey and blackiſh ſpongy matter fell to the bottom; but, on ſtanding for ſome days, was taken up, and diſſolved in the liquor, nothing being left but a little yellowiſh duſt ſcarcely worth mentioning. Six parts of oil of vitriol, diluted with an equal quantity of water, diſſolves one part of zinc.

708 White vitriol. The product of this combination is *white vitriol;* which is uſed in medicine as an ophthalmic, and in painting for making oil-colours dry quickly: what is uſed for this purpoſe, however, is not made in Britain, but comes from Germany. It is made at Goſlar by the following proceſs. An ore containing lead and ſilver, having been previouſly roaſted for the obtaining of ſuphur (ſee METALLURGY), is lixiviated with water, and afterwards evaporated in leaden boilers, as for the preparation of green vitriol: but here a regular cryſtallization is prevented; for when the ſalt has aſſumed any kind of cryſtalline form, theſe cryſtals are made to undergo the watery fuſion in copper caldrons. It is then kept conſtantly ſtirring till a conſiderable part of the moiſture is evaporated, and the matter has acquired the conſiſtence of fine ſugar. White vitriol generally contains ſome ferruginous matter, from which it may be entirely freed by ſome freſh zinc; for this ſemimetal precipitates from the vitriolic acid all other metallic ſubſtances; but notwithſtanding this ſtrong attraction, the vitriolic acid is more eaſily expelled by diſtillation from white than green or blue vitriol. Towards the end of the diſtillation of white vitriol, the acid ariſes exceedingly concentrated, though ſulphureous: ſo that, if mixed with common oil of vitriol, it will heat it almoſt as much as oil of vitriol heats water.

709 Regulus of antimony. XIII. *With Regulus of Antimony.* To combine vitriolic acid with regulus of antimony, the ſame method muſt be uſed as directed for uniting it with quickſilver, for making turbith mineral, *viz.* to employ a very concentrated acid, and to diſtil in cloſe veſſels. The ſame phenomena alſo occur in this caſe as in making turbith mineral; a very ſuffocating ſulphureous acid ariſes; and as Mr Geoffroy obſerves, a true ſulphur ſublimes into the neck of the retort; a white, ſaline, tumefied, maſs remains in the veſſel; and when the veſſels are unluted, a white fume iſſues, as in the ſmoking ſpirit of libavius. See *Combinations of marine acid with tin,* infra.

710 Regulus of cobalt. XIV. *With Regulus of Cobalt.* From a combination of the vitriolic acid with cobalt, a red ſalt may be obtained. To procure it, one part of cobalt, reduced to a very fine powder, may be mixed with two or three of concentrated acid, diluting the liquor after it has been digeſted for 24 hours, and then filtering and evaporating it.

711 Arſenic. XV. *With arſenic.* Neumann relates, that powdered white arſenic being diſtilled in a retort with oil of vitriol, a tranſparent ſublimate like glaſs aroſe, which in a few days loſt its tranſparency, and became opaque like the arſenic itſelf. The arſenic remaining in the retort ſuſtained an open fire without any ſenſible alteration. The author of the Chemical Dictionary ſays, that if a concentrated vitriolic acid is diſtilled from arſenic, the acid which comes over ſmells exactly like marine acid. When the ſolution is diſtilled till no more acid ariſes, the retort is then almoſt red-hot, and no arſenic is ſublimed; but remains fuſed at the bottom of the retort; and, when cold, is found to be an heavy, compact maſs, brittle and tranſparent as cryſtal-glaſs. This kind of arſenical glaſs, expoſed to the air, ſoon loſes its tranſparency from the moiſture it attracts, which diſſolves and partly deliquiates it. This deliquium is extremely acid—By digeſting one part of arſenic with two of concentrated oil of vitriol, diluting the ſolution with water, and then filtering and evaporating, we obtain a yellowiſh ſalt which ſhoots into pyramidal, tranſparent, and ſhining cryſtals. None of the three laſt mentioned combinations have been found applicable to any uſeful purpoſe.

712 Oil. XVI. *With Oil.* The product of this combination is a thick black ſubſtance, very much reſembling balſam of ſulphur in colour and conſiſtence; to which it is ſometimes ſubſtituted. If this ſubſtance is diſtilled with a gentle heat, great part of the acid becomes volatile, and evaporates in white fumes, having a pungent ſmell reſembling that of burning ſulphur. 713 Volatile ſulphureous acid. This goes by the name of *volatile* or *ſulphureous vitriolic acid*; and a ſalt was formerly prepared from it by ſaturation with fixed alkali, which was thought to poſſeſs great virtues. From its inventor it was called the *ſulphureous ſalt of Stahl.* The moſt ſingular property of this volatile acid is, that though the vitriolic in its fixed ſtate is capable of expelling any other acid from its baſis, the volatile one is expelled by every acid, even that of vinegar. It is very difficultly condenſible, as we have already taken notice; and, when mixed with water, ſeems ſcarcely at all acid, but rather to have a bitteriſh taſte.

Several methods have been propoſed for procuring this acid from burning ſulphur, which yields it in its greateſt degree of volatility, as well as concentration; but the produce is ſo exceedingly ſmall, that none of them are worth mentioning. 714 How procured by Dr Prieſtley. Dr Prieſtley has given very good directions for obtaining the volatile vitriolic acid in the form of air. His method was, to pour, on ſome

ſome oil of vitriol contained in a phial, a very ſmall quantity of oil olive; as much as was ſufficient to cover it. He then applied the proper apparatus for the reception of air in quickſilver (ſee Air); and, holding a candle to the phial, the volatile vitriolic acid ruſhed out in great quantity. Had he received this air in water, inſtead of quickſilver, the conſequence would have been, that ſome part of it, at leaſt, would have been abſorbed by the water, and a ſulphureous acid liquor produced. This ſeems indeed almoſt the only method of procuring the ſulphureous vitriolic acid of any tolerable ſtrength; but it is never required in the form of a liquor, except for experimental purpoſes. The only uſeful-property hitherto diſcovered about this kind of acid is, that it is remarkably deſtructive of colours of all kinds; and hence the fumes of ſulphur are employed to whiten wool, &c.

715 Charcoal. XVII. *With Phlogiſton of charcoal.* If charcoal is mixed with concentrated vitriolic acid, and the mixture diſtilled, the ſame kind of acid is at firſt obtained, which comes over when oil is uſed; and towards the end, when the matter begins to grow dry, a true ſulphur ſublimes. The beſt way, however, of producing ſulphur from the vitriolic acid is by combining it, when in a perfectly dry ſtate, with the phlogiſton. By this means ſulphur may very readily be made at any time. The proceſs is generally directed to be performed in the following manner.

716 Sulphur prepared from vitriolated tartar. Reduce to fine powder any quantity of vitriolated tartar. Mingle it carefully with a 16th part of its weight of charcoal-duſt. Put the whole into a covered crucible ſet in a melting furnace. Give a heat ſufficient to melt the ſalt; and when thoroughly melted, pour it out on a flat ſtone. The vitriolated tartar and charcoal will now be converted into a ſulphureous maſs, ſimilar to a combination of alkaline ſalts with ſulphur. See *Alkaline Salts*, below.

717 Spirit of wine. XVIII. *With Spirit of wine.* The reſult of this combination is one of the moſt extraordinary phenomena in chemiſtry; being that fluid, which, for its extreme degree of volatility, was firſt diſtinguiſhed by the name of *ether*: and now, ſince a liquor of the like kind is diſcovered to be preparable from ſpirit of wine by means of other acids, this ſpecies is diſtinguiſhed by the name of *vitriolic ether*. The method of preparing this ſubtle liquor recommended by M. Beaumé, ſeems to be the beſt of any hitherto diſcovered.

718 Ether. Mix together equal parts by weight, of highly rectified ſpirit of wine and concentrated oil of vitriol, or ſomewhat more than two meaſures of ſpirit of wine with one of the acid. The mixture is to be made in a flint glaſs retort, the bottom and ſides of which are very thin, that it may not break from the heat which is ſuddenly generated by the union of theſe two ſubſtances. The ſpirit of wine is firſt put into the retort, and then the acid is poured in by a glaſs-funnel, ſo that the ſtream may be directed againſt the ſide of the glaſs; in which caſe it will not exert much of its force on the ſpirit, but will lie quietly below at the bottom. The retort is now to be very gently ſhaken, that the acid may mingle with it by little and little. When the mixture is completed, very little more heat will be neceſſary to make the liquor boil.

This mixture is to be diſtilled with as briſk and quick a heat as poſſible; for which reaſon, immediately after the acid and ſpirit are mixed, the retort ſhould be put into a ſand furnace heated as much as the mixture is. The diſtillation ſhould be continued only till about one-third of the liquor is come over; if it is continued farther, part of the vitriolic acid riſes in a ſulphureous ſtate. In the retort a thick, black, acid matter remains, which is ſimilar to a combination of oil of vitriol with any inflammable matter, and from which a little ſulphur may be obtained. Along with the ſulphureous acid, a greeniſh oil, called *oleum vitrioli dulcis*, ariſes, which has a ſmell compounded of that of the ether and ſulphureous acid: and Mr Beaumé has ſhown that it is compounded of theſe two; for if it is rectified with an alkali, to attract the acid, it is changed into ether. If, after the diſtillation of the ether, ſome water be poured into the retort, the liquor by diſtillation may be brought back to the ſtate of a pure vitriolic acid.

As the ſteams of the ethereal liquor are exceedingly volatile, and at the ſame time a quick fire is neceſſary to the ſucceſs of the operation, the receiver muſt be carefully kept cool with very cold water or with ſnow. Care muſt alſo be taken to prevent any of the ſulphureous acid ſteams from coming over; but as it is impoſſible to prevent this totally, the liquor requires rectification. This is the more neceſſary, as a part of the ſpirit of wine always riſes unchanged. From this acid the liquor is eaſily ſet free, by adding a ſmall quantity of alkaline ſalt, and re-diſtilling with a very gentle heat; but as ſpirit of wine is likewiſe very volatile, the diſtillation muſt be performed in a very tall glaſs. Dr Black recommends a matraſs, or bolt-head, with a tin-pipe adapted to the head, ſo as to convey the ſteams at a right angle, to be condenſed in the receiver. When this fluid is to be prepared in great quantities, the ether, by proper management, may be made to equal half the weight of the ſpirit of wine employed. Mr Dollfuſs has made many important experiments on this ſubject; of which the following is an abſtract: 1. Two pounds of vitriolic acid were mixed with as much of ſpirit of wine, and the mixture diſtilled with a very gentle fire. The firſt ten ounces that came over conſiſted of a liquor ſtrongly impregnated with ether, and of an agreeable odour. This was put by itſelf and marked A. It was followed by a ſtronger ethereal liquor, of which a ſmall quantity only would mix with water. Of this there were 12 ounces, which were alſo put by themſelves, and marked B. By continuing the proceſs two ounces more were obtained, which ſmelled of ſulphur, and were marked C. The diſtillation was now continued with a view to concentrate the vitriolic acid, when three drachms of a thicker kind of ether were found ſwimming on a weak ſulphureous acid. This thick liquid was not in the leaſt volatile, and in conſiſtence reſembled an expreſſed oil. 2. Twenty-four ounces of ſpirit of wine were now added to the reſiduum of the former diſtillation, and the proceſs recommenced. The firſt ſeven ounces that came over were poured to the dulcified ſpirit marked A. Next paſſed over ten ounces of a tolerably pure ether, which was mixed with the contents of B; beſides two ounces that had a ſulphureous ſmell, which were mixed with C. By a repeated dephlegmation of what remained in the retort were obtained five ounces of a weak ſulphureous acid; and the remainder being again mixed with 20 ounces of ſpirit of wine, yielded firſt ſix ounces of the liquor marked A; then four ounces of pure ether put into that marked B; and after that another ounce marked C. By continuing the diſtillation four ounces of weak ſulphureous acid were obtained, on which floated a little oil of wine. 3. The remainder, which was very thick, and covered with a ſlight pellicle, was mixed with 20 ounces of ſpirit of wine, and yielded five ounces of dulcified ſpirit marked A; eight ounces of pure ether marked B; and at laſt one ounce of the ſame, which had rather a ſulphureous ſmell. This was followed by a few drops of acid; but the remainder frothed up with ſuch violence, that an end was put to the operation, in order to prevent its paſſing over into the receiver.

By theſe four diſtillations there were obtained from ſix pounds of ſpirit of wine and two of oil of vitriol, 28 ounces of dulcified ſpirit of vitriol and 38 of ether; which laſt, when rectified by diſtillation over manganeſe, yielded 28 ounces of the beſt ether. At the end of this diſtillation were produced 13 ounces of weak acetous acid; and the liquor of the laſt running marked C, afforded, by rectification, four ounces of good ether. The ſulphureous acid liquor yielded four ounces of weak acetous acid, and three drachms of naphtha reſembling a diſtilled oil in conſiſtence.

By theſe proceſſes the vitriolic acid was rendered quite thick and black; its weight being reduced to 24 ounces. The blackneſs was found to be owing to a powder which floated in the liquid, and could neither be ſeparated by ſubſiding to the bottom nor riſing to the top. The liquor was therefore diluted with eight ounces of water, and filtered through powdered glaſs; by which means the black ſubſtance was collected, partly in powder, and partly in grains of different ſizes. It felt very ſoft between the fingers, and left a ſtain upon paper like Indian ink; but though waſhed with 24 ounces of water, ſtill taſted acid. Half an ounce of it diſtilled in a retort yielded a drachm and an half of weak acetous mixed with a little ſulphureous acid; the reſiduum was a black coal, which by calcination in an open fire for a quarter of an hour, yielded 25 grains of white aſhes, conſiſting of ſelenite, calcareous earth, and magneſia. A drachm of it digeſted with nitrous acid, which was afterwards diſtilled from it, and then diluted with diſtilled water and filtered, yielded a few cryſtals, which appeared to be genuine ſalt of tartar, an inſoluble ſelenite being left behind. On rectifying the vitriolic acid freed from the black matter and diluted with eight ounces of water, nine ounces of ſulphureous acid were firſt obtained, after which followed an ounce of acid rather high-coloured, and then the vitriolic acid quite colourleſs. It now weighed only $19\frac{3}{4}$ ounces, and its ſpecific gravity was but 1.723, while that of the acid originally employed had been 1.989.

On repeating the proceſs with ſix pounds of ſpirit of wine to two of oil of vitriol, the firſt 12 ounces that came over were ſpirit of wine almoſt totally unchanged; then two ounces ſmelling a little of ether; and afterwards two pounds, of which about one-third were ether. When about five pounds had been drawn off, the diſtilling liquor began to ſmell ſulphureous; and after nine ounces more had been drawn off, the frothing up of the matter in the retort obliged him to put an end to the operation. The acid was then filtered through pounded glaſs as before, and afterwards committed to diſtillation. The three firſt ounces were a weak ſulphureous acid; then followed an ounce more concentrated, and of a red colour; then another of a yellowiſh caſt; after which the reſt of the acid came over quite colourleſs. The whole weighed 27 ounces, and the ſpecific gravity of it compared with diſtilled water was as 1.667 to 1.000.

719 Properties of ether.

Ether is the lighteſt of all known fluids, except air; and is ſo volatile, that *in vacuo* its boiling point is 20° below 0° of Fahrenheit's thermometer. If a ſmall quantity is poured out on the ground, it inſtantly evaporates, diffuſing its fragrance all through the room, and ſcarce perceptibly moiſtening the place on which it fell. It difficultly mixes with water, as being of an oily nature: ten parts of water, however, will take up one part of ether. Its great volatility renders it ſerviceable in nervous diſeaſes, and removing pains, when rubbed on with the hand, and kept from evaporating immediately. By ſpontaneous evaporation, it produces a great degree of cold. (See EVAPORATION and CONGELATION). The moſt extraordinary property, however, is, that if gold is diſſolved in aqua-regia) ſee *Metallic Subſtances*, below), and ether added to the ſolution, the gold will leave the acid and permanently unite with the ether. The exceeding great volatility of ether renders it very eaſily inflammable even on the approach of flame; and therefore it ought never to be diſtilled, or even poured from one veſſel to another, by candle-light. If a leſs quantity of the vitriolic acid is added to the ſpirit of wine than what is ſufficient to produce ether, the product is called *ſpiritus vitrioli dulcis*. The following experiment made by Wallerius, induced him and others to think, that the vitriolic acid was convertible into the nitrous.

720 Experiment in favour of the transmutation of vitriolic into nitrous acid.

"Some ſalt of tartar (ſays he) being mixed with the dulcified ſpirit of vitriol, or perhaps with the ether (for the author expreſſes himſelf a little ambiguouſly), the full bottle ſtopt with a cork, tied over with bladder, and laid on its ſide; on ſtanding for four months, the greateſt part of the ſpirit was found to have eſcaped, and the ſalt was ſhot into hexangular priſmatic cryſtals reſembling nitre. It taſted ſtrongly of the ſpirit, but had no other particular taſte. Laid on a burning coal, it crackled, exploded with a bright flaſh, and flew into the air. He afterwards found, that by adding to the ſpirit a drop or two of any acid, the ſalt cryſtallizes the ſooner; that in this caſe it has a ſouriſh taſte, but in other reſpects is the ſame with that made without acid. This ſalt-petre (ſays the author) promiſes, from the violence of its exploſion, to make the ſtrongeſt gun-powder in the world, but a very dear one. Though the experiment ſhould not be applicable to any uſe in this way, it will probably contribute to illuſtrate the generation of nitre: as it palpably ſhows nitre, that is, the acid or characteriſtic part of nitre, produced from the vitriolic acid and phlogiſton.

721 Not concluſive.

We cannot here help again regretting that chemiſts of ſuperior abilities ſhould ſometimes leave very important diſcoveries only half finiſhed, ſo that chemiſts of an inferior rank know not what to make of them. Had

Wallerius,

Wallerius, who ſeems more than once to have been in poſſeſſion of this ſalt, only poured on it a few drops of oil of vitriol, the peculiar colour and ſmell of its fumes muſt have been a much more convincing proof of the reality of the tranſmutation than that of mere deflagration; becauſe the latter can be otherwiſe accounted for.

722
Violent exploſions from the application of heat.

It is certain, that many ſuſtances, water itſelf not excepted, will explode with great violence if ſuddenly heated beyond what they are able to bear. If ſpirit of wine is confined in a cloſe veſſel, it will alſo by means of heat burſt it as effectually as water; and as the vapours of this ſubſtance are inflammable, the exploſion will be attended with a flaſh if any flame is near. In like manner ether, on the approach of a candle, takes fire, and goes off in a flaſh like lightning; but this happens, not from any thing nitrous, but from its great volatility and inflammability. If therefore the vapours of the ethereal liquors are confined, and heat is applied ſuddenly to the containing veſſel, their great volatility will cauſe them make an inſtantaneous effort againſt the ſides of it, which increaſing with a ſwiftneſs far beyond that of aqueous or ſpirituous vapours, will make a much quicker as well as a much ſtronger exploſion than either of them; and if a flaming ſubſtance is near, the exploſion will be attended with a bright flaſh like that of the ether itſelf.

In the experiment now before us, the ſalt taſted ſtrongly of the ſpirit, or ether, from which it was made. The ſpirit was therefore confined in the cryſtals of ſalt; and this volatile liquor, which, even under the preſſure of the atmoſphere, boils with the heat of 100° of Fahrenheit, was, in a confined ſtate, ſubjected to the heat of a burning coal; that is, to more than ten times the degree of heat neceſſary to convert it into vapour. The conſequence of this could be no other, than that the particles of ſalt, or perhaps the air itſelf, not being capable of giving way ſoon enough to the forcible expanſion of the ether, a violent exploſion would happpen, and the ſalt be thrown about; which accordingly came to paſs, and might very reaſonably be expected, without any thing nitrous contained in the ſalt.

2d 722
Cavallo's method of purifying ether.

Mr Cavallo deſcribes an eaſy and expeditious method of purifying ether, though a very expenſive one; as out of a pound of the common kind ſcarce three or four ounces will remain of that which is purified. The method of purifying it, he ſays, was communicated to him by Mr Winch chemiſt in London, and is to be performed in the following manner. "Fill about a quarter of a ſtrong bottle with common ether, and pour upon it twice as much water; then ſtop the bottle and give it a ſhake, ſo as to mix the ether for ſome time with the water. This done, keep the bottle for ſome time without motion, and the mouth of it downwards, till the ether be ſeparated from the water, and ſwims above it; which it will do in three or four minutes. Then opening the bottle with the mouth ſtill inverted, let the greateſt part of the water run out very gently; after this, turn the bottle with the mouth upwards; pour more water upon the ether, ſhaking and ſeparating the water as before. Repeat this operation three or four times; after which the ether will be exceedingly pure, and capable of diſſolving elaſtic gum, though it could not do ſo before."

As great part of the ether undoubtedly remains mixed with the water after this proceſs, our author remarks, that it might be worth while to put the water into a retort and diſtil the ether from it, which will come ſufficiently pure for common uſe. He obſerves alſo, that "it is commonly believed that water combines with the pureſt part of the ether when the two fluids are kept together; though the contrary ſeems to be eſtabliſhed by this proceſs. According to Mr Waſtrumb, we may obtain from the reſiduum of vitriolic ether a reſin containing vitriolic acid, vinegar, Glauber's ſalt, ſelenite, calcareous earth, ſilex, iron, and phoſphoric acid.

§ 2. *Of the* NITROUS *Acid and its Combinations.*

THIS acid is far from being ſo plentiful as the vitriolic. It has been thought to exiſt in the air; and the experiments of Mr Cavendiſh have ſhown, that it may be artificially compoſed, by taking the electric ſpark in a mixture of dephlogiſticated and phlogiſticated air. See AEROLOGY, n° 77.

724
Of the preparation of nitre.

With regard to the preparation of nitre, Dr Black obſerves, that it is made in great plenty in the more ſouthern parts of Europe; likewiſe in the ſouthern parts of Perſia, in China, the Eaſt Indies, and in North America. We have had no accounts of the manner in which it is prepared in the Eaſt Indies, no perſon on the ſpot having taken particular notice of the manufacture. The general account is, that it is obtained from the ſoil of certain diſtricts which are called *ſaltpetre grounds*; where the ſoil is very cold, barren, and unhealthy. The ſalt is there ready formed by nature. It is only neceſſary to gather large quantities of the earth, and to put it into a cavity through which a great quantity of water is poured, which diſſolves the nitre; and the lixivium runs into an adjacent pit, out of which it is lifted in order to be evaporated and obtained in the form of cryſtals. This account, however, has been thought unſatisfactory; becauſe there is hardly any part of Europe in which it is found in this manner. It is diſcovered indeed in ſome very large diſtricts in Poland, particularly in Podolia, where the country is flat and fertile, and had been once very populous, but is now in a great meaſure deſerted. It is there obtained from tumuli or hillocks, which are the remains of former habitations; but theſe are the only places in which it is found in any conſiderable quantity. In Spain, it is ſaid that the inhabitants extract it from the ſoil after a crop of corn. It has been found in America in lime-ſtone grounds, in the floors of pigeon-houſes, tobacco-houſes, or the ruins of old ſtables, where a number of putrefying vegetables were once collected. In general, however, it is extracted from artificial compounds or accidental mixtures, where animal and vegetable ſubſtances have been fully putrefied by being expoſed to the air with any ſpongy or looſe earth, eſpecially of the calcareous kind, and open to the north or north-eaſt wind, and more or leſs covered from the heat or rains. This laſt particular is abſolutely neceſſary to its formation in any quantity; for the heat, by evaporating the moiſture too much, prevents it from being produced, and the rains waſh it away after it is already made. Cramer, an author of the greateſt credit, informs us in his Docimaſtics, that he made a little hut expoſed to the freſh air of the country,

725
Diſcovered in ſome places in Podolia in Poland;

726
In Spain and America.

727
Requiſites for its formation.

728
Cramer's artificial compoſt for making nitre.

country, with windows to admit the winds. In this he put a mixture of garden mold, the rubbiſh of lime, and putrid animal and vegetable ſubſtances. This he frequently moiſtened with urine; and in a month or two found his compoſition very rich in nitre, yielding at leaſt one-eight part of its weight.

729 How prepared in Hanover.

It is manufactured in Europe by making artificial compounds with leſs trouble. In Hanover it is got by collecting the rakings of the ſtreets; which are built up into mud-walls that are allowed to remain a certain time, when the ſurface is found covered with a white ſaline efflореſcence. A perſon is employed to ſcrape this off; and putting it into a veſſel, it is waſhed with water to diſſolve the nitre, and the remaining earthy matter is again plaſtered on the mud-walls, and freſh matter brought from the ſtreets to renew them occaſionally: and by this ſimple method a conſiderable quantity is obtained.

730 In other parts of Germany.

In Germany the peaſants are directed by law to build mud-walls of this kind with the dung and urine of animals, and ſome ſtraw. After they have ſtood for ſome time, and the vegetable and animal ſubſtances are rotten, they afford a conſiderable quantity of nitre.

731 In France.

In France it is obtained from accidental collections of this kind; as where looſe earth has been long expoſed to the contact of animal ſubſtances, as the ruins of old ſtables, pigeon-houſes, &c. Sometimes from the mould upon the ground where dunghills have been lying. A particular ſet of people go about in ſearch of theſe materials; and when, by making a ſmall eſſay, they find that they will turn to account, they put the materials into a large tub with a perforated bottom, and another which is water-proof put below it. Some ſtraw is interpoſed betwixt the two; and on pouring water upon the materials, it ſoaks through them, undergoes a kind of filtration in paſſing through the ſtraw, and is then drawn off by a cock placed in the the under-tub, and boiled to a proper conſiſtence for cryſtallization. The cryſtals are at firſt brown and very impure, but by repeated diſſolution and cryſtallization become pure and white.

732 Dr Black's concluſions concerning the nature of ſalt-petre.

From theſe particulars relating to the hiſtory of ſalt-petre, Dr Black concludes, that it is not properly a foſſil, being produced at the ſurface of the ground. Margraaf diſcovered a ſmall quantity of it in the analyſis of ſome of the waters about Berlin, and others have found it in the wells about ſome great cities: but no true nitre has ever been found in ſprings; ſo that this nitrous ſalt may be ſuppoſed to have derived its origin from the quantity of putrid matters with which all cities abound. All rich and fertile ſoils are found to contain it; and in the hot countries, where the products of nature are numerous, and putrefaction carried on very faſt, they are often very rich in nitre. This may happen in ſome places from the conflux of waters; which remaining for ſome time on the ſurface, and afterwards exhaling, left the ſaline particles behind.

733 Suppoſed to be the laſt effect of putrefaction.

On the whole, Dr Black concludes, that neither nitre nor its acid does exiſt in the air, becauſe it might eaſily be detected there; though many have embraced this opinion from its being uſually found at the ſurface of the ground. He is of opinion, that it is the effect of the laſt ſtage of putrefaction of animal and vegetable ſubſtances; and it is never to be found except where theſe or their effluvia are preſent, and never till the putrefaction is complete. It has been a matter of diſpute, whether it exiſted in thoſe matters before the proceſs of putrefaction, or was produced by it. But it is pretty certain, ſays the Doctor, that it originated in them; for the ſun-flower, tobacco, and other plants, are found to contain it before putrefaction: and ſome have even aſſerted, that plants placed in the earth, deprived of all its ſaline ſubſtances, will yield it. The compoſitions recommended by Cramer are the fitteſt for producing a complete degree of putrefaction, provided they contain a moderate degree of humidity, and that the quantity expoſed to the air be defended from too great a heat by the ſun, which would dry up its moiſture; and likewiſe from too great a degree of cold, which likewiſe checks fermentation. The importance of the calcareous earth in ſuch a compoſition would likewiſe favour the concluſions juſt now drawn; for the moſt remarkable effect of this earth is to promote and perfect the putrefaction of theſe ſubſtances. It would ſeem, therefore, that the true ſecret of the production of nitre is to mix properly together animal and vegetable ſubſtances with earth, particularly of the calcareous kind; expoſing them to the air with a moderate degree of humidity, ſufficient to promote their putrefaction in the moſt effectual manner; and when the putrefaction is carried to the utmoſt height, we may then expect that nitre will be produced.

734 Diſtinguiſhing characteriſtic of the nitrous acid.

The diſtinguiſhing characteriſtic of the nitrous acid is its great diſpoſition to unite with the phlogiſton; and, when ſo united, firſt to become exceedingly volatile, and at laſt to be diſſipated in a very white bright flame: this is called its *detonation* or *deflagration*. In the ſtrongeſt ſtate in which this acid is procurable in a liquid form, it is of a reddiſh yellow colour, and continually exhales in denſe, red, and very noxious fumes; and in this ſtate is called *ſmoking*, or, from its inventor, *Glauber's*, ſpirit of nitre.

I. To extract the Nitrous Acid by means of the *Vitriolic*.

735 Spirit of nitre.

Into a glaſs retort put two pounds of good ſalt-petre, and pour upon it 18 ounces of concentrated oil of vitriol; ſet the retort in a ſand-heat, and lute on a large receiver with the compoſition already recommended, for reſiſting acid fumes; the mixture will grow very warm, and the retort and receiver will be filled with red vapours. A ſmall fire is then to be kindled, and cautiouſly raiſed till no more drops will fall from the noſe of the retort. What comes over will be a very ſtrong and ſmoking ſpirit of nitre.

736 Rectification.

In this proceſs, the nitrous acid is generally mixed with part of the vitriolic which comes over along with it, and from which it muſt be freed if deſigned for nice purpoſes. This is moſt effectually done by diſſolving in it a ſmall quantity of nitre, and rediſtilling the mixture. The vitriolic acid which came over in the firſt diſtillation is kept back by the nitre in the ſecond, combining with its alkaline baſis, and expelling a proportionable quantity of the nitrous acid.

737 Different methods of diſtilling.

We have here directed the pure vitriolic acid to be uſed, in order to expel the nitrous one; but for this purpoſe any combination of the vitriolic acid with a metallic or earthy baſis may be uſed, though not with equal advantage. If calcined vitriol is made uſe of,

as

as much phlogiſton is communicated by the calx of iron contained in that ſalt as makes the nitrous acid exceedingly volatile, ſo that great part of it is loſt. If calcined alum, or ſelenite, is made uſe of, the vitriolic acid in theſe ſubſtances immediately leaves the earth with which it was combined, in order to unite with the alkaline baſis of the nitre, and expels its acid: but the moment the nitrous acid is expelled from the alkali, it combines with the earth which the vitriolic acid had left; from which it cannot be driven without a violent fire; and part of it remains obſtinately fixed, ſo as not to be expelled by any degree of heat. Hence the produce of ſpirit, when nitre is diſtilled with ſuch ſubſtances, always turns out conſiderably leſs than when the pure vitriolic acid is uſed. Alum is preferable to ſelenite, for the purpoſes of diſtilling ſpirit of nitre; becauſe the acid does not adhere ſo ſtrongly to argillaceous as to calcareous earth.

According to Weigleb, the nitrous acid may be expelled not only by clay, gypſum, and other ſubſtances containing the vitriolic acid, but even by various kinds of vitrifiable earth. Clean pebbles, quartz in the form of ſand, pieces of broken china and ſtone ware, powdered glaſs, *&c* mixed with nitre in the proportion of ſix to one, always expel the acid, though imperfectly. In France the acid is always extracted by means of clay.

The reaſon of theſe decompoſitions is, that the alkaline baſis of the nitre attracts the ſiliceous earth, whoſe fixedneſs in a vehement fire gives it an advantage over the volatile nitrous acid, in the ſame manner that the weak acid of phoſphorus or arſenic will alſo expel it by reaſon of their fixedneſs in the fire.

Even ſpirit of ſalt, according to Margraaff's experiments, may be uſed for diſtilling the ſpirit of nitre. That celebrated chemiſt informs us, that on diſtilling nitre with eight or nine times its quantity of ſtrong marine acid, a ſpirit comes over which conſiſts chiefly of the nitrous acid, but has alſo ſome portion of that of ſea-ſalt. The reaſon of this is ſhown in Mr Kirwant's experiments on chemical attractions*. In the preſent caſe, however, the decompoſition may be facilitated by the ſtrong attraction of the nitrous acid for phlogiſton; for it is well known, that on mixing the nitrous and marine acids together, the latter is always dephlogiſticated. It ſeems therefore that in this caſe a double decompoſition takes place, the nitrous acid uniting itſelf to the phlogiſton of the marine, and the latter attaching itſelf to the alkali of the nitre.

738 Uſes. Spirit of nitre is very uſeful in the arts of dyeing and refining, where it is known by the name of *aquafortis*; and therefore an eaſy and cheap method of procuring it is a valuable piece of knowledge. Many difficulties, however, occur in this proceſs, as well as that for the vitriolic acid. Oil of vitriol, indeed, always expels the nitrous acid with certainty; and on diſtilling the mixture, a ſpirit of nitre ariſes; but if a glaſs retort is uſed for the purpoſe of diſtilling this acid, the quantity of reſiduum left in diſtillation is ſo great, and ſo inſoluble in water, being no other than vitriolated tartar, that the retort muſt always be broken in order to get it out; and the produce of ſpirit will ſcarce afford the breaking a retort. If earthen retorts are made uſe of, they muſt certainly be of that kind called ſtone-ware, and the price of them will be very little if at all inferior to that of glaſs. Iron pots are ſaid to be made uſe of in the diſtillation of common aquafortis in large quantities; but they have the great inconvenience of making a quantity of the acid ſo volatile, that it not only will not condenſe, but ſpreads its ſuffocating vapours all round in ſuch a manner as to prove very dangerous to thoſe who are near it. If an iron veſſel, therefore, is thought of for the purpoſe of diſtilling aquafortis, it will be proper at leaſt to attempt luting over the inſide with a mixture of gypſeous earth and ſand, to prevent as much as poſſible the acid from attracting the metal.

Dephlogiſticated ſpirit of nitre is obtained by diſtilling the ſmoking kind with a gentle heat, until what remains is as colourleſs as water. It is diſtinguiſhed by emitting white and not red fumes like the other kind, when ſet in a warm place. It muſt be kept conſtantly in the dark, otherwiſe it will again become phlogiſticated, and emit red vapours by the action of the light; the ſame thing will alſo take place if it be heated with too violent a fire.

II. To procure the Nitrous Acid by means of *Arſenic*.

739 Blue aquafortis. Pulveriſe equal quantities of dried nitre and white cryſtalline arſenic; mix them well together, and diſtil in a glaſs-retort with a fire very cautiouſly applied; for the arſenic acts on the nitre with ſuch a violence, and the fumes are here ſo volatile, that unleſs great care is taken, a moſt dangerous exploſion will almoſt certainly happen. As, in this caſe, the nitrous fumes ariſe in a perfectly dry ſtate, ſome water muſt be put into the receiver, with which they may unite and condenſe. The aquafortis ſo produced will have a blue colour, owing to the inflammable principle ſeparated from the arſenic, by which its extreme volatility is likewiſe occaſioned. If this blue aquafortis is expoſed to the air, its colour ſoon flies off. If inſtead of the white arſenic we employ the pure arſenic acid, the diſtilled liquor will have no blue colour.

Nitrous Acid COMBINED,

740 Salt-petre. I. *With Vegetable fixed Alkali.* This ſalt, combined with the nitrous acid to the point of ſaturation, regenerates nitre. It is obſervable, however, according to Neumann, that there is always ſome diſſimilarity between the original and regenerated nitre, unleſs quicklime is added. The regenerated ſalt, he ſays, always corrodes tin, which the original nitre does not; owing probably to a quantity of phlogiſticated acid remaining in it. Boiling with quicklime deprives it of this quality, and makes it exactly the ſame with original nitre.

741 Cubic-nitre. II. *With Foſſile alkali.* The neutral ſalt ariſing from a combination of the nitrous acid and foſſile alkali is ſomewhat different from common nitre; being more difficult to cryſtallize, inclining to deliquate in the air, and ſhooting into cryſtals of a cubical form, whence it gets the name of *cubic nitre*. Its qualities are found ſomewhat inferior to the common nitre; and therfore it is never made, unleſs by accident, or for experiments.

742 Fuſibility. Nitre is one of the moſt fuſible ſalts. It is liquefied in a heat much leſs than what is neceſſary to make it red; and thus remain in tranquil fuſion, without ſwelling. If nitre thus melted be left to cool and fix, whe-

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* See n° 292.

whether it has been made red-hot or not in the fuſion, it coagulates into a white, ſemi-tranſparent, ſolid maſs, called *mineral cryſtal*, having all the properties of nitre itſelf. By this fuſion, Mr Beaumé obſerves that nitre loſes very little, if any, of the water contained in its cryſtals, ſince the weight of mineral cryſtal is nearly the ſame with that of the nitre employed.

When nitre is kept in fuſion with a moderate heat, and at the ſame time does not touch any inflammable matter, nor even flame, it remains in that ſtate without ſuffering any very ſenſible alteration; but if it is long kept in fuſion with a ſtrong fire, part of the acid is deſtroyed by the phlogiſton which penetrates the crucible; and hence the nitre becomes more and more alkaline.

743 Uſes.

Nitre is of very extenſive uſe in different arts; being the principal ingredient in gun-powder; and ſerving as an excellent flux to other matters; whence its uſe in glaſs making. (See GLASS.) It is alſo poſſeſſed of a conſiderable antiſeptic power; whence its uſe in preſerving meat, to which it communicates a red colour. In medicine, nitre is uſed as a diuretic, ſedative, and cooler; but very often ſits uneaſy on the ſtomach. The reſemblance of the cryſtals of nitre to thoſe of Glauber's ſalt has ſometimes been the occaſion of dangerous miſtakes. Dr Alexander mentions a ſwelling over the whole body of a woman, occaſioned by her taking a ſolution of nitre inſtead of Glauber's ſalt. Two miſtakes of the ſame kind we have alſo known. In one an ounce, and in the other upwards of two ounces, of nitre were ſwallowed. The ſymptoms occaſioned were univerſal coldneſs and ſhivering, extreme debility and ſickneſs at ſtomach, cold ſweats and faintings. Neither of the caſes proved mortal. The cure was effected by cordials and corroborants.

744 Sal prunella.

A proceſs has obtained a place in the diſpenſatories for a ſuppoſed purification of nitre by means of flower of brimſtone. A pound of ſalt-petre is to be melted in a crucible, or ſmall iron veſſel; and an ounce of flowers of ſulphur thrown upon it, by ſmall quantities at a time: a violent deflagration enſues on each addition; and after the whole is put in, the ſalt is poured out in moulds, and then called *ſal prunella*. It has been diſputed whether the nitre was at all depurated by this proceſs; Dr Lewis thinks it is not. From our own experience, however, we can affirm, that by this means a ſediment falls to the bottom, which carries with it any impurities that may have been in the nitre, and leaves the fluid ſalt clear and tranſparent as water. This precipitate is probably no other than a vitriolated tartar formed by the union of the ſulphureous acid and alkali of the nitre, which being leſs fuſible than the nitre, ſubſides in a ſolid form and clarifies it.

745 Nitrous ammoniac.

III. *With Volatile Alkali.* The nitrous acid ſeems peculiarly adapted to an union with volatile alkali; ſaturating as much, or rather more of it than the ſtrongeſt vitriolic acid is capable of doing. The product is a very beautiful ſalt, called *volatile nitre*, or *nitrous ſal ammoniac*. It very readily diſſolves, not only in water, but in ſpirit of wine, which diſtinguiſhes it from the vitriolic and common kind of ſal ammoniac. It alſo requires leſs heat for its ſublimation: indeed care muſt be taken not to apply too great a heat for this purpoſe, as the nitrous ſal ammoniac has the property of deflagrating by itſelf without any addition of inflammable matter; and this it does more or leſs readily, as the volatile alkali with which it was made was more or leſs impure and oily.

746 Dr Ward's white drop.

The medical virtues of this kind of nitre have not been inquired into. It ſeems to have made the principal ingredient in the famous Dr Ward's white drop, which was celebrated as an antiſcorbutic; with what juſtice thoſe who have tried it muſt determine.

747 Calcareous nitre.

IV. *With Calcareous Earths.* Theſe the nitrous acid diſſolves into a tranſparent colourleſs liquor; but for this purpoſe it muſt be very much diluted, or the ſolution will have a gelatinous conſiſtence. This compound is not applicable to any uſeful purpoſe. It has a very acrid taſte; and, if inſpiſſated, attracts moiſture from the air. If it is totally dried, it then reſembles an earthy matter, which deflagrates very weakly. By diſtillation in a retort, almoſt all the acid may be expelled, and what little remains flies off in an open fire.

748 Nitrous acid decompoſed.

Mr Pott, who has particularly examined the combination of nitrous acid with quicklime, ſays that the acid ſuffered remarkable alterations by diſtillation from quicklime, and repeated cohobations upon it. By theſe experiments he obtained a ſalt more ſenſibly ſuſceptible of cryſtallization and detonation, than what can be obtained by a ſingle combination. From his experiments it would ſeem, that nitrous acid, by this treatment with quicklime, was capable of being entirely decompoſed.

749 Phoſphorus.

If a ſolution of chalk in the nitrous acid be evaporated to dryneſs, and then gently calcined, it acquires the property of ſhining in the dark, after having been expoſed to the ſun's rays, or even to the light of a candle. This ſubſtance, from its inventor, is called *Baldwin's phoſphorus*; or, from its being neceſſary to keep it in a glaſs hermetically ſealed, *phoſphorus hermeticus*. (See EARTHS).

V. *With Argillaceous Earths and Magneſia.* All that is known concerning the combinations of nitrous acid with theſe earths is, that the firſt produce aſtringent, and the ſecond purgative compounds, ſimilar to alum and Epſom ſalt, and which are not ſuſceptible of cryſtallization.

750 Gold.

VI. *With Gold.*—Till very lately it has been the opinion of chemiſts, that the nitrous acid by itſelf was incapable of acting upon this metal.—Dr Brandt, however, produced before the Swediſh academy of ſciences, a ſolution of gold in the nitrous acid, obtained in parting, by that acid, a mixture of gold and ſilver. —The mixed metal was boiled with aquafortis in a glaſs body fitted with a head and receiver, the liquor poured off, and the coction repeated with freſh parcels of ſtronger and ſtronger nitrous ſpirit, till all the ſilver was judged to be extracted. The laſt parcel was boiled down till the matter at the bottom looked like a dry ſalt; on boiling this in freſh aquafortis in cloſe veſſels, as before, a part of the gold was diſſolved, and the liquor tinged yellow. But though gold is by this means truly ſoluble in the nitrous acid, the union is extremely ſlight; the gold being not only precipitated on the addition of ſilver, but likewiſe ſpontaneouſly on expoſure to the air.—Dr Lewis very juſtly obſerves, that this ſolution may have been often made unknown to the chemiſt who did ſo; and probably occaſioned the miſtakes which ſome have fallen into, who thought that they were in poſſeſſion of aquafortis capable of tranſmuting ſilver into gold. Notwithſtanding theſe authorities, Mr Kirwan is of opinion that the nitrous acid is in no caſe able to diſſolve gold; the metal being only intimately mixed or diffuſed through it.

751 Silver.

II. *With Silver.*—Pure ſpirit of nitre will diſſolve its own weight of ſilver; and ſhoots with it into fine white cryſtals of a triangular form, conſiſting of very thin plates joined cloſely one upon another. Theſe cryſtals are ſomewhat deliqueſcent; of an extremely bitter, pungent, and nauſeous taſte; and, if taken internally, are highly corroſive and poiſonous. They melt in a ſmall heat, and form, on cooling, a dark-coloured maſs ſtill more corroſive, called *lunar cauſtic*, or *lapis infernalis*. They readily diſſolve in water; and, by the aſſiſtance of warmth, in ſpirit of wine. In the *Acta Naturæ Curioſorum*, tom. vi. there is a remarkable hiſtory of ſilver being volatilized by its combination with the nitrous acid. Four ounces of ſilver being diſſolved in aquafortis, and the ſolution ſet to diſtil in an earthen retort, a white tranſparent butter roſe into the neck, and nothing remaining behind; by degrees the butter liquefied, and paſſed down into the phlegm in the receiver. The whole being now poured back into the retort, the ſilver aroſe again along with the acid. The volatilization being attributed to the liquor having ſtood in a laboratory where charcoal was bringing in, the experiment was repeated with a freſh ſolution of ſilver, and a little powdered charcoal, with the ſame event.

752 Lunar cauſtic.

753 Colours produced by ſolution of ſilver.

Solution of ſilver in the nitrous acid ſtains hair, bones, and other ſolid parts of animals, and different kinds of wood, of all the intermediate ſhades from a light brown to a deep and laſting black. The liquors commonly ſold for ſtaining hair brown or black, are no other than ſolutions of ſilver in aquafortis, ſo far diluted in water as not ſenſibly to corrode the hair.

It gives a permanent ſtain likewiſe to ſundry ſtones; not only to thoſe of the ſofter kind, as marble, but to ſome of conſiderable hardneſs, as agates and jaſpers. The ſolution for this purpoſe ſhould be fully ſaturated with the metal; and the ſtone, after the liquor has been applied, expoſed for ſome time to the ſun. M. du Fay obſerves (in a paper on this ſubject in the French memoirs for 1728), that if the ſolution be repeatedly applied, it will penetrate into the whitiſh agate, or chalcedony, about one-twelfth of an inch: that the tincture does not prove uniform, on account of the veins in the ſtone: that the colours, thus communicated by art, are readily diſtinguiſhed from the natural, by diſappearing on laying the ſtone for a night in aquafortis: that, on expoſing it to the ſun afterwards for ſome days, the colour returns: that the ſolution gave ſomewhat different tinctures to different ſtones; to oriental agate, a deeper black than to the common chalcedony; to an agate ſpotted with yellow, a purple; to the jade ſtone, a pale browniſh; to the common emerald, an opaque black; to common granite, a violet unequally deep; to ſerpentine ſtone, an olive; to marble, a reddiſh, which changed to purple, and fixed in a brown; that on ſlates, talcs, and amianthus, it had no effect.

754 Arbor Dianæ.

If a ſolution of ſilver be diluted with pure water, a conſiderable quantity of pure mercury added, and the whole ſet by in a cold place; there will form by degrees a precipitation and cryſtallization reſembling a little tree, with its root, trunk and branches, called *arbor Dianæ*, or the *philoſophic ſilver tree*. Another kind of artificial vegetation may be produced by ſpreading a few drops of ſolution of ſilver upon a glaſs plate, and placing in the middle a ſmall bit of any of the metals that precipitate ſilver, particularly iron. The ſilver quickly concretes into curious ramifications all over the plate.

755 Solution of ſilver decompoſed.

Like other metallic ſolutions, this combination of the nitrous acid with ſilver is decompoſed by fixed and volatile alkalies, calcareous earths, and ſeveral metals, (ſee the *Table of Affinities*); but with ſeveral peculiar circumſtances attending the precipitation. With metals, the ſilver is readily and copiouſly thrown down at firſt, but ſlowly and difficultly towards the end. The menſtruum generally retains ſome portion of the ſilver, as the ſilver almoſt always does of the metal which precipitated it. For recovering the ſilver from aquafortis after parting, the refiners employ copper. The ſolution, diluted with water, is put into a copper veſſel, or into a glaſs one with thin plates of copper, and ſet into a gentle warmth. The ſilver begins immediately to ſeparate from the liquor in form of fine grey ſcales, or powder; a part of the copper being diſſolved in its place, ſo as to tinge the fluid more or leſs of a bluiſh green colour. The plates are now and then ſhaken, that ſuch part of the ſilver as is depoſited upon them may fall off, and ſettle to the bottom. The digeſtion is continued till a freſh bright plate, kept for ſome time in the warm liquor, is no longer obſerved to contract any powdery matter on the ſurface; when the liquor is poured off, and the precipitate waſhed with freſh parcels of boiling water. It is obſervable, that though the acid in this proceſs ſaturates itſelf with the copper, in proportion as it lets go the ſilver, yet the quantity of copper which it takes up is not near ſo great as that of ſilver which it depoſits. One drachm of copper will precipitate three of ſilver, and ſaturate all the acid that held the three drachms diſſolved.

756 Characters curiouſly marked on the inſide of a glaſs by means of the ſun's light.

Calcareous earths, as chalk or quicklime, throw down a part of the ſilver, but leave a very conſiderable part ſuſpended in the liquor. If the earth be moiſtened with the ſolution into the conſiſtence of a paſte, and expoſed to the ſun, it changes its white colour to a dark purpliſh black; diſtinct characters may be exhibited on the matter, by intercepting a part of the ſun's light by threads, ſlit paper, *&c.* placed on the outſide of the glaſs. Culinary fire does not affect its colour: after the maſs has been exſiccated by this, it changes as before, on expoſure to the ſun.

Mild volatile alkaline ſpirits, added to a ſolution of ſilver, precipitate but little, and cauſtic volatile alkalies none. Pure fixed alkalies, and alkalies rendered cauſtic by quicklime, throw down the whole. Fixed alkalies impregnated with inflammable matter by calcination with animal coals, occaſion at firſt a conſiderable precipitation; but if added to a larger quantity, take up a great part of the metal again. Mr Margraaf relates, that edulcorated calces of ſilver totally diſſolve, both in a lixivium of theſe alkalies and in volatile ſpirits; and that the marine acid precipitates the ſilver from the volatile, but not from the fixed, alkaline ſolution. Kunckel reports that the calx precipitated by volatile ſpirits made with quicklime, fulminates or explodes in the fire; and that by inſpiſſating a ſolution of pure ſilver, melting the dry reſiduum, pouring it on ſpirit of urine ſuperſaturated with ſalt, and ſetting the mixture in a gentle warmth, a blood-red maſs is produced, ſo tough as to admit of being wound about the fingers.

757 Copper.

758 Verditer.

III. *With Copper*. The nitrous acid very readily diſſolves this metal into a green-coloured and very cauſtic liquor. The ſolution, if properly evaporated, will cryſtallize; but the cryſtals are deliqueſcent, and therefore difficult to be preſerved. The only uſe of this combination is for the preparation of the pigment called *verditer*. Of this there are two kinds, the blue and green. The blue is by far the brighteſt colour, and conſequently the moſt valuable. It has been ſaid that this is obtained by precipitating a ſolution of copper by any calcareous earth; and therefore is ſold by the refiners who have large quantities of ſolution of copper accidentally made. The ſolution is ſaid to be precipitated by chalk, or whiting; and that the precipitate is the beautiful blue colour called *verditer*. By this method, however, only the green kind can be obtained. The blue we have found to be of a quite different nature, and formed by precipitation with a gentle heat from a ſolution of copper in volatile alkali. See the article COLOUR-MAKING.

759 Iron.

IV. *With Iron*. On this metal the concentrated nitrous acid acts very violently, and plentifully corrodes, but does not diſſolve it; the calx falling almoſt as faſt as diſſolved; and when it is once let fall, freſh acid will not take it up again. If the acid was diluted at firſt, it takes up a conſiderable porportion, provided the metal be leiſurely added. If the ſolution is performed with extreme ſlowneſs, the colour will be green; but if otherwiſe, of a dark red. It does not cryſtallize; and, if inſpiſſated to dryneſs, deliquates in the air.

760 Tin.

V. *With Tin*. Concentrated nitrous acid acts upon tin with great force, but only corrodes the metal into a white indiſſoluble maſs. In order to obtain a perfect ſolution of tin in the nitrous acid, the metal muſt be put in by very little at a time, and a diluted aquafortis made uſe of. This ſolution has been conſiderably uſed in dyeing, and is remarkable for heightening red colours of all kinds; but the ſolution made with *aqua-regis* is preferable.

161 Lead.

VI. *With Lead*. Proof aquafortis, lowered with an equal quantity of water, diſſolves about half its weight of lead. On diluting the ſolution with a large quantity of water it turns milky, and depoſites great part of the metal. The ſolution ſhoots, upon exhaling part of the menſtruum, into ſmall pyramidal cryſtals with ſquare baſes, of an auſtere ſweet taſte.

762 Quickſilver ſuppoſed to be extracted from lead.

In the memoirs of the French academy for 1733, there is a particular account of an experiment, in which mercury is ſaid to have been extracted from lead by diſſolving in it the nitrous acid. During the diſſolution, there fell a precipitate which is plainly proved to be mercury, and was looked upon to be one of the conſtituent parts of the lead ſeparated by this ſimple proceſs: it ſeems probable, however, that the mercury in this caſe had been contained in the aquafortis; for pure lead diſſolved in pure aquafortis gives no ſuch precipitate.

The cryſtals of lead in the nitrous acid, when thrown into the fire, do not deflagrate as other combinations of this acid with metallic or ſaline baſes; but crackle violently, and fly round, with great danger to the by-ſtanders. If they are rubbed into very fine powder, they may then be melted without any danger. By repeated diſſolutions in freſh aquafortis, they at laſt form a thick fluid like oil, which cannot be dried without great difficulty. This compoſition is not adapted to any particular uſe, and is a violent poiſon.

763 Quickſilver.

764 Red precipitate.

VII. *With Quickſilver*. Aquafortis of ſuch a degree of ſtrength as to take up half its weight of ſilver, diſſolves with eaſe above equal its weight of mercury into a limpid liquor, intenſely corroſive and poiſonous, which ſpontaneouſly ſhoots into white cryſtals. Theſe cryſtals, or the ſolution exſiccated, and moderately calcined, aſſume a ſparkling red colour; and are uſed in medicine as an eſcharotic, under the name of *red precipitate*. The precipitate has ſometimes been given internally, it is ſaid, in very large quantities; even a whole drachm at one doſe. But this would ſeem incredible; and the peſent practice does not countenance the taking of red precipitate inwardly. This ſolution ſeems to have been what gave the efficacy to Ward's white drop.

When red precipitate is prepared in quantity, it is proper to diſtil the mercurial ſolution; becauſe moſt of the aquafortis may then be ſaved. It is exceedingly pure, if by purity we mean its being free of any admixture of vitriolic or marine acid; but is conſiderably tainted with the inflammable principle of the mercury extricated during the diſſolution. In conſequence of this, it is very volatile and ſmoking; which has generally, though improperly, been taken as a ſign of ſtrength in the nitrous acid.

765 Biſmuth.

VIII. *With Biſmuth*. This ſemimetal is very readily acted upon by the nitrous acid. Proof aquafortis diſſolves about half its weight of biſmuth. If the metal was haſtily added, the ſolution proves of a greeniſh colour; if otherwiſe, it is colourleſs and tranſparent. Unleſs the acid was diluted with about an equal quantity of water, a part of the biſmuth cryſtallizes almoſt as faſt as it diſſolves. The metal is totally precipitated both by fixed and volatile alkalies. The laſt, added in greater quantities than are ſufficient for precipitation, take it up again. The liquor generally appears greeniſh; by alternate additions of the alkaline ſpirit and ſolution, it becomes bluiſh or purple. Fixed alkalies calcined with inflammable matter likewiſe diſſolve the biſmuth after they have precipitated it.

766 Magiſtery of biſmuth.

The only uſe of this compound is for the precipitate, which is uſed as a coſmetic, under the name of *magiſtery of biſmuth*. The common way of preparing this is by diluting the ſolution very largely with water, upon which it turns milky, and a fine white precipitate falls, which is to be well edulcorated with water, and is then employed as a coſmetic both in waſhes and pomatums.

Concerning the preparation of this coſmetic, Neumann obſerves, that there are ſundry variations.—"Some (ſays he) takes aqua-regia for the menſtruum; and for the precipitant a ſolution of ſea-ſalt, alkalies, ſpirit of wine, &c. Some mix with the ſolution of biſmuth a ſolution of benzoin in ſpirit of wine, and thus obtain a magiſtery compounded of biſmuth and benzoin. Others add a ſolution of chalk to the metalline ſolution, and precipitate both together by alkalies. I have made trial with a good number of different precipitants; and found, that with common fixed alkali and cauſtic alkali, with watery and vinous alkaline ſpirits, the magiſtery was white, and in conſiderable quantity; the liquor, after the precipitation with volatile ſpirits, appearing blue. That oil of vitriol threw down a white precipitate very copiouſly: but that with ſpirit of ſalt, or ſpirit of vitriol, the precipitate was in very ſmall quantity, in colour like the foregoing; diſtilled vinegar making no precipitation at all. Common rectified ſpirit of wine, and tartarized ſpirit, common water, and lime-water, gave white precipitates. Solutions of nitre, vitriolated tartar, ſal mirabile, alum, borax, common ſalt, ſal ammoniac, the combination of marine acid with calcareous earth, and terra foliata tartari, all precipitated the biſmuth white. With a ſolution of gold in aqua-regia the magiſtery proved grey; with a ſolution of the ſame metal in aqua-regia made with ſpirit of ſalt, the precipitate was likewiſe grey, and in ſmall quantity; with ſolution of copper in aquafortis, white, and in very ſmall quantity, the liquor continuing blue; with ſolution of vitriol of copper, white; with ſolution of mercury ſublimate, white and plentiful; with ſolution of iron in aquafortis, yellowiſh; with ſolution of lead in aquafortis, and of ſugar of lead, white; with ſolution of zinc in aquafortis there was little precipitate; and with ſolutions of ſilver, tin, regulus of antimony, and of mercury, in the ſame acid, none at all."

767 Zinc.

IX. *With Zinc.* Upon this ſemimetal the nitrous acid acts with greater violence than any other, and will forſake any other metallic ſubſtance for it. The whole is very ſoon diſſolved into a tranſparent colourleſs liquor. The calces of flowers of zinc are likewiſe ſoluble in the nitrous acid; but neither the ſolution of the flowers, nor of the metal itſelf, have been yet found applicable to any uſeful purpoſe. Neumann remarks, that on extracting with nitrous acid the ſoluble parts of calamine, which is an ore of zinc, the ſolution, inſpiſſated to dryneſs, left a reddiſh brown maſs, which on digeſtion with ſpirit of wine exploded and burſt the veſſel.

768 Regulus of antimony.

X. *With Regulus of Antimony.* The nitrous acid rather corrodes than diſſolves this ſemimetal. The corroded powder forms a medicine formerly uſed under the name of *bezoar mineral*, but now diſregarded.

769 Regulus of cobalt.

770 Regulus of cobalt, how diſcovered in ores.

XI. *With Regulus of Cobalt.* This ſemimetal diſſolves readily in the nitrous acid, both in its metallic form and when reduced to a calx. The ſolution is of a red colour. Hence the nitrous acid furniſhes means of diſcovering this ſemimetal in ores after ſtrong calcination; very few other calces being ſoluble in the nitrous acid, and thoſe that are not influencing the colour.

XII. *With Nickel.* This ſemimetal is eaſily diſſolved by the nitrous acid into a deep green liquor; but neither this ſolution, nor indeed the ſemimetal of which it is made, has hitherto been found of any uſe.

XIII. *With Arſenic.* This ſubſtance is readily diſſolved by the nitrous acid; which abſtracts the phlogiſton, and leaves the pure arſenical acid behind. See below *Acid of Arſenic*.

771 Oils.

772 Unguentum citrinum.

XIV. *With Expreſſed Oils.* Theſe, as well as all other fatty or unctuous ſubſtances, are conſiderably thickened and hardened by their union with the nitrous acid. There is only one preparation where this combination is applied to any uſe. It is the *unguentum citrinum* of the ſhops. This is made by adding to ſome quantity of melted hog's-lard a ſolution of quickſilver in the nitrous acid. The acid, though in a diluted ſtate, and combined with mercury, nevertheleſs acts with ſuch force on the lard, as to render the ointment almoſt of the conſiſtence of tallow.

773 Spirit of wine.

774 Spiritus nitri dulcis.

XV. *With Vinous Spirits.* If highly rectified ſpirit of wine and ſtrong ſpirit of nitre are ſuddenly mixed together, the acid inſtantly becomes volatile, and is diſſipated with great heat and efferveſcence in highly noxious red fumes. If the acid is cautiouſly poured into the ſpirit, in the proportion of five, ſix, or even ten parts of ſpirit to one of acid, and the mixture diſtilled in a glaſs retort ſet in a water-bath, an exceedingly fragrant and volatile ſpirit comes over, uſed in medicine as a diuretic and cooler, under the name of *ſpiritus nitri dulcis*. This liquor is not acid; nor has what remains in the retort any more the characteriſtics of nitrous acid, which ſeems to be entirely decompoſed in this proceſs. (See the following article.)

775 Nitrous ether.

With the nitrous acid and ſpirit of wine, may alſo be made an exceedingly volatile liquor, called *nitrous ether*, to diſtinguiſh it from the vitriolic abovementioned. The proportions of nitrous acid and ſpirit of wine to each other for nitrous ether, are two of the acid by weight to three of the ſpirit. Dr Black's proceſs for making it is as follows. Take four ounces of ſtrong phlogiſticated nitrous acid; and having cooled it by putting it into a mixture of ſalt and ſnow, or into water cooled very near the freezing point, by putting pieces of ice into it, he puts it into a phial, and pours upon it an equal quantity of water, likewiſe cooled very low, in ſuch a manner that the water may float as much as poſſible on the ſurface of the ſpirit. Six ounces of ſtrong ſpirit of wine are then put in, ſo as to float in like manner on the ſurface of the water; the phial is placed in a veſſel containing cold water: and ſo great is the power of cold in reſtraining the action of bodies, that if the mixture was too cold, no ether would be produced; but at the temperature juſt mentioned, the ether begins to be formed in a few hours, with ſome little efferveſcence, and an expulſion of a ſmall quantity of nitrous air. We muſt provide for the eſcape of this elaſtic fluid, by having an hole in the cork, or the veſſel would be broken. The whole of the ether will be formed in a few days, and may be ſeparated from the reſt of the liquor by means of a funnel, ſhaped as in Pl. CXXXIV. fig. 9.

776 Woulfe's proceſs for procuring it in large quantities.

To procure the nitrous ether in large quantities, Mr Woulfe recommends the following proceſs. Put into a retort four pounds of nitre, then mix together four pounds of vitriolic acid, and three pounds five ounces of ſpirit of wine. Theſe are poured on the nitre by adding only two ounces at a time: the vitriolic acid acting on the nitre, produces a ſufficient degree of heat; and the acid of the nitre uniting with

Nitrous acid and its combinations.

the ſpirit, forms a nitrous ether, which flies off from the mixture, and is condenſed in a number of veſſels placed in cold water.—To obtain good nitrous ether readily, and at one diſtillation, Mr Dollfuſs adviſes to diſtil four parts of nitre of mangangeſe, four of vitriolic acid, and eight parts of ſpirit of wine.

777 Inquiry into the nature of ether.

Macquer ſuppoſes that ether is the moſt oily part or quinteſſence of ſpirit of wine. But it cannot be proved that ether contains any oil. And, beſides, if this were the caſe, thoſe acids which have the ſtrongeſt attraction for water would produce the greateſt quantity of ether; which is found not to be the caſe: and it is moſt probable that ether is produced by a combination of ſome part of the acid with a portion, particularly the inflammable part, of the ſpirit of wine; and it has been ſhown by chemical experiments, that every kind of ether contains a part of the acid employed. Dr Black himſelf has formed ether without any ſpirit at all, by expoſing nitrous acid highly phlogiſticated for ſome months to the light of the ſun. This was owing to the attraction of the principle of inflammability; which it is well known that light has the power of affording to bodies that attract it with force.

Nitrous Acid DECOMPOSED,

778 Oils fired by ſpirit of nitre.

I. *By Eſſential Oils.* If equal quantities of ſtrong nitrous acid and oil of cloves are poured into the ſame veſſel, the mixture inſtantly takes fire; both acid and oil burning with great fury till only a light ſpongy coal remains. Dr Lewis obſerves, that this experiment does not always ſucceed, and that there are but few oils which can be fired with certainty, without attending to a particular circumſtance firſt diſcovered by M. Rouelle, and communicated in the French Memoirs for the year 1747. "On letting fall into the oil equal its quantity of acid, the mixture effervеſces, ſwells, and a light fungous coal ariſes: a little more of the acid poured upon this coal ſets it inſtantly on fire. By this method almoſt all the diſtilled oils may be fired by ſpirit of nitre of moderate ſtrength. Expreſſed oils alſo may be ſet on fire by a mixture of the nitrous acid and oil of vitriol; the uſe of which laſt ſeems to be to abſorb the aqueous humidity of the ſpirit of nitre.

779 Nitre alkalized.

II. *By Charcoal.* By this ſubſtance the nitrous acid cannot be conveniently decompoſed, unleſs it is combined with an alkaline or metallic baſe. For the purpoſe of decompoſing the acid, common ſaltpetre is moſt convenient. The proportions recommended by Dr Lewis for alkaliſating nitre, are four ounces of the ſalt to five drachms of powdered charcoal. If theſe are carefully mixed, and injected by little and little into a tubulated retort made red hot, and fitted with a large receiver and a number of adopters, a violent deflagration will enſue on every addition, attended with a great quantity of air, and ſome vapours which will circulate for ſome time, and then condenſe in the veſſels. This liquor is called *clyſſus of nitre.* If ſulphur is uſed inſtead of nitre, the clyſſus is of a different kind, conſiſting of a mixture of the nitrous and vitriolic acids. The reſiduum, when charcoal is uſed, is a very ſtrong and pure alkali; with ſulphur it is vitriolated tartar. To prevent the loſs occaſioned by the violent deflagration, when this operation is performed in open veſſels, Dr Black recommends to have the materials ſomewhat moiſt.

780 Clyſſus of nitre.

III. *By Vinous Spirits.* In the proceſs already mentioned for making *ſpiritus nitri dulcis,* a total decompoſition of the acid ſeems to take place: for neither the dulcified ſpirit itſelf, nor the acid matter left in the retort, ſhow any ſigns of deflagration with inflammable matters, which is the peculiar characteriſtic of nitrous acid.

Marine acid and its combinations.

781 Reſiduum of ſpiritus nitri dulcis analized by Mr Pott.

Mr Pott has given an analyſis of the oleaginous reſiduum of the diſtillation. Diſtilled by a ſtronger fire, it gave over a yellow, acid, ſlightly empyreumatic ſpirit; which being ſaturated with fixed alkali, the liquor evaporated, and the dry neutral ſalt laid on burning coals, did not deflagrate. After this ſpirit aroſe a red empyreumatic oil; and in the bottom of the retort was left a ſhining black maſs like ſoot; which, burnt in a crucible, left a white fixed earth, convertible by a vehement fire into glaſs. Another parcel of the above reſiduum was evaporated to the conſiſtence of pitch. In this ſtate it gave a yellow tincture to ſpirit of wine, flamed vividly and quietly on burning coals, and at laſt ſwelled up like bitumen. Another portion was ſaturated with alkaline ley, with which it immediately effervеſced, and then evaporated as the former. It gave, as before, a yellow colour to rectified ſpirit of wine, and a much deeper yellow to dulcified ſpirit of nitre; and in the fire diſcovered no footſtep of detonation. M. Macquer ſuppoſes this acid to have been not the nitrous, but the acetous, which enters into the compoſition of the ſpirit of wine; and his conjecture is now confirmed by late experiments.

§ 3. *Of the* MARINE *Acid and its Combinations.*

782 Marine acid.

THIS acid is never, at leaſt very rarely, found but in a ſtate of ſaturation with the mineral alkali; in which caſe it forms the common ſalt uſed in food. Almoſt the only exception to this is human urine, and perhaps that of ſome other animals; for there the marine acid is found ſaturated, not with the mineral, but the common vegetable, fixed alkali. From being found in ſuch plenty in the waters of the ocean, it has the name of *marine acid.*

783 Marine acid thought to be the ſame with the vitriolic.

It is commonly thought that this acid is no other than the vitriolic, ſomehow or other diſguiſed by the inflammable principle; to which ſome have added another, called by them a *mercurial earth.*

The reaſons given for this ſuppoſition, however, are but very ſlight, conſiſting chiefly in the reſemblance between the volatile vitriolic acid and the marine, both in the white colour of their vapours, and likewiſe the great volatility of both. As to the exiſtence of that principle called a mercurial earth, it hath never been proved; and, till that time, can never be allowed to be an ingredient in the compoſition of any ſubſtance whatever. As we do not remember to have read of any experiments where the marine acid was directly produced from that of vitriol, we ſhall content ourſelves with relating one very remarkable fact which happened to fall under our own obſervation.

784 A tranſmutation.

As vitriolated tartar, or Glauber's ſalt, when fuſed with charcoal duſt, is converted into an hepar ſulphuris, attempts have been made on this principle to ſeparate the pure alkali from the reſiduum of Glauber's ſpirit of nitre and ſpirit of ſalt. In an attempt of this kind, which, by the bye, proved unſucceſsful, as all others of the ſame kind muſt do, 30 or 40 pounds

pounds of the maſs for Glauber's ſalt were fuſed in a ſtrong iron pot, with a ſufficient quantity of common coal powdered and ſifted. As the quantity of powdered coal was pretty large, the maſs was thereby hindered from flowing into thin fuſion; and, that the whole might be perfectly alkaliſated, it was frequently ſtirred up with an iron ladle, and kept very intenſely heated for ſome hours. The maſs was now taken out by means of an iron ladle, and laid on a flat ſtone; and, as it was but half fluid, every ladleful concreted into a black irregular ſaline maſs, which had the appearance of a cinder; but which, however, conſiſted of an hepar ſulphuris mixed with ſome coal-duſt. As there was a conſiderable quantity of this matter, and the ladlefuls were thrown at random above one another, it ſo happened, that between two or three of the pieces, a kind of chimney was formed, ſo that there being a ſmall draught of air through the interſtices, and the maſſes containing a quantity of coal-duſt, the internal parts were in a ſtate of ignition, while the external were quite cold. From theſe ignited places a white fume aroſe; which being collected on the colder maſſes, aſſumed the form of white flowers. Theſe were found to be genuine ſal ammoniac, compoſed of a volatile alkali and marine acid; both of which we have the greateſt reaſon to think were produced at that very time, and that a double tranſmutation took place; namely, of the vitriolic acid into the marine, and of the fixed alkali into the volatile. Our reaſons for being of this opinion are, 1. That the matter had been ſubjected to ſuch an extreme and long continued heat, that, had any ſal ammoniac been pre exiſtent in the mixture, it muſt have certainly been diſſipated, as this ſalt always ſublimes with a degree of heat below ignition. 2. Though the matter was taken out of the pot of a very intenſe red heat, ſo that the ſaline part was evidently melted, yet no ammoniacal fume iſſued from it at that time, nor till the maſſes had been for ſome time expoſed to the air, and were become cool, excepting only thoſe interſtices where the air kept up a burning heat, by a ſmall draught being formed from the ſituation of the ſaline maſſes. 3. In thoſe ignited places, when cool, the fixed ſalt was entirely decompoſed, neither alkaline ſalt, Glauber's ſalt, fixed alkali, nor ſulphur remaining; but the whole was conſumed to a kind of ferruginous aſhes. We are therefore of opinion, that the marine acid and volatile alkali are, in ſome caſes, mere creatures of the fire, and moſt commonly produced at the ſame time, from the ſlow combuſtion of mineral ſubſtances. Hence, where heaps of hot cinders are thrown out, ſmall quantities of the true ſal ammoniac are always formed, when the ignited ones happen to fall in ſuch a manner as to occaſion a ſmall draught of air through them.

785
Dr Prieſtley's obſervations on marine acid.

The marine acid, or ſpirit of ſalt, is weaker than either the vitriolic or nitrous; though Dr Prieſtley hath obſerved, that, when concentrated to the utmoſt degree, in which ſtate it was perfectly inviſible and elaſtic as air, it was then able to ſeparate the nitrous acid from an alkali. In ſome other caſes, too, it appears not only ſtronger than the nitrous, but even than the vitriolic; of which we ſhall take notice in courſe. —Mr Berthollet ſays, that he has been able alſo to procure the marine acid in a ſolid ſtate, by diſtilling it in Mr Woulfe's apparatus, kept perfectly cool with ice.

The yellow colour of the marine acid is ſometimes owing to iron, which may be precipitated from it by means of an alkali. In certain caſes, however, it is obſerved to have a much darker and nearly a brown colour, without containing the ſmalleſt particle of this metal.—Mr Dollfuſs is of opinion, that the yellow colour of the marine acid is owing to a portion of dephlogiſticated air which it generally contains. A pretty ſtrong proof that it emits this kind of air indeed is, that a candle will burn longer in a bottle containing ſome marine acid, than it will in an equal quantity of common air.

I. To procure the Marine Acid by means of the *Vitriolic*.

786
Spirit of ſea-ſalt.

Put any quantity of ſea-ſalt into a tubulated glaſs-retort, to which a large receiver is firmly luted, having a quantity of water in it, more or leſs as you want your ſpirit of ſalt to be more or leſs ſtrong. Having placed your retort in a ſand-bath, take of concentrated oil of vitriol half as much as you put ſalt into the retort. Through the aperture in the upper part of the retort, pour a ſmall quantity of the vitriolic acid; a violent efferveſcence will immediately ariſe, and white vapours will aſcend, and come over into the receiver. Theſe vapours are the marine acid in its moſt concentrated ſtate; and, as they are very greedy of moiſture, they will unite with the water in a very ſhort time, unleſs too much oil of vitriol is put in at once; in which caſe, part of them will be diſſipated through the ſmall hole in the receiver. When you perceive the firſt fumes condenſed, add a little more oil of vitriol, taking care to ſtop the aperture of the retort as ſoon as you drop in the vitriolic acid, that the marine acid may not eſcape. Continue this by intervals, till your acid is all put in; and then make a very gentle fire, that the retort may be no warmer than the hand can bear. This degree of heat muſt be continued a long time, otherwiſe very much of the acid will be loſt. To perform this operation perfectly, no more acid ſhould be forced over, than what the water in the receiver can take up; and by this means the operator's patience will be rewarded with a vaſtly larger produce of acid than can be procured by haſty diſtillation. When the vapours become a little more fixed, a greater heat is neceſſary, but nothing equal to what the nitrous acid requires. For diſtilling ſpirit of ſalt, Mr Wiegleb recommends four pounds of oil of vitriol to ſix of common ſalt.—It may alſo be obtained from the bittern remaining after the cryſtallization of common ſalt, by adding one pound of oil of vitriol to five of bittern. It may even be obtained from this liquid by ſimple diſtillation without any additional acid; but a violent fire will then be neceſſary, and it is almoſt impoſſible to prevent the liquor from ſwelling and running over the neck of the retort in the beginning of the proceſs.

787
Why diſtillation of ſea-ſalt with copperas does not ſucceed.

The marine acid cannot be procured by means of combinations of the vitriolic acid with metallic and earthy baſes, as the nitrous is; for though, by means of calcined vitriol, for inſtance, the marine acid is effectually expelled from its alkaline baſis, yet it immediately combines with the calx of iron left by the vitriolic acid, and not only adheres obſtinately, but even ſublimes the metal; ſo that what little ſpirit can be ob-

obtained, is never pure. This inconvenience is not ſo great when uncalcined copperas is made uſe of: for the marine acid has a very ſtrong attraction to water; which partly diſſolves its union with the metalline calx. If gypſum is uſed, inſtead of calcined vitriol, not a drop of ſpirit will be obtained. Alum and ſal catharticus amarus anſwer better.

II. To procure the Marine Acid by means of the *Nitrous*.

788 Aqua-regis.

Take equal quantities of ſea-ſalt and Glauber's ſpirit of nitre; put the ſalt into a retort, and pour on it the nitrous acid; let them ſtand for 10 or 12 hours; then diſtil with a gentle heat; an acid liquor will come over, which is a compound of the nitrous and marine acids, called *aqua-regis*. When the diſtillation is finiſhed, and the veſſels cooled, pour back the diſtilled liquor on the maſs which is left on the retort, and diſtil again: the ſecond produce will be more of the nature of ſpirit of ſea-ſalt than the former. Continue to do this, pouring the diſtilled liquor either on the maſs left in the retort, or upon freſh ſea-ſalt, till you obſerve that no nitrous acid ariſes. No experiments have been made on this ſpirit of ſalt, by which we can judge whether it is different from that procured by the vitriolic acid or not.

III. To procure the Marine Acid, by diſtilling Salt *per ſe*.

789 Spirit of ſalt *per ſe*.

Put into a retort any quantity of common ſalt which has not been dried, and diſtil in a ſand-heat till nothing more will come over. In the receiver you will have a liquor conſiderably more acid than vinegar, in weight about the fourth part of the ſalt employed. On the dry ſalt left in the retort, pour ſome water, ſomewhat leſs in quantity than the liquor which came over. Let it ſtand till the ſalt has thoroughly imbibed the moiſture, and then diſtil again. You will again have an acid, but weaker than the former. Repeat this ſix or ſeven times; after which you will obtain no more marine acid in this way. It has been thought that ſea-ſalt was capable of total decompoſition by means of moiſture alone; but that is found to be a miſtake. The reaſon of any acid being procurable in this way, is the impurity of the common ſalt, which is always mixed with a quantity of ſal catharticus amarus, and of marine acid combined with magneſia, from which laſt it is ſeparable by moiſture. If a pure ſalt be formed by combining marine acid with ſalt of ſoda, no ſpirit will be obtained.

IV. To dephlogiſticate the Marine Acid.

790 Marine acid dephlogiſticated by that of nitre or by manganeſe.

The marine acid, when mixed either with that of nitre or with manganeſe, loſes that peculiar ſmell by which it is uſually diſtinguiſhed, and acquires one much more volatile and ſuffocating. When mixed with the former, the compound is called *aqua-regia*; when ſubjected to the action of manganeſe, the product is called *dephlogiſticated ſpirit of ſalt*. The method of procuring this acid recommended by Mr Scheele is as follows:

791 Scheele's method of dephlogiſticating it by manganeſe.

Mix common muriatic acid in any quantity with levigated manganeſe in a glaſs retort; to which lute on with blotting paper a receiver capable of containing about 12 ounces of water. Put about two drachms of liquid into it; and in about a quarter of an hour, or ſomewhat more, a quantity of elaſtic fluid, which is the true dephlogiſticated ſpirit of ſalt, will paſs over, and communicate a yellow colour to the air in the receiver; after which the latter is to be ſeparated from the retort. If the paper has been cloſely applied, a quantity of the air will now ruſh out with ſome violence; a cork muſt therefore inſtantly be put into it, and another receiver applied, having in like manner two drachms of water in it, which will alſo be filled in a ſhort time; and thus may ſeveral phials full of this aerial acid be procured in a ſhort time. Care ſhould be taken, that the retort be placed in ſuch a manner as that any drops of liquid which chance to ariſe may fall down again into it. The water put into the receivers ſeems to condenſe the vapours of the marine acid; and it is moſt proper to uſe ſmall receivers, on account of the great quantity of vapour which is loſt at every operation.

792 Properties of dephlogiſticated ſpirit of ſalt.

The effects of this dephlogiſticated marine acid, which can ſcarcely be condenſed into a liquid, are, 1. The lute is corroded in diſtillation, and the corks become yellow, as from aquafortis. 2. Paper coloured with lacmus becomes nearly white, as well as all vegetable red, blue, and yellow flowers; and the ſame change is likewiſe produced upon the green colour of vegetables; nor can any of theſe colours be recovered either by alkalies or acids. 3. Expreſſed oils and animal fats, expoſed to the vapour, become as tenacious as turpentine. 4. Cinnabar grew white on the ſurface; and when it was waſhed, a pure ſolution of corroſive ſublimate was obtained; but ſulphur was not changed. 5. Green vitriol became red and deliqueſcent; but white and blue vitriol remained unchanged. 6. Iron filings were diſſolved; and on evaporating the ſolution to dryneſs, common muriatic acid was obtained by diſtillation with marine acid. 7. In like manner all the metals, even gold itſelf, were diſſolved; and by precipitation with volatile alkali, the ſolution of gold yielded aurum fulminans. 8. The cauſtic volatile alkali produced a white cloud, and emitted a number of air-bubbles, which on burſting diſcharged an elaſtic vapour. 9. Fixed alkali was changed into common ſalt, which decrepitated in the fire. 10. Arſenic became deliqueſcent, inſects died, and fire was inſtantaneouſly extinguiſhed in the vapour.

793 Miſtake of Stahl accounted for.

Theſe phenomena proceed from the ſtrong attraction of dephlogiſticated marine acid for the phlogiſton it has loſt; and which is one of the eſſential parts of it, without which it can ſcarce at all be condenſed into a liquor. "Perhaps (ſays Mr Scheele) Stahl obtained ſuch a dephlogiſticated muriatic acid by means of iron; and from the yellow colour of the cork was led to ſuppoſe that the muriatic acid had been changed into the nitrous. If you make a mixture of manganeſe, muriatic acid, or diluted vitriolic acid, and alcohol; and after ſome days digeſtion diſtil it by a gentle fire, no efferveſcence enſues: but the ſpirit of wine goes over; and, what is very remarkable, has a ſtrong ſmell of nitrous ether.

2d 793 New ſalt reſembling nitre by Mr Berthollet.

A new ſalt has been produced by Mr Berthollet from the union of dephlogiſticated ſpirit of ſalt with vegetable alkali. This appears to be of the nitrous kind, as having a cool taſte and detonating ſtrongly in the fire. The compound was in very ſmall quantity, and ſeemed to require more pure air for its compoſition than an equal bulk of acid. The greateſt part of the ſalt produced was the common ſalt of Sylvius, or digeſtive ſalt, formed by a combination of the phlogiſticated marine acid with alkali. Six parts of the dephlogiſticated acid are required to give their air to one of the ſalt. When the fixed alkali is employed, ſome of the dephlogiſticated acid eſcapes with the pure air; and in general, when not expoſed to a bright heat, the ſalt we ſpeak of is formed. Some of the dephlogiſticated acid remains in its proper form after the ſalt is made, and may be ſeparated by the volatile alkali. It is to be obſerved, that if the cauſtic alkali be employed, and the ſolution much concentrated, even though not under the influence of a bright light (for it is the light which produces the extrication of the dephlogiſticated air*), a great effervеſcence will enſue, and a quantity of dephlogiſticated air eſcape; whence of conſequence, little ſalt can be obtained.

This ſalt is ſoluble in greater quantity in hot than in cold water; and not only detonates like nitre, but with much greater violence. The reaſon is, that, like nitre, it not only contains dephlogiſticated air, but has it in greater quantity; an hundred grains of ſalt giving 75 of air. Attempts have been made to procure gunpowder by means of this ſalt, but as yet they have been attended with little ſucceſs.

The other properties of this ſalt as yet diſcovered are, that it ſhoots into rhomboidal cryſtals; it does not precipitate mercury, ſilver, or lead, from their ſolutions in nitrous acid; and it gives out its air again in ſuch a pure ſtate as ſcarcely to be paralleled in any other ſubſtance.

With the mineral alkali the dephlogiſticated acid forms a deliqueſcent ſalt, ſoluble in ſpirit of wine; and which, even in a fluid ſtate, detonates with burning charcoal. With lime, when ſo far quenched that the air in its interſtices is ſeparated, the dephlogiſticated acid unites but weakly. It may be recovered from the lime, however, provided the light be obſcure, with very little loſs, and almoſt unchanged.

Marine Acid COMBINED,

794 Sal digeſtivus ſylvii.

I. *With Vegetable Fixed Alkali.* This combination is accidentally formed after the diſtillation of volatile ſalts, by means of ſalt of tartar (ſee *Alkaline Salts*). It was formerly known by the name of *ſal digeſtivus Sylvii;* and a proceſs for making it was inſerted in the diſpenſatories, under the name of *ſpiritus ſalis marini coagulatus;* but as it has been found to poſſeſs no virtues ſuperior, or even equal, to common ſalt, it is fallen into diſuſe.

The cryſtals of this kind of ſalt are not cubical, like thoſe of common ſalt, but parallelopipeds, and if thrown into the fire crack and leap about with violence. They are ſoluble in greater quantity by hot water than cold; and therefore are cryſtallized by evaporating the ſolution to a pellicle, and then letting it cool.—It is very remarkable, that though by a direct combination of vitriolic acid with vegetable fixed alkali, the ſalt called *vitriolated tartar* is formed; yet if this alkali is once ſaturated with ſpirit of ſalt, ſo as to form a *ſal digeſtivus*, upon the decompoſition of this ſalt by means of oil of vitriol, the reſiduum of the diſtillation will not be a vitriolated tartar, but a ſalt eaſily ſoluble in water, and which bears a ſtrong reſemblance to Glauber's ſalt. Whether, by means of ſpirit of ſea-ſalt, the vegetable alkali could be converted into the mineral, or ſalt of ſoda, is a queſtion well worthy of being ſolved.

II. *With Minenal Alkali.* This combination is the common alimentary ſalt, and is never made but for experiment's ſake; as the marine acid cannot be had but from ſea-ſalt. For the extraction of this ſalt from ſea-water, ſee the article SALT.

795 Sal ammoniac.

III. *With Volatile Alkali.* The produce of this combination is the common ſal ammoniac, which is uſed in different arts, and which has the property of making tin unite very readily with iron and copper, ſo is much uſed by copperſmiths and in the manufactory of tinned iron.

Sal ammoniac is uſually ſold in large ſemi-tranſparent cakes, which are again capable of being ſublimed into maſſes of the like kind. If they are diſſolved in water, the ſalt very eaſily ſhoots into ſmall cryſtals like feathers. Expoſed to a moiſt air, it deliquates. It is one of the ſalts which produces the moſt cold by its ſolution; ſo as to ſink the thermometer 18 or 20 degrees, or more, according to the temperature of the atmoſphere. According to Mr Gellert, a ſolution of ſal ammoniac has the property of diſſolving reſins. According to Neumann, the volatility of ſal ammoniac is ſo much diminiſhed by repeated ſublimations, that at laſt it remains half fluid in the bottom of the ſubliming veſſel. In its natural ſtate, it ſublimes with a degree of heat neceſſary to melt lead. Pott ſays, that a ſmall quantity of ſal ammoniac may be produced by diſtilling ſea-ſalt with charcoal, or with alum, or by diſtilling marine acid with Armenian bole. The ſame author affirms, that the inflammability of ſulphur is deſtroyed by ſubliming it with twice its quantity of ſal ammoniac.

796 How made.

The method of making this ſalt was long unknown; and it was imported from Egypt, where it was ſaid to be prepared by ſublimation from ſoot alone, or from a mixture of ſea-ſalt, urine, and ſoot. That it ſhould be produced from ſoot alone is very improbable; and the other method, from the known principles of chemiſtry, is abſolutely impoſſible. The compoſition of this ſalt, however, being once known, there remained no other deſideratum than a method of procuring thoſe competent parts of ſal ammoniac ſufficiently cheap, ſo as to afford ſal ammoniac made in Britain at a price equally low with what was imported. The volatile alkali is to be procured in plenty from animal ſubſtances or from ſoot; and the low price of the vitriolic acid made from ſulphur affords an eaſy method of decompoſing ſea-ſalt, and obtaining its acid at a low rate. A ſal ammoniac work has, accordingly, been eſtabliſhed for ſeveral years paſt in Edinburgh; the principal material made choice of for procuring the volatile alkali is ſoot; and though no perſons are admitted to ſee the work, the large quantities of oil of vitriol brought into it, and the quantities of genuine *ſal mirabile* which are there made, evidently ſhow that the proceſs for making ſal ammoniac alſo produces Glauber's ſalt, by the decompoſition of common ſalt by means of vitriolic acid. The method of conducting the proceſs is unknown; but it is plain that there can be no other difficulty than what ariſes from the volatility of the vapours of the alkali and of the marine acid. In the common way of diſtilling thoſe ſubſtances, a great part of both is loſt; and if it is attempted to make ſal ammoniac by combining theſe two when diſtilled by the common apparatus, the pro-

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* See *Aërology*, nº 36, *et ſeq.*

duce will not pay the coſt; a little ingenuity, however, will eaſily ſuggeſt different forms and materials for diſtilling-veſſels, by which the marine acid and volatile alkali may be united without loſing a particle of either.

If a ſolution of vitriolic or Glauber's ſecret ſal ammoniac is mixed with ſea-ſalt, the vitriolic acid ſeizes the alkaline baſis of the ſea-ſalt, and expels the marine acid; which immediately unites with the volatile alkali left by the vitriolic acid, and forms a true ſal ammoniac. If this ſolution is now evaporated to dryneſs, and the ſaline maſs ſublimed, the ſal ammoniac riſes, and leaves a combination of vitriolic acid and mineral alkali at the bottom. This fixed maſs being diſſolved, filtered, and evaporated, affords Glauber's ſalts. This has ſometimes been thought a preferable method of making ſal ammoniac, as the trouble of diſtilling the marine acid was thereby prevented; but it is found vaſtly inconvenient on another account, namely, that when ſal ammoniac is mixed with any fixed ſalt, it is always more difficult of ſublimation, and a part of it even remains entirely fixed, or is deſtroyed. The maſs of Glauber's ſalt alſo, by reaſon of the inflammable and oily matter contained in impure volatile alkalies, is partly changed into a ſulphureous maſs, ſo that the ſolution refuſes to cryſtallize; at leaſt the operation is attended with intolerable trouble.

797 Fixed ſal ammoniac.

IV. *With Earths.* The combinations of this acid with earths of any kind have never been found applicable to any purpoſe, and therefore they are ſeldom made or inquired into. The combination with calcareous earth is indeed pretty frequently made accidentally, in the diſtillation of volatile alkali from ſal ammoniac by means of chalk or quicklime. When melted in a crucible and cooled, it appears luminous when ſtruck, and has been called *phoſphorus ſcintillans*. See Earths.

798 Phoſphorus.

799 Solution of gold in ſpirit of ſalt.

V. *With Gold.* The marine acid has no action on gold in its metallic ſtate, in whatever manner the acid be applied; but if the metal is previouſly attenuated, or reduced to a calx, either by precipitation from aqua-regis or by calcination in mixture with calcinable metals, this acid will then perfectly diſſolve, and keep it permanently ſuſpended. Gold, precipitated from aqua-regis by fixed alkalies, and edulcorated by repeated ablutions, may be diſſolved even in a very weak ſpirit of ſalt by moderate digeſtion. This ſolution appears of the ſame yellow colour as that made in aqua-regis; gives the purple ſtain to the ſkin, feathers, bones, and other ſolid parts of animals; the ſame violet ſtain to marble; and ſtrikes the ſame red colour with tin. Even when common aqua-regia is made uſe of for the menſtruum, it ſeems to be chiefly by the marine acid in that compound liquor that the gold is held in ſolution. In diſtillation the nitrous acid ariſes, and the marine acid remains combined with the gold in a blood-red maſs, ſoluble, like moſt of the combinations of metallic bodies with this acid, in ſpirit of wine. If, towards the end of the diſtillation, the fire is haſtily raiſed, part of the gold diſtils in a high ſaffron-coloured liquor; and part ſublimes into the neck of the retort in cluſters of long ſlender cryſtals of a deep red colour, fuſible in a ſmall heat, deliquating in the air, and eaſily ſoluble in water. By repetitions of this proceſs the whole of the gold may be elevated, except a ſmall quantity of white powder whoſe nature is not known.—This red ſublimate of gold is ſaid to be eaſily fuſible with the heat of one's hand, and to be ſhown by the Papiſts for the blood of St Januarius; the ſublimate contained in a phial, being warmed by the hands of the prieſts who hold it, conſtitutes the miracle of that ſaint's blood melting on his birth-day.

800 Blood of St Januarius.

801 Silver.

VI. *With Silver.* Strong ſpirit of ſalt corrodes leaf-ſilver into a white powder, but has no effect on filings or larger maſſes of the metal. If applied in the form of vapour to maſſes of ſilver, and ſtrongly heated at the ſame time, it readily corrodes them. Thus, if filings, grains, or plates, of ſilver are mixed with about twice their weight of mercury ſublimate, and expoſed to a moderate fire, in a retort, or other diſtilling veſſel, a part of the marine acid in the ſublimate will be ſeparated and unite with the ſilver, leaving the mercury to ariſe in the form of mercurius dulcis. Marine acid is commonly ſuppoſed to be incapable of diſſolving ſilver into a liquid ſtate; but Henckel relates, that if red ſilver ore, which conſiſts of ſilver intimately mixed with red arſenic, be digeſted in ſpirit of ſalt, the ſilver will be extracted and kept permanently diſſolved.

802 Luna cornea.

The combination of marine acid with ſilver is called *luna cornea*. The moſt ready way of preparing it is by diſſolving ſilver in the nitrous acid, and then adding ſpirit of ſalt, or a ſolution of ſea-ſalt, when a precipitation inſtantly enſues; the marine acid expels the nitrous, and uniting with the ſilver, falls to the bottom in form of a white powder. The ſame precipitation would take place, if a ſolution of ſilver was made in the vitriolic acid.

803 Its properties.

Luna cornea weighs one-fourth more than the ſilver employed; yet, when perfectly waſhed, it is quite inſipid to the taſte. It does not diſſolve in water, ſpirit of wine, aqua-fortis, or aqua-regis; but is in ſome ſmall degree acted upon by the vitriolic acid. It melts in the fire as ſoon as it grows red-hot; and, on cooling, forms a ponderous browniſh maſs, which being caſt into thin plates, becomes ſemitranſparent, and ſomewhat flexible, like horn; whence its name *luna cornea*. A ſtronger fire does not expel the acid from the metal, the whole concrete either ſubliming entire, or paſſing through the crucible. It totally diſſolves in volatile alkaline ſpirits without any ſeparation of the metal. Expoſed to the fire in a cloſe copper veſſel, it penetrates the copper, and tinges it throughout of a ſilver colour. Kunckel obſerves, that when carefully prepared, melted in a glaſs veſſel, and ſuffered to cool ſlowly, to prevent its cracking, it proves clear and tranſparent; and may be turned into a lathe and formed into elegant figures. He ſuppoſes this to be the preparation which gave riſe to the notion of malleable glaſs.

804 Copper.

VII. *With Copper.* In the marine acid, copper diſſolves but ſlowly. The ſolution, if made without heat, appears at firſt brown; but, on ſtanding for ſome time, depoſits a white ſediment, and becomes green. On adding freſh copper, it becomes brown again, and now recovers its greenneſs more ſlowly than before. The white ſediment, on being barely melted, proves pure and perfect copper of the ſame colour as at firſt. Copper calcined by fire communicates a reddiſh colour to this acid.

805 Iron.

VIII. *With Iron.* The marine acid acts upon iron leſs

leſs vehemently than the nitrous, and does not diſſolve ſo much; nevertheleſs, it attacks the metal briſkly, ſo as to raiſe conſiderable heat and efferveſcence, and diſſolve it into a yellow liquor. During the ſolution, an inflammable vapour ariſes as in the ſolution of this metal by vitriolic acid. This ſolution of iron does not cryſtallize. If it is evaporated, it leaves a greeniſh ſaline maſs, which is ſoluble in ſpirit of wine, and runs in the air into a aſtringent yellow liquor.

806 **Iron volatilized.**

On diſtillation, ſome of the acid ſeparates, and towards the end of the operation the ſpirit becomes yellow. This is followed by a yellowiſh or deep reddiſh ſublimate, which gliſtens like the ſcales of fiſhes; leaving behind a ſubſtance which conſiſts of thin, gloſſy plates, like talc.

807 **Tinctura martis.**

The ſolution of iron in ſpirit of ſalt, with the addition of ſome ſpirit of wine, is uſed in medicine as a corroborant, under the name of *tinctura martis*. The ſublimate of iron is alſo uſed for the ſame purpoſe, and called *ens veneris*, or *flores martiales*. It is commonly directed to be prepared by ſubliming iron filings and ſal ammoniac together. In the proceſs, the ſal ammoniac is partly decompoſed, and a cauſtic alkaline liquor diſtils.

808 **Flores martiales.**

Then the undecompoſed ſal ammoniac, and the martial ſublimate abovementioned, ariſe together. The ſublimate has a deeper or lighter yellow colour, according as it contains more or leſs iron. The name *ens veneris* is improper. It was given by Mr Boyle, who diſcovered this medicine. He imagined it to be a preparation of copper, having made uſe of a colcothar of vitriol containing both iron and copper.

2d 808 **Beſtuchef's tincture.**

A medicine of this kind was lately ſold with great reputation on the Continent, under the name of *Beſtuchef's nervous tincture*. It was introduced by M. Beſtuchef Field Marſhal in the Ruſſian ſervice: but not long after it came into vogue in Pruſſia and other northern kingdoms of Europe: it made its appearance alſo in France, under the name of *General de la Motte's golden drops*. This happened through the infidelity of Beſtuchef's operator, who, for a ſum of money, violated the oath of ſecrecy he had taken to Beſtuchef, and diſcovered the ſecret to de la Motte. To the latter it proved a very valuable acquiſition; for he not only procured a patent for it from the king of France in 1730, with the excluſive privilege of ſelling it, but had a handſome penſion ſettled upon him; ſelling his medicine beſides a half a Louis d'or per phial.

3d 808 **Miſtakes concerning it.**

The attention of the public was particularly drawn to theſe drops, by their remarkable property of loſing their yellow colour in the ſun, and regaining it in the ſhade, which induced many to believe that they contained gold; and in which opinion they were encouraged by de la Motte. Even chemiſts of no little reputation were deceived by this appearance; and M. Beaumé, imagining he had diſcovered the ſecret, publiſhed a preparation to the world as the true arcanum of la Motte's drops. It conſiſted of a calx of gold precipitated from aqua-regia by means of fixed alkali, and rediſſolved in nitrous acid, to which was added a large quantity of ſpirit of wine. Others, however, who could find nothing but iron by an analyſis of the drops, refuſed their aſſent; and at length, in 1780, M. Beaumé's miſtake was made evident by the publication of the proceſs at the deſire of the empreſs of Ruſſia, who gave 3000 rubles for the receipt.

4th 808 **True method of preparing it.**

The original *recipe* is perplexed, tedious, and expenſive; but when deprived of its ſuperfluous parts, is nearly as follows. Six pounds of common pyrites and twelve of corroſive ſublimate are to be triturated together, and then ſublimed ſix or eight times till all the mercury is expelled. The reſiduum is to be boiled three times with thrice its quantity of water, and as often filtered, and laſtly, diſtilled to dryneſs. By increaſing the fire, a martial ſalt is at laſt ſublimed into the neck of the retort; to three drachms of which are to be added 12 ounces of highly rectified ſpirit of wine, and the whole expoſed to the rays of the ſun. This is the yellow tincture; but there was alſo a white one, which, however, ſeems to be but of little value. It is made by pouring on the reſiduum of the laſt ſublimation twelve pounds of highly rectified ſpirit of wine, and drawing it off by a gentle diſtillation after a few days digeſtion.

5th 808 **Suppoſed to abſorb phlogiſton from the ſun's rays.**

—Mr Klaproth imagines, from the following experiment, that Beſtuchef's tincture abſorbs phlogiſton from the rays of the ſun. He poured a few drops of a ſolution of tartar into two ounces of diſtilled water, and divided this into two parts. Into one glaſs having poured a few drops of the tincture that had not been expoſed to the ſun, the iron was precipitated in the uſual form of a yellow ochre; but on treating in the ſame manner a portion of the tincture that had been expoſed to the ſolar rays, the precipitate fell of a bluiſh green colour.

809 **Solution of tin.**

IX. *With Tin.* Though the concentrated marine acid has a greater attraction for tin than any other acid, it does not readily diſſolve this metal while the acid is in its liquid ſtate; but may be made to diſſolve it perfectly by the addition of a ſmall quantity of ſpirit of nitre. Neumann obſerves, that an ounce of ſpirit of ſalt, with only a ſcruple of ſpirit of nitre, diſſolved tin perfectly: but on inverting the proportions, and taking a ſcruple of marine acid to an ounce of the nitrous, four ſcruples, or four and an half, of tin, were diſſolved into a thick pap; ſome more of the marine acid being gradually added, the whole was diſſolved into a clear liquor. In making theſe ſolutions, a ſmall quantity of black matter uſually ſubſides.

The ſolution of tin is ſometimes colourleſs; ſometimes of a bluiſh, or yellow colour, according to different circumſtances of the proceſs. It is of the greateſt conſequence in dyeing, by not only heightening the colours, but making them more durable (See DYEING). It ſhoots into ſmall cryſtals; and, if inſpiſſated, deliquates in the air.

810 **Smoking liquor of Libavius.**

Marine acid in its concentrated ſtate volatilizes tin, and forms with it a thick liquor, which, from its inventor, is called *ſmoking liquor of Libavius*. To prepare this ſmoking liquor, an amalgam muſt be made of four parts of tin and five of mercury. This amalgam is to be mixed with an equal weight of corroſive mercury. by triturating the whole together in a glaſs mortar. The mixture is then to be put into a glaſs retort, and the diſtillation performed with a fire gradually increaſed. A very ſmoking liquor paſſes into the receiver; and towards the end of the diſtillation, a thick, and even concrete matter. When the operation is finiſhed, the liquor is to be poured quickly into a cryſtal glaſs-bottle, with a glaſs ſtopper. When this bottle is opened, a white, copious, thick, the poignant fume iſſues, which remains long in the air without diſappearing.

The acid in this liquor is far from being ſaturated, and

and is capable of ſtill diſſolving much tin in the ordinary way. From this imperfect ſaturation, together with its concentration, proceeds partly its property of ſmoking ſo conſiderably: nevertheleſs, ſome other cauſe probably concurs to give it this property; for though it ſmokes infinitely more than the moſt concentrated ſpirit of ſalt, its vapours are, notwithſtanding, much leſs elaſtic. It has all the other properties of concentrated marine acid when imperfectly ſaturated with tin. If it is diluted with much water, moſt of the metal ſeparates in light white flocks. In dyeing, it produces the ſame effects as ſolution of tin made in the common way. If the diſtillation is continued after the ſmoking liquor of Libavius has come over, the mercury of the corroſive ſublimate will then ariſe in its proper form.

811 Lead.

X. *With Lead.* Marine acid, whether in its concentrated or diluted ſtate, has little effect upon lead, unleſs aſſiſted by heat. If ſpirit of ſalt is poured on filings of lead, and the heat is increaſed ſo as to make the liquor boil and diſtil, a part of the acid will be retained by the metal, which will be corroded into a ſaline maſs; and this, by a repetition of the proceſs, may be diſſolved into a limpid liquor. If lead is diſſolved in aquafortis, and ſpirit of ſea-ſalt, or ſea-ſalt itſelf, added, a precipitation of the metal enſues; but if ſome aqua-regia is added, the precipitate is rediſſolved.

812 Plumbum corneum.

The combination of lead with marine acid, has, when melted, ſome degree of tranſparency and flexibility like horn; whence, and from its reſemblance to luna cornea, it is called *plumbum corneum*. This ſubſtance is uſed in preparing phoſphorus, according to Mr Margraaf's method.

813 Quickſilver.

XI. *With Quickſilver.* Marine acid in its limpid ſtate, whether concentrated or diluted, has no effect upon quickſilver, even when aſſiſted by a boiling heat; but if mercury is diſſolved in the vitriolic or nitrous acids, and ſea-ſalt, or its ſpirit, is added to the ſolution, it immediately precipitates the quickſilver in the ſame manner as it does ſilver or lead.
814 Corroſive ſublimate.
If concentrated marine acid, in the form of vapour, and ſtrongly heated, meets with mercury in the ſame ſtate, a very intimate union takes place; and the produce is a moſt violent corroſive and poiſonous ſalt, called *corroſive ſublimate mercury*. This ſalt is ſoluble, though ſparingly, in water; but is far from being perfectly ſaturated with mercury; for it will readily unite with almoſt its own weight of freſh quickſilver, and ſublime with it into a ſolid white maſs (which, when levigated, aſſumes a yellowiſh colour) called *mercurius dulcis*, *aquila alba*, or *calomel*.

815 Different methods of making.

There have been many different ways of preparing corroſive mercury, recommended by different chemiſts. Neumann mentions no fewer than ten. 1. From mercury, common ſalt, nitre, and vitriol. 2. From mercury, common ſalt, and vitriol. 3. Mercury, common ſalt, and ſpirit of nitre. 4. Solution of mercury in aquafortis, and ſalt. 5. Solution of mercury in aquafortis, and ſpirit of ſalt, or the white precipitate. 6. Mercury, common ſalt, nitre, and oil of vitriol. 7. Edulcorated turbith mineral, and common ſalt. 8. Red precipitate, common ſalt, and oil of vitriol. 9. Edulcorated turbith mineral, and ſpirit of ſalt. 10. Mercury, ſal ammoniac, and oil of vitriol.

From a view of theſe different methods, it is evident, that the intention of them all is to combine the marine acid with quickſilver; and as this combination can be effected without making uſe of the nitrous acid, the greateſt chemiſts have imagined that this acid, which is by far the moſt expenſive of the three, might be thrown out of the proceſs altogether, and the ſublimate be more conveniently made by directly combining marine acid and mercury in a proceſs ſimilar to the diſtillation of ſpirit of ſalt. This method was formerly recommended by Kunckel; then publiſhed in the memoirs of the Academy of Sciences for 1730; and has been adopted and recommended by Dr Lewis.

The proceſs conſiſts in diſſolving mercury in the vitriolic acid, as directed for making turbith mineral. The white maſs remaining on the exſiccation of this ſolution is to be triturated with an equal weight of dried ſalt, and the mixture is then to be ſublimed in a ſand-heat; gradually increaſing the fire till nothing more ariſes.

816 Differences of quality.

Neumann obſerves, that there is a conſiderable difference in the quality of ſublimates made by the different methods he mentions; particularly in thoſe made with or without nitre. This we have alſo found to be the caſe; and that ſublimate made without the nitrous acid is never ſo corroſive, or ſoluble in water, as that which is made with it: nor will it afterwards take up ſo large a quantity of crude mercury as it otherwiſe would, when it is to be formed into calomel. The above proceſs, therefore, tho' very convenient and eaſy, is to be rejected; and ſome other in which the nitrous acid is uſed, ſubſtituted in its ſtead. The reaſon of theſe differences is, that the ſpirit of ſalt muſt by ſome means or other be dephlogiſticated before it can unite in ſufficient quantity with the metal, into the compound deſired, which is accompliſhed by the addition of nitrous acid.

From Tachenius, Neumann gives us the following proceſs, which he ſays was the method of making ſublimate at London, Venice, and Amſterdam. Two hundred and eighty pounds of quickſilver, 400 pounds of calcined vitriol, 200 pounds of nitre, the ſame quantity of common ſalt, and 50 pounds of the caput mortuum remaining after a former ſublimation, or (in want of it) of the caput mortuum of aquafortis, making, in all, 1130 pounds, are well ground, and mixed together; then ſet to ſublime in proper glaſſes placed in warm aſhes, the fire is increaſed by degrees, and continued for five days and nights. In the making ſuch large quantities, he ſays, ſome precautions are neceſſary, and which thoſe conſtantly employed herein are beſt acquainted with. The principal are, the due mixture of the ingredients, which in ſome places is performed in the ſame manner as that of the ingredients for gun-powder: that a head and receiver be adapted to the ſubliming glaſs, to ſave ſome ſpirit of nitre which will come over. (Here a bent tube of glaſs will anſwer the purpoſe, as already mentioned). The fire muſt not be raiſed too haſtily. When the ſublimate begins to form, the aſhes muſt be removed a little from the ſides of the glaſs, or the glaſs cautiouſly raiſed up a little from the aſhes. (This laſt, we think, is highly imprudent.) Laſtly, the laboratory muſt have a good chimney, capable of carrying off the noxious fumes. The above-mentioned quantities commonly yield 360 pounds of ſublimate; the 280 pounds of quickſilver gaining 80 from the 200 pounds of ſea-ſalt. The makers of ſublimate

limate in France, he ſays, employ, in one operation, only 20 pounds of mercury. This they diſſolve in aquafortis, evaporate the ſolution to dryneſs, mix the dry matter with 20 pounds of decrepitated ſea-ſalt and 60 of calcined vitriol, and then proceed to ſublimation.

817 Obſervations on the different methods.

The above proceſſes, particularly the laſt, are unexceptionable as to the production of a ſublimate perfectly corroſive; but the operation, it is evident, muſt be attended with conſiderable difficulty, by reaſon of the large quantity of matter put into the glaſs at once. We muſt remember, that always on mixing a volatile ſalt with a quantity of fixed matter, the ſublimation of it becomes more difficult than it would have been had no ſuch matter been mixed with it. It is of conſiderable conſequence, therefore, in all ſublimations, to make the quantity of matter put into the glaſs as little as poſſible. It would ſeem more proper, inſtead of the calcined vitriol uſed in the proceſſes laſt mentioned, to diſſolve the mercury in the vitriolic acid, as directed in turbith mineral, and ſublime the dry maſs mixed with nitre and ſea-ſalt.

818 Suppoſed adulteration with arſenic.

It has been ſaid, that corroſive ſublimate mercury was frequently adulterated with arſenic; and means have even been pointed out for detecting this ſuppoſed adulteration. Theſe means are, to diſſolve a little of the ſuſpected ſalt in water, and add an alkaline lixivium to precipitate the mercury. If the precipitate was of a black colour, it was ſaid to be a certain ſign of arſenic. This, however, ſhows nothing at all, but that either the alkali contains ſome inflammable matter, which, joining with the precipitate, makes it appear black; or that the ſublimate is not perfectly corroſive; for if a volatile alkali is poured on levigated *mercurius dulcis*, the place it touches is inſtantly turned black.

819 Mercurius dulcis.

Mercurius dulcis, or calomel, is prepared by mixing equal parts, or at leaſt three of quickſilver with four of ſublimate; after being thoroughly ground together in a glaſs or ſtone mortar, they are to be poured through a long funnel into a bolt-head, and then ſublimed. The medicine has been thought to be improved by repeated ſublimations, but this is found to be a miſtake. Mr Beaumé has found that mercurius dulcis cannot be united with corroſive ſublimate in the way of ſublimation; the former, by reaſon of its ſuperior volatility, always riſes to the top of the veſſel.

820 Zinc volatilized.

XII. *With Zinc.* This ſemimetal diſſolves readily in the marine acid into a tranſparent colourleſs liquor. It is volatilized, as well as moſt other metallic ſubſtances by this combination, as appears from the following proceſs delivered by Neumann.

“ Equal parts of filings of zinc and powdered ſal ammoniac being mixed together, and urged with a gradual fire in a retort; at firſt aroſe, in a very gentle heat, an exceſſively penetrating volatile ſpirit, ſo ſtrong as to ſtrike a man down who ſhould inadvertently receive its vapour freely into the noſe. This came over in ſubtile vapours, and was followed by a ſpirit of ſalt in denſe white fumes. In an open fire, white flowers ſucceeded; and at length a reddiſh and a black butter. In the bottom of the retort was found a portion of the zinc in its metallic form, with a little ponderous and fixed butyraceous matter which liquefied in the air. The lump was far more brittle than zinc ordinarily is; of a reddiſh colour on the outſide, and blackiſh within. The bottom of the retort was variegated with yellow and red colours, and looked extremely beautiful. The remaining zinc was mixed afreſh with equal its weight of ſal ammoniac, and the proceſs repeated. A volatile alkaline ſpirit and marine acid were obtained as at firſt; and in the retort was found only a little black matter. When the zinc was taken at firſt in twice the quantity of the ſal ammoniac, the part that preſerved its metallic form proved leſs brittle than in the foregoing experiment, and the retort appeared variegated in the ſame manner. On endeavouring to rectify the buttter, the retort parted in two by the time that one half had diſtilled.” The nature of this combination is unknown.

821 Butter of antimony.

XIII. *With Regulus of Antimony.* This ſemimetal cannot be united with the marine acid unleſs the latter is in its moſt concentrated ſtate. The produce is an exceſſively cauſtic thick liquid, called *butter of antimony*. The proceſs for obtainining this butter is ſimilar to that for diſtilling the ſmoking ſpirit of Libavius. Either crude antimony, or its regulus, may be uſed: for the ſpirit of ſalt will attack the reguline part of this mineral without touching the ſulphureous. Three parts of corroſive ſublimate are to be mixed with one of crude antimony; the mixture to be digeſted in a retort ſet in a ſand-heat; the marine acid in the ſublimate will unite with the reguline part of the antimony. Upon increaſing the fire, the regulus ariſes, diſſolved in the concentrated acid, not into a liquid form, but that of a thick unctuous ſubſtance like butter, from whence it takes its name. This ſubſtance liquefies by heat, and requires the cautious application of a live coal to melt it down from the neck of the retort. By rectification, or expoſure to the air, it becomes fluid like oil but ſtill retains the name of butter. If water is added to butter of antimony, either when in a butyraceous form, or when become fluid by rectification, the antimony is precipitated in a white powder called *powder of algaroth*, and improperly *mercurius vitæ*. This powder is a violent and very unſafe emetic. The butter itſelf was formerly uſed as a cauſtic; but it was totally neglected in the preſent practice, until lately that it has been recommended as the moſt proper material for preparing emetic tartar. (See below.) Mr Dollfuſs recommends the following method as the beſt for making butter of antimony; *viz.* two ounces and a quarter of the grey calx of antimony, eight ounces of common ſalt, and ſix of acid of vitriol. By diſtilling this mixture, ten ounces of the antimonial cauſtic were obtained; and in order to determine the quantity of metal contained in it, he mixed two ounces of the cauſtic with four ounces of water; but thus ſuch a ſtrong coagulum was formed, that he was not able to pour off any of the water even after ſtanding 24 hours. The precipitate, when carefully dried, weighed 50 grains. The reſult was much the ſame when glaſs of antimony was uſed, only that the precipitate was much more conſiderable, half an ounce of the cauſtic then yielding 60 grains, though at another time only 50 grains were obtained. In the reſiduum of the former experiment he found 30 grains of an earthy ſubſtance, chiefly a combination of calcareous earth with muriatic acid.

When the mercurius vitæ precipitates, the union between the marine acid and regulus is totally diſſolved; ſo that the powder, by frequent waſhings, becomes perfectly free from every particle of acid, which unites with the water made uſe of, and is then called very improperly, *philoſophic ſpirit of vitriol.*

822 Sympathetic ink. XIV. *With Regulus of Cobalt.* Pure ſpirit of ſalt diſſolves this ſemimetal into a reddiſh yellow liquor, which immediately becomes green from a very gentle warmth. On ſaturating the ſolution with urinous ſpirits, the precipitate appears at firſt white, but afterwards becomes blue, and at length yellow. If the nitrous acid is added to ſolutions of regulus of cobalt, they aſſume a deep emerald green when moderately heated, and on cooling become red as at firſt. Duly evaporated, they yield roſe-coloured cryſtals, which change their colour by heat in the ſame manner. This ſolution makes a curious ſympathetic ink, the invention of which is commonly aſcribed to M. Hellot, though he himſelf acknowledges that he received the firſt hint of it from a German chemiſt in 1736. Any thing wrote with this ſolution is inviſible when dry and cold; but aſſumes a fine green colour when warm, and will again diſappear on being cooled; but if the heat has been too violent, the writing ſtill appears. M. Hellot obſerves, that if nitre or borax be added to the nitrous ſolution, the characters wrote with it become roſe-coloured when heated; and if ſea-ſalt is afterwards paſſed over them, they become blue; that with alkali ſufficient to ſaturate the acid, they change purple and red with heat.—A blue ſympathetic ink may be made from cobalt in the following manner. Take of an earthy ore of cobalt, as free from iron as poſſible, one ounce. Bruiſe it, but not to too fine a powder. Then put it into a cylindrical glaſs, with 16 ounces of diſtilled vinegar, and ſet the mixture in hot ſand for the ſpace of ſix days, ſtirring it frequently; or elſe boil it directly till there remain but four ounces. Filter and evaporate it to one half. If your ſolution be of a roſe colour, you may be certain that your cobalt is of the right ſort. A red brown colour is a ſign of the ſolution containing iron; in which caſe the proceſs fails. To two ounces of the ſolution thus reduced, add two drachms of common ſalt.—Set the whole in a warm place to diſſolve, and the ink is made.

823 Oil of arſenic. XV. *With Regulus of Arſenic.* This ſubſtance is ſoluble in all acids; but the nature of the compounds formed by ſuch an union is little known. If half a pound of regulus is diſtilled with one pound of corroſive ſublimate, a thin ſmoking liquor and a butyraceous ſubſtance will be obtained, as in making the ſmoking liquor of Libavius. By repeated rectifications, this butter may be almoſt all converted into ſpirit. If equal parts of the arſenic and ſublimate are uſed, a ponderous black oil comes over along with the ſpirit, which cannot be mixed with it. By rectification in a clean retort they will become clear, but ſtill will not incorporate. If they are now returned upon the red maſs remaining in the firſt retort, and again diſtilled, a much more ponderous oil than the former will be obtained.

824 Marine ether. XVI. *With Inflammable Subſtances.* The acid of ſea-ſalt is very little diſpoſed to contract any union with the phlogiſton, while in a liquid ſtate; and much leſs ſo, even in its moſt concentrated ſtate, than either the vitriolic or nitrous. Mr Beaumé, however, has found, that a ſmall quantity of ether, ſimilar to that prepared with the vitriolic and nitrous acids, may be obtained by cauſing the fumes of the marine acid unite with thoſe of ſpirit of wine. Others, and particularly ſome German Chemiſts, attempted to make this liquor, by employing a marine acid previouſly combined with metallic ſubſtances, ſuch as butter of antimony. The ſmoking liquor of Libavius ſucceeds beſt. If equal parts of this liquor and highly rectified ſpirit of wine are diſtilled together, a conſiderable quantity of true ether is produced; but which, like the vitriolic and nitrous ether, muſt be rectified in order to its greater purity. The tin contained in the ſmoking liquor is ſeparated and precipitated in white powder. In this proceſs, the acid is probably more diſpoſed to unite with the ſpirit of wine, by having already begun to combine with the inflammable principle of the metal.—For marine ether, Mr Dollfuſs recommends to put into a retort four ounces of digeſtive ſalt previouſly well dried and powdered, and two ounces of manganeſe; pouring upon this a mixture of five ounces of ſpirit of wine and two of oil of vitriol; the firſt five ounces and a half of the diſtilled liquor being poured back on the reſiduum, and the whole afterwards drawn off by a gentle heat. The ſpirit of ſalt thus obtained had a very penetrating agreeable odour, ſomewhat like that of nitrous ether; and at firſt ſwam upon the top of water; but at length mixed with it on being agitated for a long time. Towards the end of the diſtillation a little oil was obtained, which did not mix with the water; and by the addition of four ounces more of ſpirit of wine, more of the dulcified acid was obtained. With regard to this kind of ether, however, Mr Weſtrumb denies that it can be made by any method hitherto known; and inſiſts, that all the liquids as yet produced under the name of marine ether are in reality dulcified ſpirit of ſalt, and not true ether, which will ſwim on the top of water.

825 Attraction for phlogiſton. Dr Prieſtley has obſerved, that the pure marine acid, when reduced to an inviſible aerial ſtate, has a ſtrong affinity with phlogiſton; ſo that it decompoſes many ſubſtances that contain it, and forms with them an air permanently inflammable. By giving it more time, it will extract phlogiſton from dry wood, cruſts of bread not burnt, dry fleſh; and, what is ſtill more extraordinary, from flints. From what has been above related, it appears that the dephlogiſticated ſpirit of ſalt has a very ſtrong attraction for phlogiſton.

Eſſential oil of mint abſorbed the marine acid air pretty faſt, and preſently became of a deep brown colour. When taken out of this air, it was of the conſiſtence of treacle, and ſunk in water, ſmelling differently from what it did before; but ſtill the ſmell of the mint was predominant. Oil of turpentine was alſo much thickened; and became of a deep brown colour, by being ſaturated with acid air. Ether abſorbed the air very faſt; and became firſt of a turbid white, and then of a yellow and brown colour. In one night a conſiderable quantity of ſtrongly inflammable air was produced.

Having once ſaturated a quantity of ether with acid air,

air, he admitted bubbles of common air to it, through the quickſilver by which it was confined, and obſerved that white fumes were made in it, at the entrance of every bubble, for a conſiderable time. Having at another time, ſaturated a ſmall quantity of ether with this kind of air, and the phial which contained it happenning to be overturned, the whole room was inſtantly filled with a white cloud, which had very much the ſmell of ether, but peculiarly offenſive. Opening the door and window of the room, this light cloud filled a long paſſage and another room. The ether, in the mean time, was ſeemingly all vaniſhed: but, ſometime after, the ſurface of the quickſilver in which the experiment had been made was covered with a very acid liquor, ariſing probably from the moiſture in the atmoſphere, attracted from the acid vapour with which the ether had been impregnated. This ſeems to ſhow, that however much diſpoſed the marine acid may be to unite with phlogiſtic matters when in its aerial ſtate, the attraction it has for them is but very ſlight, and ſtill inferior to what it has for water.

Camphor was preſently reduced into a fluid ſtate by imbibing this acid air; but there ſeemed to be ſomething of a whitiſh ſediment in it. After continuing two days in this ſituation, water was admitted to it, upon which the camphor immediately reſumed its former ſolid ſtate; and to appearance was the ſame ſubſtance that it had been before.

Strong concentrated oil of vitriol, being put to marine acid air, was not at all affected by it in a day and a night. In order to try whether it would not have more power in a condenſed ſtate, it was compreſſed with an additional atmoſphere; but, on taking off this, the air expanded again, and was not in the leaſt diminiſhed. A quantity of ſtrong ſpirit of nitre was alſo put to it without any ſenſible effect. From theſe laſt experiments it appears, that the marine acid is not able to diſloge the other acids from their union with water.

2d 825
New acid diſcovered by Mr Homberg.

Beſides the acids already mentioned, Mr Homberg deſcribes an artificial one generated by mixing two ounces and a half of luna cornea, with an ounce and a half of tin calcined alone and without addition, by means of fire. The mixture is to be expoſed to a naked fire in a coated retort, of which two-thirds ought to be left empty; when a browniſh matter, an ounce and a half in weight, will adhere to the neck of the retort. This matter is tin combined with the marine acid, and the reſiduum is ſilver deprived of the ſame acid, which may therefore now be melted together without any loſs. The ſublimate, well powdered and dried, is to be equally divided into two phials, and ſublimed; by repeating which operation two or three times, a volatile ſalt, of an acid nature, very white and tranſparent, is obtained. The reſiduum of theſe ſublimations is always calx of tin.

§ 4. *Of the* FLUOR *Acid.*

826
Firſt diſcovered by Mr Margraaf.

THIS acid was diſcovered ſome time ago by Mr Margraaf, and more fully inveſtigated by Mr Scheele. The experiments by which it was originally produced, and its properties aſcertained, are as follows:

827
How prepared.

I. Two ounces of concentrated vitriolic acid were poured upon an equal quantity of fluor, which had been previouſly pounded in a glaſs mortar, and then put into a retort, to which a receiver was adapted, and the juncture cloſed with grey blotting-paper. On the application of heat, the maſs began to efferveſce and ſwell, inviſible vapours penetrated every where through the joining of the veſſels, and towards the end of the proceſs white vapours aroſe, which covered all the internal parts of the receiver with a white powder.—The maſs remaining in the retort was as hard as a ſtone, and could not be taken out without breaking the veſſel. The lute was quite corroded and friable.

828
Forms a white earthy cruſt with water

II. The proceſs was repeated exactly in the ſame manner, excepting only that a quantity of diſtilled water was put into the receiver. A white ſpot ſoon began to form on the ſurface of the water, juſt in the centre, and immediately under the mouth of the retort. This ſpot continually increaſed, till at laſt it covered the whole ſurface of the water, forming a pretty thick cruſt, which prevented the communication of the water with new vapours that came over. On gently agitating the receiver, the cruſt broke, and fell to the bottom; ſoon after which a new cruſt like the former was produced. At laſt the receiver, and ſoon after the retort alſo, became white in the inſide. The veſſels, when cooled, were found much corroded internally. In the receiver was an acid liquor mixed with much white matter, ſeparable by filtration.

829
Which has the properties of ſiliceous earth.

III. This white matter when edulcorated and dried, ſhowed itſelf to be ſiliceous earth by the following properties. 1. It was rare, friable, and white. 2. It was not ſenſibly ſoluble in acids. 3. It did not make a tough paſte with water, but was looſe and incoherent after being dried. 4. It diſſolved by boiling in lixivium tartari, and the ſolution in cooling aſſumed a gelatinous conſiſtence. 5. In its pure ſtate it ſuffered no change in the ſtrongeſt heat; but when mixed with alkali, it boiled, frothed up, and formed a glaſs in a melting heat. 6. It diſſolved in borax without ſwelling.

830
Scheele's experiment to determine the origin of this earth.

IV. To determine whether this earth was formed during the proceſs, he poured vitriolic acid upon powdered fluor contained in a cylinder of braſs which was cloſed exactly with a cover, after having ſuſpended over the mixture an iron nail and a bit of charcoal. On opening the veſſel two hours afterwards, he found the nail and charcoal unchanged; but on moiſtening them, he found both covered with a white powder in a ſhort time. This powder had all the properties of ſiliceous earth; and as in the experiment he had made no uſe of glaſs veſſels, he concluded that it did not proceed from the glaſs veſſels as might have been ſuſpected from their being ſo much corroded, but was generated in ſome other way.

831
Artificial fluor yields a ſimilar reſult.

V. Having recompoſed fluor by ſaturating the acid with calcareous earth, he treated the compound in the ſame manner as the natural fluor, with a ſimilar reſult; and repeating the experiment five times over, he conſtantly found the ſiliceous earth and acid diminiſh conſiderably, ſo that at laſt ſcarce any mark of acidity was left. Thence he concluded, that all the fluor acid united itſelf by degrees with the vapours of the water, and thus formed the ſiliceous earth. "It may be objected (ſays Mr Scheele), that the fluor acid is perhaps already united by nature with a fine ſiliceous powder,

der, which it volatilizes, and carries over in diſtillation, but leaves it as ſoon as it finds water to unite with, juſt as muriatic acid parts with the regulus of antimony, when butter of antimony is dropped into water. But if this was the caſe, the fluor acid would leave the whole quantity of ſiliceous earth thus combined with it in the firſt diſtillation, and therefore ſhow no mark of its preſence in the following proceſſes. When I put ſpirit of wine into the receiver inſtead of water no ſiliceous earth was produced; but the alcohol became ſour. When I put an unctuous oil into the receiver, all the fluor acid penetrated through the crevices of the lute, and neither united with the oil, nor produced a ſiliceous earth. This happened alſo when acid of vitriol was put into the receiver. If therefore the ſiliceous earth was not a product of each diſtillation, but, being previouſly contained in the acid, was only depoſited from it in conſequence of the union of the acid with a third ſubſtance, I think the ſiliceous earth ought equally to appear when alcohol was put into the receiver, with which it unites, as well as with water; but as this does not happen, I conclude that not all the ſiliceous earth, which is depoſited upon the ſurface of water during the diſtillation of the fluor acid, was previouſly diſſoved in this acid."

832 Mr Scheele's concluſion that the earth proceeds from an union of the acid with water.

833 Conteſted by Meſſrs Boullanger Monnet, &c.

834 Their opinions ſhown to be erroneous by Mr Scheele.

835 Fluor acid proved to be different from that of ſea-ſalt.

This opinion of Mr Scheele did not meet with general approbation. M. Boullanger endeavoured to ſhow, that the fluor acid is no other than the muriatic intimately combined with ſome earthy ſubſtance; and Mr Monnet maintained that it is the ſame with that of vitriol volatilized by ſome extraordinary connection with the fluor; which opinion was alſo maintained by Doctor Prieſtley. Mr Scheele conteſted theſe opinions, but found much greater difficulty in ſupporting his own opinions than in overthrowing thoſe of his adverſaries. Boullanger inſiſted that fluor acid precipitates the ſolutions of ſilver and quickſilver, producing luna cornea with the former, and mercurius dulcis with the latter. Mr Scheele owns that fluor acid precipitates both theſe metals, but the precipitate obtained is in very ſmall quantity, and the little that is produced ariſes only from a ſmall quantity of ſea-ſalt with which the fluor, as well as all other calcareous ſubſtances, is generally mixed. The greateſt part of the acid, therefore, will not precipitate the ſolutions of theſe metals, which it ought to do upon Mr Boulanger's hypotheſis. Mr Scheele then proceeds to ſhow a method of ſeparating this ſmall quantity of marine acid from that of fluor. A ſolution of ſilver made with nitrous acid is to be precipitated with alkali of tartar, and as much acid of fluor poured upon the edulcorated powder as is ſufficient to give an exceſs of acid; after which the ſolution is to be filtered. This ſolution of ſilver in fluor acid is then to be dropped into that acid we deſire to purify, till no more precipitation enſues; after which the acid is filtered through grey paper, and diſtilled to dryneſs in a glaſs retort. The aqueous part comes over firſt, but is ſoon followed by fluor acid, which covers the inſide of both the veſſels, together with the ſurface of the water in the receiver, with a thick ſiliceous cruſt. The acid thus rectified, does not precipitate ſolution of ſilver in the leaſt, or otherwiſe ſhow the ſmalleſt ſign of muriatic acid.

836 And from that of vitriol.

That the fluor acid is different from that of vitriol Mr Scheele proved by the following experiment. Upon one ounce of pure levigated fluor with alkohol, he poured three ounces of concentrated oil of vitriol, and diſtilled the mixture in a ſand-bath, having previouſly put 12 ounces of diſtilled water into the receiver. He then took other three ounces of the ſame acid diluted with 24 ounces of water, to which he afterwards added lixivium tartari previouſly weighed, till he attained the exact point of ſaturation. After the diſtillation he weighed the remaining lixivium; having kept up ſuch a degree of heat for eight hours as was not ſufficient to raiſe the vitriolic acid. On breaking the retort, and reducing the maſs to powder he boiled it in a glaſs veſſel with 24 ounces of water for ſome minutes; after which he added juſt as much lixivium tartari as he had found before to be requiſite for the ſaturation of three ounces of the vitriolic acid, and continued the boiling for a few minutes longer. On examining the ſolution, it was found to contain a vitriolated tartar perfectly neutralized, neither acid nor alkali prevailing in any degree; which ſhowed that no vitriolic had paſſed into the receiver. The ſaline matter being then extracted with hot water, the remaining earth was found to weigh 9½ drachms. Two drachms of this diſſolved in muriatic acid, excepting only a ſmall quantity of matter which ſeemed to be fluor undecompoſed, and which on being dried weighed only nine grains. Into one part of this ſolution he poured ſome acid of ſugar, and into another vitriolic acid. The former produced ſaccharated lime, and the latter gypſum. A third part was evaporated to dryneſs, and left a deliqueſcent ſalt; and the remaining part of the earth burned in a crucible, produced a real quick lime.

837 Quicklime the baſis of fluor.

Thus it appeared that the real baſis of fluor is quicklime, and likewiſe that the fluor acid is different from that of vitriol, as appears farther from the following conſiderations: 1. Pure fluor acid does not precipitate terra ponderoſa, nor ſolution of lead in nitrous acid. 2. The ſame acid, when ſaturated with alkali of tartar, evaporated to dryneſs, and afterwards melted with powdered charcoal, does not produce any hepar ſulphuris.

838 Miſtake of Mr Monnet on this ſubject.

Mr Monnet, in order to ſupport his hypotheſis, denies that fluor contains any calcareous earth. In proof of which he adduces the following experiment: Equal quantities of alkali and fluor were melted together, with little or no change on the mineral; for, after having taken away by lixiviation the alkali employed, he diſſolved the fluor remaining on the filter in nitrous acid, adding vitriolic acid to the ſolution; and becauſe he obtained no precipitate, concluded at once, that fluor contains no calcareous earth. Mr Scheele on the contrary affirms, that all ſolutions of fluor yield a precipitate of gypſum whenever vitriolic acid is added to them. He explains Mr Monnet's failure, by ſuppoſing that he had diluted his ſolution with too great a quantity of water.

839 Wiegleb's experiments on the origin of the ſiliceous earth.

Mr Wiegleb, diſſatisfied with the hypotheſis of Scheele, as well as others, concerning the fluor acid, began a new ſet of experiments on the mineral. Having firſt accurately repeated thoſe made by Mr Scheele, he proceeded to inquire into the origin of the ſiliceous earth, in the following manner: Having firſt weighed the retort deſtined for the experiment in an an accurate manner, and found that its weight was two ounces and five drachms, he put into it two ounces of calcined fluor in powder, adding, by means of a glaſs tube, 2½ ounces of oil of vitriol. The retort was then placed on the furnace; and a receiver, which when empty weighed two ounces, two drachms, and 30 grains, and now contained two ounces of diſtilled water, was luted to it. The diſtillation was conducted with all poſſible care, and at laſt puſhed till the retort grew red hot; but it was found impoſſible to prevent a few vapours from penetrating through the lute. Next day the retort, ſeparated from the receiver, was found to weigh, together with its contents, five ounces, five drachms, and 30 grains; and conſequently had loſt in weight one ounce, three drachms, and 30 grains. The receiver, which, with the water, had originally weighed four ounces, two drachms, and 30 grains, now weighed five ounces and three drachms, and had therefore gained one ounce and 30 grains. This gain, compared with the loſs of the retort, ſhows that the retort loſt more by three drachms than the receiver gained; ſo that theſe muſt have undoubtedly paſſed through the luting in form of vapour.

To determine the point in queſtion, the empty veſſels, with what had been put into them, were accurately weighed; when the weights and loſs upon the whole were found to be as follows.

	oz.	dr.	gr.
The empty retort - -	2	5	0
Calcined fluor - - -	2	0	0
Oil of vitriol - -	2	4	0
Total weight before diſtillation	7	1	0
After it -	5	5	30
Loſs of retort - -	1	3	30
The empty receiver weighed -	2	2	30
The water put into it - -	2	0	0
Total weight before diſtillation	4	2	30
Total weight after diſtillation -	5	3	0
Gain of receiver -	1	0	30

Deducting this grain of weight in the receiver from the loſs of weight in the retort, we find, that three drachms were wanting on the whole, which muſt undoubtedly, as already obſerved, have been diſſipated in vapour. The retort being now broken, and the dry earth both in its neck and arch ſeparated as accurately as poſſible, it was found to weigh three drachms; the reſiduum in the retort weighed three ounces, two drachms, and 40 grains. Now, as the maſs in the retort had originally weighed four ounces and four drachms, it appeared, by deducting the reſiduum, to have ſuffered, on the whole, a loſs of one ounce, one drachm, and 20 grains. To determine the loſs more accurately, the following calculations were made:

	oz.	dr.	gr.
The white earth ſeparated from the neck and arch of the retort -	0	3	0
Gain of the receiver - -	1	0	30
Loſt in vapour - - - -	0	3	0
Total	1	6	3

Here Mr Wiegleb was ſurpriſed to find, that the matter which came from the retort amounted to more by five drachms ten grains than the maſs in the retort had loſt of its original weight; to illuſtrate which it was neceſſary to weigh the retort and receiver by themſelves. The pieces of the retort now weighed only one ounce ſeven drachms and 50 grains; whereas, before the proceſs, the weight of the retort was two ounces five drachms. It appeared, therefore, that it had loſt five drachms ten grains, the very quantity which had been gained by the receiver. This laſt had loſt nothing of its original weight.

The fluid in the receiver was next diluted with four ounces of diſtilled water, and the whole poured out on a filter, in order to ſeparate the earthy matter with which it was mixed, and freſh water poured upon it to take out all the acid: after which the earth was dried, and found to weigh 57 grains. The clear liquor was then diluted with more diſtilled water, and afterwards precipitated with ſpirit of ſal ammoniac prepared with fixed alkali. A briſk effervescence took place before any precipitate began to fall, but ceaſed ſoon after the precipitation took place. The whole mixture become gelatinous; and the precipitate, when dry, weighed two drachms. The whole quantity of earth, therefore, obtained in this proceſs amounted to five drachms 47 grains, which is forty-ſeven grains more than the retort had loſt in weight. This exceſs is, by our author, attributed to part of the acid ſtill adhering to it, and to the acceſſion of ſome moiſture from the air; to determine which he heated each of the parcels of earth red hot ſeparately, and thus reduced them to four drachms 52 grains, which is leſs by 18 grains than the loſs of the retort, and which, he is of opinion, muſt have eſcaped in the three drachms of vapour.

840
The earthy cruſt proceeds from the ſolution of the glaſs diſtilling veſſels.

From this experiment Mr Wiegleb concludes, that the earth produced in the diſtillation of fluor proceeds neither from the ſpar nor from a combination of the acid with water, but from the ſolution of the glaſs by the ſparry acid. To his opinion alſo Dr Crell accedes. "In diſtilling fluor (ſays he) with oil of vitriol, I have found the retort as well as the receiver very much corroded. I poured the acid obtained by the proceſs into a phial furniſhed with a glaſs ſtopper, and obſerved after ſome time conſiderable depoſition. I then poured the liquor into another phial like the former; and that it might neither on the one hand attack the glaſs, nor on the other compoſe ſiliceous earth with the particles of water, according to Mr Scheele's hypotheſis, I added highly rectified ſpirit of wine. I ſaw, however, after ſome time, another conſiderable depoſition. This ſeemed alſo to proceed from the glaſs that had been before diſſolved, which the acid let fall in conſequence of the gradual combination with the ſpirit of wine; otherwiſe we muſt ſuppoſe, what to me appears incredible, that the acid decompoſes the ſpirit, attracts the water, and forms the earth."

841
Mr Mayer's examination of the fluor acid.

This ſingular acid has been ſtill further examined by Mr Meyer. He informs us, that, among Mr Scheele's experiments, he was particularly ſtruck by one in which no earthy cruſt was obtained, after putting ſpirit of wine into the receiver. Mr Meyer repeated this experiment, hoping, that when but little ſpirit was put into the receiver, he might be able to procure a new kind of ether. An ounce of finely powdered fluor, which had been previouſly heated red hot, was put into a glaſs retort, to which was fitted a receiver containing three ounces of highly rectified French brandy. The diſtillation was continued for three hours with a gentle heat: when the acid, having made its way through the bottom, put and end to the proceſs. No cruſt could be perceived on the ſurface of the ſpirit: but in the place where it had been in contact with the receiver there was a thin ring of tranſparent jelly. The ſame mixture of oil of vitriol and fluor was therefore again put into a retort of very ſtrong glaſs, and the ſame ſpirit put into the receiver. The diſtillation was conducted two hours with a gentle and afterwards with a ſtronger, heat. When it was half over, the ſpirit began to change into a thin jelly; and at the end of the proceſs ſome firmer pieces were found at the bottom. Theſe were waſhed with ſpirit of wine; and in order to obtain the ſpirit together with the acid in a pure ſtate, it was put into a large retort, and again ſubjected to diſtillation. As the retort grew warm, the opal-coloured ſpirit became clear and ſwelled, what remained becoming again gelatinous; a good deal of earth remained behind, but did not adhere firmly to the retort, which was ſmooth in the inſide, though full of ſhallow excoriations. It was alſo evident, that the glaſs was actually corroded, and that the earthy matter is not a mere cruſt adhering to the inſide. The jelly being thoroughly edulcorated, as well as the earth that remained in the retort after the rectification, and that which was diſſolved in the water precipitated by ſpirit of ſal ammoniac, the whole quantity amounted to two drachms. That which had ſeparated ſpontaneouſly was ſemitranſparent. "As this earth (ſays he) ſhowed the properties of ſiliceous earth, and the glaſs, which was ſo much corroded, conſiſts in great meaſure of it, the greateſt part of it might come from the glaſs, and the reſt of it perhaps be a conſtituent part of the fluor itſelf.

842
How to procure the acid free from ſiliceous earth.

In order to aſcertain this it was neceſſary to obtain the fluor acid quite free from ſiliceous earth. I therefore expoſed the ley, which I had procured by the precipitation of the earth with ſal ammoniac, to a gentle evaporation in a ſlightly covered glaſs veſſel. The product was one drachm 56 grains of an ammoniacal ſalt; the glaſs did not appear to have been attacked. Half a drachm of this ſalt was ſublimed in a ſmall retort, which, towards the end of the operation, was laid on the bare fire. No cruſt appeared on the ſurface of the water in the receiver. At the bottom of the retort lay a little flocculent earth of a light grey colour, above which the internal ſurface was covered with a white pellicle that reflected various colours; and in the neck there was a ſublimate. The thin pellicle eaſily ſeparated in many places from the glaſs, which was ſmooth beneath, though not without ſome ſmall furrows. I poured water both upon the ammoniacal ſalt and cruſt; in conſequence of which it acquired a very ſour taſte, and coloured the tincture of turnſole red. The white cruſt that was left behind undiſſolved weighed five grains, and melted into a green glaſs without addition. This was nothing but the glaſs that had been corroded by the fluor acid; but as this acid can be ſet looſe only by ſtrong heat, it had done no more than corrode the glaſs, without paſſing over along with it in the form of vapour, and then depoſing it again on the water. For, upon pouring two drachms of oil of vitriol upon half a drachm of this ammoniacal ſalt a little moiſtened, and placed in a glaſs retort, a great foam aroſe, and the thick vapours that aſcended covered the water in the receiver with a white cruſt. A ſcruple of the ſalt on ſolution, left behind a grain of earth, which, as I conjecture, it had taken up during the evaporation in the glaſs veſſel."

To prevent this, our author diſtilled half an ounce of fluor with an ounce of oil of vitriol for five hours. The cruſts were ſeparated from th water; they weighed, after being well waſhed and dried, eleven grains; they were white and very flocculent; thirty-two grains of ſiliceous earth were precipitated from the filtered water: the ley was then evaporated in a leaden veſſel and yielded 80 grains of ſalt.

843
Experiments made with an iron diſtilling veſſel.

As glaſs veſſels were no longer to be truſted, a piece of a gun-barrel furniſhed with a cover, and terminated by a bent tube, intended to ſerve inſtead of the neck of a retort, was afterwards uſed; and with this apparatus the following experiments were made:

1. Half a drachm of the newly prepared ſal-ammoniac was diſtilled for two hours with two drachms of oil of vitriol, into a glaſs receiver containing an ounce of water. No veſtige of a cruſt could be perceived on the water, but ſome earth was perceived in the receiver, where the vapours having aſcended through the tube, came into contact with the wet glaſs; and here the ſurface was become ſenſibly rough. On the addition of volatile alkali, a few flocculi of ſiliceous earth, a mounting only to one-fourth of a grain, were thrown down out of the water.

2. A drachm of vitriol was added to a drachm and an half of the ſalt; but a leaden receiver was now uſed, containing an ounce of water as before. The water acquired an unpleaſant ſmell, but ſhowed no ſigns of a cruſt. On the addition of ſpirit of ſal ammoniac, a little grey earth weighing half a grain fell to the bottom.

844
No cruſt formed by mixing ſand, with a ſalt containing fluor acid.

3. A ſcruple of this ſalt, mixed with an equal quantity of white ſand in fine powder, and diſtilled with a drachm and an half of oil of vitriol, into an ounce of water in the leaden receiver, ſhowed no ſign of a cruſt. The water had a putrid ſmell, and left on the filter two grains and an half of grey earth, which ran under the blow-pipe into a grain of lead. Volatile alkali precipitated five grains of grey earth, which melted on the addition of a little ſalt of tartar into a black globule, though the blow-pipe alone made no change in it.

845
But a great one by uſing powdered glaſs.

4. To 13 grains of the ſame ammoniacal ſalt a drachm of oil of vitriol and two ſcruples of green glaſs, broken into ſmall pieces, were added. The iron tube had ſcarce become warm, when a great cruſt of ſiliceous earth was perceived on the ſurface of the water, and the ſame appearance on the moiſt ſides of the veſſel. It did not, however, ſeem to increaſe during the remainder of the diſtillation. A grain and a quarter of earthy matter remained on the filter, conſiſting partly of white films, which ran under the blow-pipe into a greeniſh glaſs.

5. To aſcertain this matter ſtill more clearly, a different ſpecies of mineral fluor was uſed, which being diſtilled with a double quantity of oil of vitriol, and with a drachm of water in the receiver, yielded a thin pellicle of the appearance of lead, but no ſiliceous cruſt. Volatile alkali threw down 2¼ grains of grey earth.

earth.—A drachm mixed with the ſame quantity of pulverized ſand afforded a pellicle of lead interſperſed with a few particles of white cruſt, which ran into glaſs under the blow-pipe. Volatile alkali precipitated eight grains.—A drachm, mixed with an equal quantity of green glaſs reduced to powder, ſwelled a good deal, and yielded a thick ſiliceous cruſt.

6. To a drachm of green fluor that had been heated and powdered were added two drachms of oil of vitriol, ſtill employing the iron tube. A piece of wet charcoal was alſo ſuſpended in the inſide, a cover fixed on the tube, and the latter was heated for about 15 minutes in a ſand-bath. Obſerving now that the charcoal was dry, and had no earth upon it, a ſcruple of ſand in fine powder was added, the charcoal was wetted and replaced, but nothing appeared. Some bits of green glaſs were then thrown into the mixture which inſtantly foamed up and ran over. The charcoal was not replaced in the tube, nor was it any longer neceſſary, as it gained a covering of white powder by being held a very few moments over the orifice.

846 An experiment of Mr Scheele's explained.

Mr Scheele, in one of his experiments, obſerves, that he obſerved the white powder on a piece of charcoal that had been moiſtened and ſuſpended over fluor to which vitriolic acid was added. As this experiment was made in metallic veſſels, Mr Meyer conjectures, that the mortar uſed for reducing the fluor to powder was of ſoft glaſs, and that the phenomenon was occaſioned by the abraſion of ſome particles of glaſs.

847 Of the quantity of ſiliceous earth carried along with fluor acid.

7. To determine whether the acid can carry up much more of the ſiliceous earth than is ſufficient to ſaturate it, an ounce and an half of pure oil of vitriol was added in a retort of glaſs, and three ounces of water put into the receiver. The retort was corroded through in an hour's time, and the cruſt on the water weighed ten grains The liquid being then filtered and divided into two eqnal parts, one was precipitated with cauſtic volatile, and the other with mild fixed vegetable alkali. The former yielded 25 grains of ſiliceous earth, and the latter 68 grains of a precipitate, which flowed under the blow-pipe, ran into the pores of charcoal, and gave ont ſtrong vapours of fluor acid. The reaſon of this difference ſhall be explained when we come to treat of ſiliceous earth.

848 Violent action of fluor acid upon glaſs.

8. To a mixture of half an ounce of fluor and the ſame quantity of glaſs, in powder, 12 drachms of oil of vitriol were put in a ſmall retort, half filled with the mixture. The ingredients acted upon each other ſo violently that they roſe up into the neck of the retort; and the operation being intermitted on account of the noxious vapour they emitted, the retort was found next day covered with faſciculated cryſtals like hoarfroſt.—The experiment being repeated in a more capacious retort, and the mixture thoroughly blended by agitation, it became a thick maſs, and ſwelled like dough in fermentation: the bottom of the retort grew very hot, and the ſiliceous cruſt appeared on three ounces of water in the receiver. The diſtillation being continued for three hours, 16 grains of ſiliceous earth were found on the ſurface, and the precipitate by volatile alkali weighed 56 grains; the retort was much leſs corroded than uſual.

9. Thirty grains of this precipitate, diſtilled in a glaſs retort with a drachm and an half of oil of vitriol, produced no ſiliceous earth on the water in the receiver, or that with which the earth was edulcorated. The ley of fluorated volatile alkali was mixed with a ſolution of chalk in nitrous acid till no more precipitation took place. The mixture was paſſed through nitrous acid, and the precipitate edulcorated. It weighed, when dry, two drachms and 36 grains.

10. Two drachms of oil of vitriol being added to a drachm of this precipitate contained in a glaſs retort, the precipitate was attacked in the cold, but no cruſt appeared; the heat, however, was ſcarce applied, when the whole ſurface of the water was covered, and the ſame phenomena exhibited which are produced by the natural fluor.

849 Farther proofs that the earthy cruſts proceeds from the glaſs veſſels.

11. Mr Scheele having obſerved that a mixture of fluor as tranſparent as mountain cryſtal, and oil of vitriol in a metallic cylinder, produced no appearance of ſiliceous earth, on a wet ſponge ſuſpended on the inſide, at Mr Meyer's requeſt he made a new experiment by adding oil of vitriol to portions of fluor of this tranſparent kind placed in two tin cylinders; ſome ſiliceous earth was put into one, and a wet ſponge ſuſpended in both. The next morning the ſponge that was ſuſpended over the cylinder which held the ſiliceous earth, was covered with the white powder, but no appearance of it was ſeen on the other. The experiment was repeated by Mr Meyer with the ſame reſult, but the white cruſt did not appear till after a night's ſtanding.

12. A drachm of fluor, mixed with two of oil of vitriol, afforded, after a diſtillation of two hours, a thin film of lead on the ſurface of the water in the receiver, but no ſiliceous earth. The ſame mixture was afterwards diſtilled with the uſe only of a glaſs receiver inſtead of a lead one. In the beginning of the diſtillation a ſmall ſpot appeared under the neck of the retort, and the neck itſelf was covered with white powder, but it ſoon diſappeared; and though the empty part of the receiver was corroded, yet no more than half a grain of earth was procured.

850 Mr Wenzel's experiments in a leaden retort.

Theſe experiments ſo clearly point out the origin of the ſiliceous cruſt on the ſurface of the fluor acid, that its exiſtence as a diſtinct acid is now univerſally allowed, even by thoſe who formerly contended for its being only the vitriolic or ſome other acid diſguiſed.—Experiments of a ſimilar kind were made by Mr Wenzel, who performed his diſtillation in a leaden retort, furniſhed with a glaſs receiver. The water was covered with a variegated cruſt, and yielded a gelatinous precipitate with fixed alkali. On examining the receiver, he found its internal ſurface corroded, ſo that it appeared as if it had been rubbed with coarſe ſand. By ſubſtituting a leaden receiver, however, inſtead of a glaſs one, he obtained the acid entirely free from ſiliceous matter, and containing only a ſmall quantity of iron and aluminous earth.

2d 850 Fluor acid procurable by nitrous, muriatic, and phoſphoric acid.

The fluor acid may alſo be procured by the nitrous, muriatic, and phoſphoric acids.—Mr Scheele diſtilled one part of the mineral with two of concentrated nitrous acid. One part went over into the receiver along with the fluor acid, and a thick cruſt was formed on the water of the receiver. The maſs remaining in the retort was calcareous earth ſaturated with nitrous acid.

Fluor acid and its combinations.

With an equal quantity of marine acid, that of fluor paſſed over into the receiver with a large quantity of the muriatic; the internal ſurface of the receiver, as well as of the water contained in it, being covered with a white cruſt. The reſiduum was fixed ſal ammoniac.

Phoſphoric acid digeſted with powdered fluor, diſſolved a good deal of it; and on diſtilling this ſolution, the fluor acid went over together with the watery particles of the mixture; the remaining maſs in the retort had the properties of the aſhes of bones.

3d 850 Appearance and properties of fluor acid.

The fluor acid procured in any of theſe ways is not diſtinguiſhable by the ſmell from that of ſea-ſalt: in ſome caſes it acts as muriatic acid, in others like that of tartar; but in moſt caſes it ſhows properties peculiar to itſelf.

4th 850 Combined with fixed alkali.

With fixed alkali the fluor acid forms a gelatinous and almoſt inſipid matter, which refuſes to cryſtallize. By evaporation a ſaline maſs was obtained, which was in weight only the ſixth part of the fixed alkali diſſolved; did not change the colour of ſyrup of violets, but precipitated lime water, and likewiſe the ſolutions of gypſum and Epſom ſalt. With mineral alkali the ſame phenomena were produced as with the vegetable.

851 With volatile alkali.

Volatile alkali with fluor acid formed likewiſe a jelly, which when ſeparated from the liquor appeared to be ſiliceous earth. The clear liquid taſted like vitriolic ammoniac, and ſhot into very ſmall cryſtals, which by ſublimation yielded firſt a volatile alkali, and then a kind of acid ſal ammoniac. By diſtillation with chalk and water, all the volatile alkali quickly came over. Lime water inſtantly threw down a regenerated fluor, which was the caſe alſo with ſolutions of lime in the nitrous and muriatic acids.—Solution of ſilver let fall a powder, which, before the blow-pipe, reſumed its metallic form, the acid being diſſipated, and forming a white ſpot on the charcoal round the reduced ſilver. Solution of quickſilver in nitrous acid was precipitated, and the powder was entirely volatile in the fire; but a ſolution of corroſive ſublimate remained unchanged. Lead was totally precipitated from nitrous acid; and a ſolution of Epſom ſalt was rendered turbid. Oil of vitriol produced a fluor acid by diſtillation, which formed at the ſame time a thick cruſt on the water of the receiver. The regenerated fluor procured either by means of lime water or ſolutions of the earth in acids, was decompoſed by fixed, but not by volatile alkali.

852 With earths.

With lime, magneſia, and earth of alum, this acid became gelatinous. Part of the two laſt were diſſolved.

853 With metal.

Gold was not touched by the fluor acid either alone or mixed with that of nitre. Silver, in its metallic ſtate, underwent no change. Its calx, precipitated by an alkali, was partly diſſolved; but the remainder formed an inſoluble maſs at the bottom Vitriolic acid expelled the fluor acid in its uſual form. Quickſilver was not diſſolved, but its calx precipitated from the nitrous ſolution was partially ſo. The remaining inſoluble part of the calx united with the acid, and formed a white powder, from which the fluor acid was expelled by the vitriolic. The ſame powder formed, by means of the blow-pipe, a yellowiſh glaſs; which, however, evaporated by degrees, leaving a ſmall globule of fixed glaſs behind. Lead was not diſſolved, but the acid formed a ſweet ſolution with its calx; from whence the latter could be precipitated by the acids of vitriol, and ſea-ſalt, as alſo by ſal ammoniac. On digeſting a quantity of acid with calx of lead, which had been previouſly digeſted in the ſame, a ſpontaneous precipitation took place. The precipitate melted eaſily before the blow-pipe, and ran into metal; but part of the glaſs remained fixed in the fire. Copper was partially diſſolved, as appeared by the blue colour aſſumed by the liquid on the addition of volatile alkali. The calx of copper was eaſily ſoluble; and the liquor, though gelatinous, yielded blue cryſtals, partly of a cubic and partly of an oblong form, from which the acid could not be ſeparated but by heat. Iron was violently attacked, and gave out inflammable vapours during the ſolution. The liquor refuſed to cryſtallize; but, by evaporation, congealed into an hard maſs after the moiſture was diſſipated; and from this maſs the fluor acid might be expelled as uſual by oil of vitriol. The ſame effect was alſo produced by heat alone; the acid riſing in vapours, and leaving a red ochre behind. Calx of iron was alſo diſſolved, and the ſolution taſted like alum; but it could not be reduced to cryſtals. Tin, biſmuth, and regulus of cobalt, were not attacked in their metallic ſtate; but the calces of all of them were ſoluble. Regulus of antimony and powdered antimony were not ſenſibly acted upon. Zinc produced the ſame effects as iron, excepting that the ſolution ſeemed more inclined to cryſtallize.

Fluor acid and its combinations.

854 Glaſs corroded by this acid, as well as the ſalt formed by its combination with volatile alkali.

The moſt remarkable property of this acid, however, is its readily diſſolving glaſs and carrying it off in the form of vapour. This ſingular property belongs not only to the pure acid, but alſo to the ammoniacal ſalt formed by combining it with the volatile alkali. Mr Wiegleb informs us, that on evaporating to dryneſs, in a cup of Miſnia porcelain, a ſolution of this kind of ammoniac, which by its ſmell ſhowed an exceſs of volatile alkali, the glazing of the inſide was entirely corroded, and the bottom left as rough as a file. During the evaporation the cup was covered with white paper, which when dry appeared full of ſmall cryſtals of an acid taſte, eaſily diſtinguiſhable by the naked eye. Theſe, as well as the ammoniacal ſalt, powerfully attracted the moiſture of the air.

855 It is very difficult to be kept.

This property of the fluor acid renders it extremely difficult to be kept. Mr Meyer informs us, that having kept ſome upwards of a year in a glaſs phial, it corroded the glaſs in many points ſurrounded with concentric circles, depoſiting a powder which adhered to the bottom. He is of opinion that golden veſſels would be moſt proper for keeping this acid, as alſo for making experiments on the fluor itſelf. A phial covered in the inſide with wax and oil has been recommended for the ſame purpoſe.

856 Golden veſſels moſt proper for this purpoſe.

857 Dr Prieſtley's experiments on converting this acid into a kind of air.

This acid, as well as thoſe of vitriol, nitre, and ſea-ſalt, has been exhibited by Dr Prieſtley in an aerial form. Having put ſome pounded ſpar into a phial, and poured oil of vitriol upon it, adopting at the ſame time the uſual apparatus for obtaining air, he obſerved that a permanent cloud was formed by the vapour iſſuing out from the mouth of the tube, which he attributed to the attachment of the acid to the aqueous moiſture of the atmoſphere. The moment that water came

came in contact with this air, its ſurface became opaque and white by a ſtony film, which retarded the aſcent of the water, till the air inſinuating itſelf through the pores and cracks of the cruſt, the water neceſſarily roſe as the air diminiſhed; and breaking the cruſt, preſented a new ſurface to the air, which was immediately covered with another cruſt. Thus one ſtony incruſtation was formed after another till every particle of the air was united to the water; and the different films being collected and dried, formed a white powdery ſubſtance, generally a little acid to the taſte; but when waſhed in much pure water, perfectly inſipid. The property of corroding glaſs he found to belong to the fluor acid air only when hot. From ſome other experiments he concluded, that the fluor acid air was the ſame with what he had formerly obtained from vitriolic acid: but the experiments made ſince that time by various chemiſts, have now convinced him that it is an acid of a nature entirely different from all others.

2d 857 Method of engraving on glaſs.

By means of the fluor acid, a new art has been diſcovered, viz. that of engraving upon glaſs. For this purpoſe a looking-glaſs plate is to be covered with melted wax or maſtic; and when the coating becomes hard, it is to be engraved upon by a very ſharp-pointed needle or other inſtrument of that kind. A mixture of oil of vitriol and fluor acid are then to be put upon the plate, and the whole covered with an inverted China veſſel, to prevent the evaporation of the fluor acid. In two days the glaſs plate may be cleared of its coating, when all the traces of the needle will be found upon it.

§ 5. *Of the* SAL SEDATIVUS, *or Acid of Borax.*

858 Found in a mineral in Germany, &c.

THIS is a ſaline ſubſtance of a very ſingular nature, and till lately found no where but in borax itſelf. Its origin in different parts of the world is related under the article BORAX: but ſince that article was printed, we have accounts of its being diſcovered in a mineral of a peculiar kind found at Lunenburg near Hartz. This is frequently tranſparent, but ſometimes alſo a little opaque, and ſtrikes fire ſlightly with ſteel. It has hitherto been found only in ſmall cryſtals inveloped in a gypſeous matter. Theſe generally affect the cubical form, though they are ſometimes irregular, and from the truncatures frequently appear to be of different kinds. One of them had fourteen faces, ſix ſmall ſquare planes, and eight hexahedral; though all theſe are modifications of cubes. Mr Weſtrumb analized it with ſome difficulty; but at laſt found that 100 parts of the mineral contained 60 of ſedative ſalt, ten of magneſia, and ten of calcareous earth; of clay and flint five parts, ſometimes ten of iron, though frequently but five. The ſame acid has alſo been diſcovered in Peru, and a little in Hungary from an analyſis of petroleum. This bitumen ariſes from a rock between Pecklenicza and Moſcowina. It ſeems at firſt to be white, but ſoon grows black by expoſure to the air. It was analyſed by profeſſor Winterl, who found it to contain a tranſparent oil in a butyraceous form, and a true ſedative ſalt, united with the oil by means of an exceſs of phlogiſton. The ſedative ſalt was firſt diſcovered by Bechr, and afterwards more accurately deſcribed by Homberg; but its nature was at firſt very much miſunderſtood, being named the *narcotic ſalt of vitriol*, on account of the vitriolic acid uſed in ſeparating it from the borax. From this it is ſeparable either by ſublimation or cryſtallization. The method by ſublimation is that recommended by Homberg.

2d 858 How prepared from borax.

His proceſs conſiſts in mixing green vitriol with borax, diſſolving them in water, filtering the ſolution, and evaporating till a pellicle appears: the liquor is then to be put into a ſmall glaſs alembic, and the ſublimation promoted till only a dry matter remains in the cucurbit. During this operation, the liquor paſſes into the receiver; but the internal ſurface of the capital is covered with a ſaline matter forming very ſmall, thin, laminated cryſtals, very ſhining, and very light. This is the ſedative ſalt. The capital is then to be unluted, and the adhering ſalt ſwept off with a feather; the part of the liquor which paſſed laſt into the receiver, is to be poured on the dry matter in the cucurbit; and a new ſublimation is to be promoted as before, by diſtilling till the matter in the cucurbit is dry. Theſe operations are to be frequently repeated in the ſame manner, till no more ſedative ſalt can be obtained.

To obtain the ſedative ſalt by cryſtallization, borax is to be diſſolved in hot water; and to this ſolution any one of the three mineral acids is to be gradually added, by a little at a time, till the liquor be ſaturated, and even have an exceſs of acid, according to Mr Beaumé's proceſs. The liquor is then to be left in a cold place; and a great number of ſmall, ſhining, laminated cryſtals will be formed; theſe muſt be waſhed with a little very cold water, and drained upon brown paper. The ſedative ſalt obtained by this proceſs is ſomewhat denſer than that obtained by ſublimation; the latter being ſo light that 72 grains are ſufficient to fill a large phial.

859 Fixed in the fire.

Sedative ſalt, though thus capable of being once ſublimed, is not, however, volatile; for it ariſes only by means of the water of its cryſtallization; and when it has once loſt its water by drying, it cannot be raiſed into vapours by the moſt violent fire, but remains fixed, and melts into a vitreous matter like borax itſelf. This glaſs is ſoluble in water; and then becomes ſedative ſalt again. A great quantity of water is required to diſſolve the ſedative ſalt, and much more of cold than of boiling water; whence it is cryſtallizable by cold, as it alſo is by evaporation; a ſingular property, which ſcarce belongs to any other known ſalt.

860 Its properties.

This ſubſtance has not an *acid*, but a ſomewhat bitteriſh, taſte, accompanied with a ſlight impreſſion of coolneſs. It nevertheleſs unites with alkaline ſalts as acids do, and forms with them neutral ſalts. It is ſoluble in ſpirit of wine, to which it communicates the property of burning with a green flame. It makes no change on the blue colour of vegetables, as other acids do. It expels the other acids from their baſes, when diſtilled with a ſtrong heat; though theſe are all capable of expelling it in the cold, the acid of vinegar not excepted.

861 Mr Bourdelin's experiments.

The compoſition of ſedative ſalt is very much unknown, as no means ſufficient for its decompoſition have hitherto been found out. Mr Bourdelin, who made many experiments on this ſalt, found that it was unalterable by treatment with inflammable matters, with ſulphur, with mineral acids diſengaged, or united with metallic ſubſtances, and with ſpirit of wine. He could only perceive ſome marks of an inflammable matter, and a little marine acid. The former diſcovered itſelf by its communicating a ſulphureous ſmell to the vitriolic acid employed; and the latter by a white precipitate formed in a ſolution of mercury in the nitrous acid, by the liquor which came over on diſtilling the ſalt with powdered charcoal.

862 Mr Cadet's experiments. Mr Cadet, in the Memoirs of the Royal Academy of Sciences for 1766, has given an account of ſome experiments made by him on borax and its acid: from which he infers (1). That the acid contained in borax itſelf is the marine, and not ſedative, ſalt. (2.) That it is the marine, he proves by having made a corroſive ſublimate with this acid and *mercurius precipitatus per ſe*. That ſedative ſalt does not enter the compoſition of borax itſelf, he proves, by the impoſſibility of recompoſing borax from uniting the ſedative ſalt with foſſile alkali. The ſalt ſo produced, he owns, is very like borax, but unfit for the purpoſes of ſoldering metals as borax is. He therefore thinks, that, in the decompoſition of borax, the principles of the ſalt are ſomewhat changed, by the addition of that acid which extricates the ſedative ſalt; and that this ſalt is compoſed of the marine acid originally exiſting in the borax, of the vitriolic acid employed in the operation, and of a vitreſcible earth. (If this is true, then ſedative ſalt either cannot be procured by any other acid than the vitriolic, or it muſt have different properties according to the acid which procures it.) The vitreſcible earth, he ſays, is that which ſeparates from borax during its ſolution in water, and which abounds more in the unrefined than refined borax, and which he thinks conſiſts of a calx of copper, having obtained a regulus of copper from it. As he has never been able, however, to compoſe borax by the union of theſe ingredients, his experiments are by no means deciſive. Mr Beaumé has aſſerted that it is always produced by rancid oils; but Dr Black thinks his proofs by no means ſatisfactory.

Sedative Salt COMBINED,

I. *With Vegetable Alkali.* This ſalt forms a compound very much reſembling borax itſelf in quality; but in what reſpects it differs from, or how far it is applicable to, the purpoſes of borax, hath not yet been determined.

863 Borax. II. *With Mineral Alkali.* This ſalt has generally been thought to recompoſe borax: and though Mr Cadet has denied this, yet as his experiments are hitherto imperfect and unſupported, we ſhall here give the hiſtory of that ſalt, as far as it is yet known.

This ſalt is prepared in the Eaſt Indies. It is ſaid, that from certain hills in theſe countries there runs a green ſaline liquor, which is received in pits lined with clay, and ſuffered to evaporate with the ſun's heat; that a bluiſh mud which the liquor brings along with it is frequently ſtirred up, and a bituminous mather, which floats upon the ſurface, taken off; that when the whole is reduced to a thick conſiſtence, ſome melted fat is mixed, the matter covered with vegetable ſubſtances and a thin coat of clay; and that when the ſalt has cryſtallized, it is ſeparated from the earth by a ſieve. In the ſame countries is found native the mineral alkali in conſiderable quantity; ſometimes tolerably pure, at other times blended with heterogeneous matters of various kinds. This alkali appears to exiſt in borax, as a Glauber's ſalt may be formed from a combination of borax with vitriolic acid. For a further account See BORAX.

864 Refined. Borax, when imported from the Eaſt Indies, conſiſts of ſmall, yellow, and glutinous cryſtals. It is refined, ſome ſay, by diſſolving it in lime-water; others, in alkaline lixivia, or in a lixivium of cauſtic alkali; and by others, in alum-water. Refined borax conſiſts of large eight-ſided cryſtals, each of which is compoſed of ſmall, ſoft, and bitteriſh ſcales. It has been ſaid that cryſtals of this ſize can by no means be obtained by diſſolving unrefined borax in common water; that the cryſtals obtained in this way are extremely ſmall, and differ conſiderably from the refined borax of the ſhops; inſomuch that Cramer calls the large cryſtals, not a purified, but an adulterated borax. When diſſolved in lime-water, the borax ſhoots into larger cryſtals; and largeſt of all, when the veſſel is covered, and a gentle warmth continued during the cryſtallization. All this, however, is denied by Dr Black; who ſays, that in order to accompliſh the purification, we have only to diſſolve the impure borax in hot water; to ſeparate the impurities by filtration, after which the ſalt ſhoots into the cryſtals we commonly ſee. During the diſſolution, borax appears glutinous, and adheres in part to the bottom of the veſſel. From this glutinous quality, peculiar to borax among the ſalts, it is uſed by dyers for giving a gloſs to ſilks.

865 Its properties. All acids diſſolve borax ſlowly, and without efferveſcence. It precipitates from them moſt, but not all, metallic ſubſtances; along with which a conſiderable part of the borax is generally depoſited. It does not abſorb the marine acid of luna cornea, or of mercury ſublimate. It melts upon the ſurface of the former without uniting, and ſuffers the latter to riſe unchanged: the borax in both caſes becomes coloured; in the firſt, milky with red ſtreaks; in the latter, amethyſt or purple. Mixed with ſal ammoniac, it extricates the volatile alkali, and retains the acid; but mixed with a combination of the marine acid with calcareous earths, it unites with the earth, and extricates the acid. It extricates the acid of nitre without ſeeming to unite with the alkaline baſis of that ſalt; nor does it mingle in fuſion with the common fixed alkaline ſalts, the borax flowing diſtinct upon their ſurface. A mixture of borax with twice its weight of tartar, diſſolves in one ſixth of the quantity of water that would be neceſſary to diſſolve them ſeparately: the liquor yields, on inſpiſſation, a viſcous, tenacious maſs like glue; which refuſes to cryſtallize, and which deliquates in the air. Borax affords likewiſe a glutinous compound with the other acids, except the vitriolic; whence this laſt is generally preferred for making the ſedative ſalt. It proves moſt glutinous with the vegetable, and leaſt with the marine. With oils, both expreſſed and diſtilled, it forms a milky, ſemi-ſaponaceous compound. It partially diſſolves in ſpirit of wine. In conjunction with any acid, it tinges the flame of burning matters green; the precipitate thrown down by it from metallic ſolutions has this effect. It does not deflagrate with nitre. Fuſed with inflammable matters, it yields nothing ſulphureous, as thoſe ſalts do which

which contain vitriolic acid. By repeatedly moiſtening it when conſiderably heated, it may be entirely ſublimed.

Borax retains a good quantity of water in its cryſtals; by which it melts and ſwells up in a heat inſufficient to vitrify it. It is then ſpongy and light, like calcined alum; but, on increaſing the fire, it flows like water.

§ 6. *Of the* Acetous *Acid and its Combinations.*

867 How procured.

This acid is plentifully obtained from all vinous liquors, by a fermentation of a particular kind, (ſee Fermentation, and Vinegar.) It appears firſt in the form of an acid liquor, more or leſs deeply coloured, as the vinegar is more or leſs pure. By diſtillation in a common copper-ſtill, with a pewter head and worm, this acid may be ſeparated from many of its oily and impure parts. Diſtilled vinegar is a purer but not a ſtronger acid than the vinegar itſelf; for the acid is originally leſs volatile than water, though, by certain operations, it becomes more ſo. After vinegar has been diſtilled to about $\frac{1}{10}$ of its original bulk, it is ſtill very acid, but thick and black. This matter continues to yield, by diſtillation, a ſtrong acid ſpirit, but tainted with an empyreumatic oil. If the diſtillation is continued, a thick black oil continues to come over; and at laſt ſome volatile alkali, as in the diſtillation of animal ſubſtances. The caput mortuum left in the diſtilling veſſel, being calcined in an open fire, and afterwards lixiviated, yields ſome fixed alkaline ſalt.

Acetous Acid combined,

868 Sal diureticus.

I. *With Vegetable Alkali.* The produce of this combination is the *terra foliata tartari*, or ſal diureticus of the ſhops; but to prepare this ſalt of a fine white flaky appearance, which is neceſſary for ſalt, is a matter of ſome difficulty. The beſt method of performing this operation is, after having ſaturated the alkali with the vinegar, which requires about 15 parts of common diſtilled vinegar to one of alkali, to evaporate the liquor to dryneſs; then melt the ſaline maſs which remains with a gentle heat; after which it is to be diſſolved in water, then filtered, and again evaporated to dryneſs. If it is now diſſolved in ſpirit of wine, and the liquid abſtracted by diſtillation, the remaining maſs being melted a ſecond time, will, on cooling, have the flaky appearance deſired.

A good deal of caution is neceſſary in the firſt melting; for the acetous acid is eaſily diſſipable, even when combined with fixed alkali, by fire. It is proper, therefore, that, when the ſalt is melted, a little ſhould be occaſionally taken out, and put into water; and when it readily parts with its blackneſs to the water, muſt then be removed from the fire. The ſalt, when made, has a very ſtrong attraction for water, inſomuch that it is not eaſily preſerved, even when put into glaſs bottles. To keep it from deliquating, Dr Black, therefore, recommends the corks to be covered with ſome bituminous matter; otherwiſe they would tranſmit moiſture enough to make the ſalt deliquate.

869 Acetous acid with foſſile alkali.

II. *With Foſſile Alkali.* This alkali, combined with the acetous acid, forms a ſalt whoſe properties are not well known. Dr Lewis affirms, that it is nearly ſimilar to the terra foliata tartari. The author of the Chemical Dictionary, again, maintains it to be quite different: particularly that it cryſtallizes well, and is not deliqueſcent in the air; whereas the former cannot be cryſtallized; and even when obtained in a dry form, unleſs great care is taken to exclude the air, will preſently deliquate.

870 Vegetable ammoniac.

III. *With Volatile Alkali.* This combination produces a ſalt ſo exceedingly deliqueſcent, that it cannot be procured in a dry form without the greateſt difficulty. In a liquid ſtate, it is well known in medicine, as a ſudorific, by the name of *ſpiritus mindereri*. It may, however, be procured in a dry form, by mixing equal parts of vitriolic ſal ammoniac and terra foliata tartari, and ſubliming the mixture with a very gentle heat. When the ſalt is once procured, the utmoſt care is requiſite to preſerve it from the air.

871 Anomalous ſalts.

IV. *With Earths.* Combinations of this kind are but little known. With the calcareous and argillaceous earths compounds of an aſtringent nature are formed. According to the author of the Chemical Dictionary, the ſalt reſulting from a combination of vinegar with calcareous earth eaſily cryſtallizes, and does not deliquate. With magneſia the acetous acid does not cryſtallize; but, when inſpiſſated, forms a tough maſs, of which two drachms, or two and a half, are a briſk purgative.

872 Diſtilled verdegris.

V. *With Copper.* Upon this metal the acid of vinegar does not act briſkly, until it is partly at leaſt calcined. If the copper is previouſly diſſolved in a mineral acid, and then precipitated, the calx will be readily diſſolved by the acetous acid. The ſolution is of a green colour, and beautiful green cryſtals may be obtained from it. The ſolution, however, is much more eaſily effected, by employing verdegris, which is copper already united with a kind of acetous or tartareous acid, and very readily diſſolves in vinegar. The cryſtals obtained by this proceſs are uſed in painting, under the name of *diſtilled verdegris*.

The moſt ready, and in all probability the cheapeſt, method of preparing the cryſtals of verdegris is that propoſed by Mr Wenzel, by mixing together the ſolutions of ſugar of lead and blue vitriol, when an exchange of baſes takes place; the lead being inſtantly precipitated by the vitriolic acid, and the acetous acid uniting with the copper. From 15 ounces and two drachms of ſugar of lead with twelve ounces of blue vitriol, five ounces of the cryſtals were obtained. The precipitate of lead, though waſhed ſeveral times with water, never loſt its green colour. It may either be uſed, he ſays, in this ſtate, as a green pigment, or it may be made perfectly white by digeſtion in dilute nitrous acid.

873 Iron liquor for printing cloth.

VI. *With Iron.* Vinegar acts very readily upon iron, and diſſolves it into a very brown and almoſt black liquor, which does not eaſily cryſtallize, but, if inſpiſſated, runs per deliquium. This liquor is employed in the printing of linens, calicoes, &c. being found to ſtrike a finer black with madder, and to injure the cloth leſs, than ſolutions of iron in the other acids.

874 Lead.

VII. *With Lead.* The acetous acid diſſolves lead in its metallic ſtate very ſparingly; but if the metal is calcined, it acts upon it very ſtrongly. Even after lead is melted into glaſs, the acetous acid will receive a ſtrong impregnation from it; and hence it is dangerous to to put vinegar into ſuch earthen veſſels as are glazed with lead. In the metallic ſtate, only a drachm of lead can be diſſolved in eight ounces of diſtilled vinegar.

875 Ceruſs.

If lead is expoſed to the vapours of warm vinegar, it is corroded into a kind of calx, which is uſed in great quantities in painting, and is known by the name of *ceruſs* or *white lead*. The preparation of this pigment has become a diſtinct trade, and is practiſed in ſome places in Britain where lead is procurable at the loweſt price. The proceſs for making ceruſs is thus given by the author of the Chemical Dictionary.

“ To make ceruſs, leaden plates rolled ſpirally, ſo that the ſpace of an inch ſhall be left between each circumvolution, muſt be placed vertically in earthen pots of a proper ſize, containing ſome good vinegar. Theſe leaden rolls ought to be ſo ſupported in the pots that they do not touch the vinegar, but that the acid vapour may circulate freely betwixt the circumvolutions. The pots are to be covered, and placed in a bed of dung, or in a ſand-bath, by which a gentle heat may be applied. The acid of vinegar being thus reduced into vapour, eaſily attaches itſelf to the ſurface of theſe plates, penetrates them, and is impregnated with the metal, which it reduces to a beautiful white powder, called *ceruſs*. When a ſufficient quantity of it is collected on the plates, the rolls are taken out of the pots, and unfolded ; the ceruſs is then taken off, and they are again rolled up, that the operation may be repeated.

“ In this operation, the acid being overcharged with lead, this metal is not properly in a ſaline ſtate ; hence ceruſs is not in cryſtals, nor is ſoluble in water : but a ſaline property would render it unfit for painting, in which it is chiefly employed.”

876 Obſervations on the proceſs for ceruſs.

Though this proceſs may in general be juſt, yet there are certainly ſome particulars neceſſary to make ceruſs of a proper colour, which this author has omitted ; for though we have carefully treated thin plates of lead in the manner he directs, yet the calx always turned out of a dirty grey colour. It is probable, therefore, that after the lead has been corroded by the ſteam of vinegar, it may be waſhed with water ſlightly impregnated with the vitriolic and nitrous acids.

This preparation is the only white hitherto found fit for painting in oil : but the diſcovery of another would be very deſirable, not only from the faults of ceruſs as a paint, but alſo from its injuring the health of perſons employed in its manufacture, by affecting them with a ſevere colic ; which lead, and all its preparations, frequently occaſion.

877 Sugar of lead.

If diſtilled vinegar is poured on white lead, it will diſſolve it in much greater quantity than either the lead in its metallic form, or any of its calces. This ſolution filtered and evaporated, ſhoots into ſmall cryſtals of an auſtere ſweetiſh taſte called *ſugar of lead*. Theſe are uſed in dyeing, and externally in medicines. They have been even given internally for ſpitting of blood. This they will very certainly cure ; but at the ſame time they as certainly kill the patient by bringing on other diſeaſes. If theſe cryſtals are repeatedly diſſolved in freſh acids, and the ſolutions evaporated, an oily kind of ſubſtance will at laſt be obtained, which can ſcarcely be dried.

878 Inflammable ſpirit from ſugar of lead.

From all the metallic combinations of the acetous acid, it may be recovered in an exceedingly concentrated form, by ſimple diſtillation, ſugar of lead only excepted. If this ſubſtance is diſtilled in a retort with a ſtrong heat, it hath been ſaid that an inflammable ſpirit, and not an acid comes over ; but this is denied by Dr Black.

879 Tin.

VIII. *With Tin.* The combination of acetous acid with tin is ſo little known, that many have doubted whether diſtilled vinegar is capable of diſſolving tin or not.

880 Dr Lewis's experiments concerning the ſolubility of tin.

Dr Lewis obſerves, “ That plates of pure tin put into common vinegar begun in a few hours to be corroded, without the application of heat. By degrees a portion of the metal was taken up by the acid, but did not ſeem to be perfectly diſſolved, the liquor appearing quite opaque and turbid, and depoſiting great part of the corroded tin to the bottom, in a whitiſh powder. A part of the tin, if not truly diſſolved, is exquiſitely divided in the liquor; for, after ſtanding many days and after paſſing through a filter, ſo much remained ſuſpended as to give a whitiſhneſs and opacity to the fluid. Acid juices of fruits, ſubſtituted to the vinegar, exhibited the ſame phenomena. Theſe experiments are not fully concluſive for the real ſolubility of tin in theſe acids, with regard to the purpoſes for which chemiſts have wanted ſuch a ſolution : but they prove what is more important; that tin, or tinned veſſels, however pure the tin be, will give a metallic impregnation to light vegetable acids ſuffered to ſtand in them for a few hours.”

With regard to other metallic ſubſtances, neither the degree of attraction which the acetous acid has for them, nor the nature of the compounds formed by the union of it with ſuch ſubſtances, are known; only, that as much of the reguline part of antimony is diſſolved in this acid as to give it a violent emetic quality. See *Regulus of Aatimony*.

Concentration of the *Acetous Acid*.

881 Concentrated vinegar.

Common vinegar, as any other weak acid, may be advantageouſly concentrated by froſt ; as alſo may its ſpirit or the diſtilled vinegar of the ſhops : but as the cold, in this country, is ſeldom or never ſo intenſe as to freeze vinegar, this method of concentration cannot be made uſe of here. If diſtilled vinegar be ſet in a water-bath, the moſt aqueous part will ariſe, and leave the more concentrated acid behind. This method, however, is tedious, and no great degree of concentration can be produced, even when the operation is carried to its utmoſt length. A much more concentrated acid may be obtained by diſtilling in a retort the cryſtals of copper, mentioned (n° 872) under the name of *diſtilled verdegris*. A very ſtrong acid may thus be obtained, which has a very pungent ſmell, almoſt as ſuffocating as volatile ſulphureous acid. The Count de Lauraguais diſcovered that this ſpirit, if heated in a wide-mouthed pan, would take fire on the contact of flaming ſubſtances, and burn entirely away, like ſpirit of wine, without any reſiduum.

882 Salt of vinegar.

The ſame nobleman alſo obſerved, that this ſpirit, when well concentrated, eaſily cryſtallizes without addition.

Acetous acid and its combinations.

This may ſeem to be the moſt proper method of obtaining the acetous acid in its greateſt degree of ſtrength and purity : but as the proceſs requires a very ſtrong heat to be uſed towards the end of the operation, it is probable that part of the acetous acid may be by that means entirely decompoſed. It would ſeem preferable, therefore, to decompoſe pure terra foliata tartari by means of the vitriolic acid, in the ſame manner as nitre or ſea-ſalt are decompoſed for obtaining their acids. In this caſe, indeed, the acetous acid might be a little mixed with the vitriolic ; but that could eaſily be ſeparated by a ſecond diſtillation. A ſtill better method of preparing the acid ſeems to be by diſtilling ſugar of lead with oil of vitriol. The proportion uſed by M. Lorenzen of Copenhagen, is three ounces of vitriolic acid to eight of the ſugar of lead. Mr Dollfuſs recommends two parts of ſugar of lead to one of vitriolic acid.

883 Dr Prieſtley's experiments.

Dr Prieſtley, who gives us ſeveral experiments on the vegetable acid when reduced to the form of air, mentions his being eaſily able to expel it from ſome exceedingly ſtrong concentrated vinegar, by means of heat alone. This ſeems ſomewhat contrary to the count de Lauraguais's obſervation of the diſpoſition of the *ſpirit of verdegris*, as it is commonly called, to cryſtallize : but a ſtill greater difference is, that the vegetable acid air extinguiſhed a candle, when according to the Count's obſervation, it ought to have been inflammable. The moſt curious property obſerved by Dr Prieſtley is, that the vegetable acid air being imbibed by oil olive, the oil was rendered leſs viſcid, and clearer, *almoſt like an eſſential oil.* This is an uſeful hint ; and, if purſued, might lead to important diſcoveries.

Acetous acid combined with *Inflammable Matter.*

884 Vegetable ether.

The only method yet known, of combining acetous acid with the principle of inflammability, is by mixing together equal parts of the ſtrongly concentrated acid called *ſpirit of verdegris*, and ſpirit of wine. The reſult is, a new kind of *ether*, ſimilar to the vitriolic, nitrous, and marine. This ether, however, retains ſome of the acidity and peculiar ſmell of the vinegar. By rectification with fixed alkali, it may be freed from this acidity, and then ſmells more like true ether, but ſtill retaining ſomething of the ſmell, not of the acid, but the inflammable part of the vinegar.

In this proceſs a greater quantity of ether is obtained than by employing the vitriolic acid: which ſhows that the vegetable acid is eſſentially fitter to produce ether than the vitriolic. For making the acetous ether readily, Mr Dollfuſs recommends eight ounces of ſugar of lead dried by a very gentle heat, until it loſes the water of cryſtallization, when it will weigh five ounces and ſix drachms. It is then to be put into a glaſs retort and a mixture of five ounces of vitriolic acid, with eight of ſpirit of wine, poured upon it, and the whole diſtilled with a very gentle fire. The firſt ounce that paſſes over will be dulcified acetous acid, the next almoſt all ether, and the third ether in its pureſt ſtate.

An ether may alſo be obtained from vinegar of wood. To make it, the moſt concentrated acid of this kind is to be made uſe of. For this purpoſe an empyreumatic acid muſt firſt be diſtilled from beech-wood, and then rectified by a ſecond diſtillation. Three pounds of this require for their ſaturation five ounces of purified alkali, which by evaporation and fuſion affords three ounces and a quarter of terra foliata tartari. From this, one ounce ſix drachms of concentrated acid are obtained ; and this, on being mixed with an equal quantity of alcohol, yields two ounces one drachm and a half of genuine ether.

Acid of tartar and its combinations.

§ 7. *Of the Acid of* TARTAR.

885 Tartar.

TARTAR is a ſubſtance thrown off from wine, after it is put into caſks to depurate. The more tartar that is ſeparated, the more ſmooth and palatable the wine is. This ſubſtance forms a thick hard cruſt on the ſides of the caſks : and, as part of the fine dregs of the wine adhere to it, the tartar of the white wines is of a greyiſh white colour, called *white tartar* ; and that of red wine has a red colour, and is called *red tartar*.

886 Cream of tartar.

When ſeparated from the caſks on which it is formed, tartar is mixed with much heterogeneous matter ; from which, for the purpoſes of medicine and chemiſtry, it requires to be purified. This purification is performed at Montpelier ; and conſiſts firſt in boiling the tartar in water, filtrating the ſolution, and allowing the ſalt to cryſtallize, which it very ſoon does ; as tartar requires nearly twenty times its weight of water to diſſolve it.

The cryſtals of tartar obtained by this operation are far from being perfectly pure ; and therefore they are again boiled in water, with an addition of clay, which abſorbs the colouring matter ; and thus, on a ſecond cryſtallization, a very pure and white ſalt is obtained. Theſe cryſtals are called *cream*, or *cryſtals of tartar* ; and are commonly ſold under theſe names.

Dr Black obſerves, that in the purification of tartar, it is neceſſary to add ſome earthy ſubſtances, in order to abſorb or carry down the colour. Macquer thinks that theſe ſubſtances unite in part with the tartar, and render it more ſoluble, but they have little diſpoſition to unite with acids ; they are the purer kinds of clay, and promote the complete depoſition of its impurities ; ſo that in the management of wines it is neceſſary to add certain powdery ſubſtances which have ſome weight, and fall to the bottom readily ; and which, in falling, carry down a number of particles that would otherwiſe float in the liquor for a long time, being ſo light that they could hardly be made to ſubſide ; but the particles of clay adhering to them increaſe their gravity ; and probably it anſwers the ſame purpoſe in the refinement of tartar.

To obtain the pure Acid of *Tartar*.

887 Scheele's analyſis of cream of tartar.

For a long time the cream or cryſtals of tartar were conſidered as the pureſt acid which could be obtained from this ſubſtance ; but, in the year 1770, an analyſis of tartar was publiſhed in the Swediſh tranſactions, by Mr Scheele. His method of decompoſing the ſalt was, to diſſolve it in a ſufficient quantity of boiling water, then to add chalk in fine powder till the effervеſcence ceaſed. A copious precipitation enſued ; and the remaining liquor being evaporated;

Acid of tartar and its combinations.

porated, afforded a ſoluble tartar. This proved that cream of tartar is not, as was commonly ſuppoſed, an acid of a peculiar kind, joined with a great deal of earthy impurities; but really a compound ſalt, containing an alkali joined with an acid; and that the alkali produced from burnt tartar is not generated in the fire, but pre-exiſtent in the ſalt.

The whole ſediment contained in this experiment, is the calcareous earth combined with the acid of tartar, which may juſtly be called *ſelenites tartareus*. If ſome diluted vitriolic acid is poured upon this ſelenites tartareus, the vitriolic acid expels the acid of tartar, forming a true ſelenite with the earth, while the liquor contains the pure acid of tartar. By inſpiſſation this acid may be made ſtronger, and even formed into ſmall white cryſtals, which do not deliquate in the air. A particular ſpecies of tartar extracted from ſorrel hath been ſold for taking ſpots out of clothes, under the name of *eſſential ſalt of lemons*, and which is now diſcovered to be the ſame with the acid of ſugar.

888 Eſſential ſals of lemon.

This experiment was ſoon after confirmed by Dr Black; who farther obſerved, that if quicklime was uſed inſtead of chalk, the whole acid would be abſorbed by the lime, and the remaining liquor, inſtead of being a ſolution of ſoluble tartar, would be a cauſtic lixivium. The moſt ready method, however, of procuring the pure acid of tartar ſeems to be that recommended by Mr Schiller in the Chemical Annals for 1787. One pound of cream of tartar is to be boiled in five or ſix pounds of water, and a quartar of a pound of oil of vitriol added by little and little, by which means a perfect ſolution will be obtained. By continuing the boiling, all the vitriolated tartar is precipitated. When the liquor is evaporated to one half, it muſt be filtered; and if, on the renewal of the boiling, any thing farther is precipitated, the filtration is to be repeated. The clear liquor is then to be reduced to the conſiſtence of a ſyrup, and ſet in a temperate, or rather a warm place, when very fine cryſtals will be formed, and as much acid obtained as is equal in weight to half the cream of tartar employed. If too ſmall a quantity of vitriolic acid has been employed, the undecompoſed cream of tartar falls along with the vitriolated tartar.

Acid of Tartar COMBINED,

889 Soluble tartar.

I. *With Vegtable Alkali.* If the pure acid of tartar be combined with this alkali to the point of ſaturation, a neutral ſalt is produced, which deliquates in the air, and is not eaſily cryſtallized, unleſs the liquor be kept warm, and likewiſe be ſomewhat alkaline. This ſalt, called *ſoluble tartar*, is uſed in medicine as a purgative; but as its deliqueſence does not admit of its being kept in a cryſtalline form, it is always ſold in powder. Hence thoſe who prepare ſoluble tartar, take no further trouble than merely to rub one part of fixed alkaline ſalt with three of cream of tartar, which renders the compound ſufficiently neutral, and anſwers all the purpoſes of medicine. Dr Black informs us, that in medical preſcriptions, where ſoluble tartar is ordered as a purgative along with a decoction of tamarinds, the acid of the latter will decompoſe the ſoluble tartar, and thus the preſcription may perhaps be rendered ineffectual. The ſaline mixture uſed in fevers is nothing but a tartarus ſolubilis in ſolution.

According to Mr Scheele, cream of tartar may be recompoſed from the pure acid and alkali in the following manner: "Upon fixed vegetable alkali pour a ſolution of the acid of tartar. Continue this till the effervescence is over; the fluid will then be tranſparent; but if more of the acid is added, it will become turbid and white, and ſmall cryſtals like white ſand will be formed in it. Theſe cryſtals are a perfect cream of tartar.

890 Regenerated cream of tartar.

Upon theſe principles, another method of decompoſing cream of tartar might be tried; namely, adding to it as much oil of vitriol as would ſaturate the alkali, then diſſolving and cryſtallizing the ſalt: but, by this method, there would be danger of the acid being adulterated with vitriolic tartar.

891 Siegnette's or Rochelle ſalt.

II. *With Foſſile Alkali.* The ſalt produced from an union of cream of tartar with foſſile alkali, has been long known under the names of *Siegnette's ſalt*, *ſal Rupellenſis*, or *Rochelle ſalt*; but as the cream of tartar is now diſcovered to be not a pure acid, but adulterated with a portion of ſoluble tartar, poſſibly ſome differences might be obſerved if the pure acid was uſed.

This ſalt was firſt invented and brought into vogue by one Seignette, an apothecary at Rochelle, who kept the compoſition a ſecret as long as he could. Meſſrs Boylduc and Geoffroy afterwards diſcovered and publiſhed its compoſition.

To prepare this ſalt, cryſtals of mineral alkali are to be diſſolved in hot water, and powdered cream of tartar thrown in as long as any effervеſcence ariſes. For the better cryſtallization of the ſalt, the alkali ought to prevail. The liquor muſt then be filtered and evaporated, and very fine large cryſtals may be obtained by cold, each of which is the half of a polygonous priſm cut in the direction of its axis. This ſection, which forms a face much larger than the reſt, is, like them, a regular rectangle, diſtinguiſhable from the others, not only by its breadth, but alſo by two diſtinct diagonal lines which interſect each other in the middle. The following method of preparing Siegnette's ſalt, recommended by Mr Scheele, ſeems preferable to any other on account of its eaſe and cheapneſs. Thirty ſix ounces of cryſtals of tartar are to be ſaturated with potaſh, and eleven ounces of common ſalt diſſolved in the ley. When it is grown cold, and the vitriolated tartar has ſubſided to the bottom, it is filtered and evaporated till a pellicle appears; the two firſt cryſtallizations yield a fine Seignette's ſalt; the third contains ſome digeſtive ſalt; and the fourth is entirely compoſed of it. The reaſon of this formation of Seignette's ſalt is, that the vegetable alkali has a greater attraction for acids than the mineral, and therefore decompoſes the ſea-ſalt, whoſe baſis is then at liberty to combine with the acid of tartar; while the ſtronger marine acid takes the vegetable alkali.—A ſalt of the ſame kind will be produced by adding Glauber's ſalt inſtead of common ſea-ſalt.

892 Cream of tartar.

III. *With Volatile Alkali.* With regard to this combination, all we know as yet is, that if the alkali is over-ſaturated with acid, a cream of tartar, almoſt as difficult of ſolution as that of fixed alkali, will be obtained. When the ſaturation has been pretty exact, a beautiful ſalt, compoſed of four ſided pyramids, and which does not deliquate in the air, is produced. It is inſtantly decompounded, and emits a pungent volatile ſmell on being mixed with fixed alkali.

Acid of tartar and its combinations.

IV. *With Earths.* All that is as yet known concerning theſe combinations, is, that with the calcareous earth a compound not eaſily ſoluble in water is formed. The other properties of this ſubſtance, and the nature of combinations of tartareous acid with other earths, are entirely unknown.

893 Selenites tartareous.

V. *With Copper.* In its metallic ſtate, cream of tartar acts but weakly on the metal, but diſſolves verdegris much more prfectly than diſtilled vinegar can. The ſolution of cream of tartar, being evaporated, does not cryſtallize, but runs into a gummy kind of matter; which, however, does not attract the moiſture of the air. It readily diſſolves in water, and makes a beautiful bluiſh green on paper, which has the property of always ſhining, as if covered with varniſh. The effects of the pure acid on this metal have not yet been tried.

894 A fine green colour.

895 Chalybeated tartar.

VI. *With Iron.* The effects of a combination of iron with the pure acid have not hitherto been tried. Cream of tartar diſſolves this metal into a green liquor, which being evaporated runs *per deliquium.* It has been attempted to ſubſtitute a ſolution of this kind to the liquor uſed in printing calicoes formed of iron and ſour beer; but this gave a very dull browniſh colour with madder. Poſſibly, if the pure acid was uſed, the colour might be improved. In medicine, a combination of cream of tartar with iron is uſed, and probably may be an uſeful chalybeate.

VII. *With Regulus of Antimony.* See Sect. III.

§ 8. *Of the Acid of* SUGAR.

896 Saccharine acid.

THAT ſugar contains an acid, which on diſtillation by a ſtrong fire ariſes in a liquid form, in common with that of moſt other vegetable ſubſtances, has been generally known; but how to obtain this acid in a concrete form, and to appearance as pure and cryſtallizable as the acid of tartar, we were entirely ignorant, till the appearance of a treatiſe intitled, *Diſſertatio Chemica, de acido Sacchari, auctore* Johanne Afzelio Arvidſſon, 4to, *Upſaliæ.*

Of the method of procuring, and the properties of, this new acid, we have the following account in the Edinburgh Medical Commentaries, vol. iv.

" 1. To an ounce of the fineſt white ſugar in powder, in a tubulated retort, add three ounces of ſtrong ſpirit of nitre.

" 2. The ſolution being finiſhed, and the phlogiſton of the ſpirit of nitre moſtly exhaled, let a receiver be properly fitted to the retort and luted, and the liquor then made to boil gently.

" 3. When the ſolution has obtained a browniſh colour, add three ounces more of ſpirit of nitre, and let the ebullition be continued till the fumes of the acid are almoſt gone.

897 Chryſtals of ſaccharine acid.

" 4. The liquor being at length emptied in a *larger* veſſel, and expoſed to a proper degree of cold, quadrangular priſmatic cryſtals are obſerved to form; which being collected, and dried on ſoft paper, are found to weigh about 109 grains.

" 5. The remaining liquor being again boiled in the ſame retort, with two ounces of freſh ſpirit of nitre, till the red vapours begin to diſappear, and being then in the ſame manner expoſed to cryſtallize, about 43 grains of ſaline ſpiculæ are obtained.

Acid of ſugar and its combinations.

" 6. To the liquid that ſtill remains, about two ounces more of ſpirit of nitre being added, and afterwards the whole being, *both by boiling and evaporation,* reduced to a dry maſs, a brown, ſaline, gelatinous kind of ſubſtance is produced, which, when thoroughly dry, is found to weigh about half a drachm.

" In the ſame manner, a ſimilar acid, we are told, may be obtained from different ſaccharine ſubſtances, as *gum-arabic, honey, &c.*; but from none in ſuch quantities, or ſo pure, as from fine ſugar."

898 Preſumption of its expelling the vitriolic acid.

This ſalt poſſeſſes ſome very ſingular properties, of which what appears to us the moſt remarkable, and which we cannot help reading with ſome degree of doubt, is, that it produces an effervеſcence on being added to ſuch *alkaline, earthy, or metallic ſubſtances, as contain the vitriolic acid.* From this we ſhould be apt to think, that this acid was capable of diſlodging even the vitriolic acid from its baſis.

Acid of ſugar, being diſtilled in a retort, gives over about $\frac{3}{10}$ of its weight of water. By an intenſe heat it melts, and is partly ſublimed; leaving in the retort a dark grey maſs, of about the fifth part of the weight of the cryſtals made uſe of. The ſublimed ſalt eaſily recovers the cryſtalline form, and ſeems to have undergone no further change by ſublimation than being rendered more pure. During the diſtillation a great quantity of elaſtic vapour ruſhes out (about 100 cubic inches from half an ounce of the cryſtals), which, from the diſtilled liquor's precipitating lime-water, we may judge to be fixed air. In a ſecond ſublimation, white fumes are ſent over, which, when cold, appear to be an acid, glaſſy-coloured liquor, but cannot be again cryſtallized. " Such parts of the ſalts as adhere to the ſides and necks of the veſſels do not appear to be in the leaſt changed in the proceſs." On a third ſublimation, theſe parts produced ſuch claſtic vapours as burſt the receiver.

899 Great acid power.

This ſingular ſalt has a conſiderable acid power; twenty grains of it giving a very conſiderable degree of acidity to a large tankard of water. It diſſolves in an equal weight of diſtilled water, but concretes on the liquor's growing cool. It is alſo ſoluble in ſpirit of wine; 100 parts of boiling ſpirit of wine diſſolving 56 of the ſaccharine cryſtals, but no more than 40 when cold. The ſolution in ſpirit of wine ſoon becomes turbid; and depoſites a mucous ſediment, in quantity about $\frac{1}{40}$ of the acid made uſe of. When cold, irregular ſcaly cryſtals are formed, which when dry are perfectly white.

900 Incredible quantity of volatile alkali ſaturated by it.

With vegetable alkali, the acid of ſugar can ſcarcely be formed into cryſtals, unleſs either the alkali or acid predominate. With mineral alkali, a ſalt very difficult of ſolution is formed. The quantity of volatile alkali ſaturated by this acid is incredible. " Six parts of a pure volatile alkali may be ſaturated with one of the acid of ſugar. The produce is a quadrangular priſmatic ſalt. With lime this acid unites ſo ſtrongly, as to be ſeparable by no other means than a ſtrong heat. What kind of a ſalt reſults from this combination we are not told; but the author is of opinion, that this ſhows the uſe of lime in the purification of ſugar, in order to abſorb the ſuperfluous acid. Being ſaturated with ſome of the *terra ponderoſa,* the acid of ſugar immediately depoſits a quantity of pellucid angular cryſtals, ſcarcely ſoluble in water. With magneſia

Acid of ſugar and its combinations.

ſia the ſalt appears in form of a white powder, ſoluble neither in water nor ſpirit of wine, unleſs the acid prevails. It has a ſtronger affinity with magneſia than any of the alkaline ſalts. With earth of alum, no cryſtals are obtained; but a yellow pellucid maſs, of a ſweetiſh and ſomewhat aſtringent taſte; which, in a moiſt air, liquefies, and increaſes two-thirds in weight.

901 Its effects on metals.

This acid acts upon all metals, gold, ſilver, platina, and quickſilver, not excepted, if they have been previouſly diſſolved in an acid, and then precipitated. Iron in its metallic ſtate is diſſolved in very large quantity by the ſaccharine acid; 45 parts of iron being ſoluble in 55 of acid. By evaporation, the liquor ſhoots into yellow priſmatic cryſtals, which are eaſily ſoluble in water. With cobalt, a quantity of yellow-coloured cryſtals are obtained, which being diſſolved in water, and ſea-ſalt added to the ſolution, form a ſympathetic ink. The elective attractions of this ſingular acid are, firſt, lime, than the *terra ponderoſa*, magneſia, vegetable alkali mineral alkali, and laſtly clays.

902 Saccharine ether.

With ſpirit of wine an ether was obtained which cannot eaſily be ſet on fire unleſs previouſly heated, and burns with a blue inſtead of a white flame.

903 Whether this acid is produced from the nitrous.

Towards the concluſion of his diſſertation the author obſerves, that ſome may imagine that the acid of nitre made uſe of in theſe experiments, may have a conſiderable ſhare in the production of what he has termed *acid of ſugar*. But though he acknowledges that this acid cannot in any way be obtained but by the aſſiſtance of ſpirit of nitre, he is thoroughly convinced that it does not, in any degree, enter into its compoſition.

What occurs to us on this ſubject is, that if the acid really pre-exiſts in the ſugar, it muſt give ſome tokens of its exiſtence by mixing the ſugar with other ſubſtances beſides ſpirit of nitre. The author himſelf thinks that lime acts upon the acid part of the ſugar: from whence we are apt to conclude, that by mixing lime, in a certain proportion, with ſugar, a compound ſhould be obtained ſomewhat ſimilar to what was formed by a direct combination of lime with the pure acid. In this caſe, we might conclude that the nitrous acid produces this ſalt, by combining with the inflammable part of the ſugar, becoming thereby volatile, and flying entirely off, ſo as to leave the acid of the ſugar pure. In the diſtillation of dulcified ſpirit of nitre, however, we have an inſtance of the nitrous acid itſelf being very much altered. This muſt therefore ſuggeſt a doubt that the acid ſalt obtained in the preſent caſe is only the nitrous acid deprived of its phlogiſton, and united with ſome earthy particles.

In a treatiſe lately publiſhed by Mr Rigby, however, we are informed that ſugar itſelf may be recompoſed by uniting the acid of ſugar with phlogiſton; which aſſertion, if well founded, undoubtedly decides the diſpute in favour of the ſaccharine acid being originally contained in the ſugar.

2d 903 The ſame with the acid of ſorrel.

Late experiments have determined it to be the ſame with that of ſorrel; for which, as well as many other valuable acquiſitions, the ſcience of chemiſtry is indebted to Mr Scheele. Having diſſolved as much acid of ſugar in cold water as the liquor could take up, he added to this ſolution ſome lixivium of tartar drop by drop, waiting a little after each drop, and found the mixture, during the effervescence, full of ſmall cryſtals, which were genuine ſalt of wood-ſorrel.

Acid of phoſphorus and its combinations.

3d 903 Fulminating quickſilver.

M. Klaproth having precipitated a nitrous ſolution of quickſilver with ſalt of wood-ſorrel, perfectly neutralized by vegetable alkali, obtained a white precipitate; which, when edulcorated and dried, and gently heated in a tea-ſpoon, fulminated with a noiſe not inferior to that of fulminating gold. Acid of ſugar perfectly neutralized with vegetable alkali, afforded the ſame precipitate, and fulminated in the ſame manner.

§ 9. *Of the Acid of* PHOSPHORUS.

904 Phoſphoric acid.

THIS acid was firſt diſcovered by Homberg in urine; afterwards by Margraaf in muſtard and cruciferous plants: M. Bochante diſcovered it in wheat; and laſtly, M. Haſſenfratz has traced it in the mineral kingdom with great attention.—He has found that phoſphorated iron is contained in all the Pruſſian blues, when not purified; but that this acid is produced by the coals employed in the proceſs, and is no conſtituent part of the tinging matter. According to him it occurs almoſt univerſally in the minerals of iron which are found in the ſlimy ſtrata of the earth, as well as thoſe which are undoubtedly modern, whether primary or ſecondary; unleſs the iron be ſo far of a metallic nature as to be attracted by the magnet, or very near that ſtate. It is afforded by the ochry ſtrata, and thoſe which contain hæmatites as well as the ſlimy kind. Into theſe it is ſuppoſed to have come by the decompoſition of vegetables; and to inveſtigate this matter he examined the hibiſcus paluſtris, ſolidago, virga aurea, antirrhinum, lunaria, ſolanum nigrum, vulgatum, ſtachys paluſtris, artemiſia Zeylandica, ruta graveolens, lycopus Europeus, carex acuta; vinca major, nepeta Pannonica, and noa Abyſſina. All theſe plants afforded the acid of wood-ſorrel and the phoſphoric acid. The quantity of the former varied from two ounces to two drachms 18 grains of acid ſalt containing ſome calcareous earth, to two drachms 24 grains in a pound of each plant; the quantity of calcareous phoſphoric ſalt being from one ounce ſix drachms 48 grains to one drachm 12 grains.—M. Haſſenfratz alſo obſerves, that the phoſphoric acid is procurable from all ſorts of iron; though in ſome it ſeems to proceed from that contained in the earth, and in others from the coals employed in the reduction.

The phoſphoric acid is alſo found by Dr Marquart to be contained in the gaſtric juice of animals. One pound four ounces of the gaſtric juice of oxen gave 10 grains of a lymphatic matter, exactly like the blood in its qualities; 16 grains and ſix-ſevenths of phoſphoric acid, which with a blow-pipe was changed into a very pure and deliqueſcent glaſs of phoſphorus; five grains of phoſphorated lime, two grains of reſin, 14 grains of ſal ammoniac, 29 grains of common ſalt, a very ſmall quantity of an extract whoſe nature was difficult to aſcertain; one pound three ounces ſix drachms and 67$\frac{1}{7}$ grains of water; ſo that the ſolid contents were only 166th part of the bulk.

In ſheep, the quantity of gaſtric juice was about eight ounces in quantity, of a deeper and brighter green

green than that of oxen or calves; but affording the ſame ingredients, though in a different proportion; though no other acid than that of phoſphorus could be diſcovered. It was alſo more diſpoſed to putrefaction. Calves furniſhed from four to ſix ounces of gaſtric juice, which contained very little lymph, but afforded ſome quantity of dry jelly, though the whole was not equal to the proper proportion of lymph. The phoſphorated lime was in the uſual quantity, but the diſengaged phoſphoric acid in a very ſmall proportion. The lacteal acid was found in great quantity; to which, along with that of phoſphorus, our author ſuppoſes the property of curdling the milk in the animal's ſtomach to be owing.

The phoſphoric acid has alſo been found in very large quantity in the calcareous ſtones of Andaluſia; and Mr Klaproth has found the ſame combined with calcareous earth in a kind of beryl, cryſtallized in hexahedral priſms, called by M. Verner *apatit*.—Formerly the beſt method of obtaining it was from urine, where it is contained in very conſiderable quantity in combination with the volatile alkali, and forming a ſalt called the *microcoſmic*, or *eſſential ſalt of urine*.

905
Microcoſmic ſalt, how procured.

To procure this, a large quantity of urine is to be evaporated to the conſiſtence of a thin ſyrup; which, being ſet in a cold place, will yield, in three or four weeks, foul brown-coloured cryſtals, which are the microcoſmic ſalt, mixed with the marine, and other ſalts of urine. Theſe cryſtals are to be diſſolved in hot water; the ſolution filtered whilſt it continues hot, and ſet to cryſtallize again; and the ſolution, filtration, and cryſtallization, repeated till the ſalt becomes pure and white. In all the cryſtallizations the microcoſmic ſalt ſhoots firſt, and is eaſily diſtinguiſhed and ſeparated from the others. If the urine which remains after the firſt cryſtallization be further evaporated, and again ſet in the cold, it will yield more cryſtals; but browner and more impure than the former; and therefore requiring to be purified by themſelves. From 20 gallons of urine may be obtained four ounces of pure ſalt; a conſiderable part being ſtill left in the reſiduum.

In theſe operations the heat ought to be gentle, and the veſſels either of glaſs or compact ſtone-ware. Urine being evaporated in a copper veſſel, afforded only a green ſolution of that metal.

906
Mr Margraaf's experiments.

Concerning the nature of the microcoſmic ſalt obtained by the above proceſs, Mr Margraaf gives the following account in the Berlin memoirs for 1746.

"Sixteen ounces of the ſalt, diſtilled in a glaſs retort, in a heat gradually raiſed, gave over eight ounces of a volatile urinous ſpirit, reſembling that made from ſal ammoniac by quicklime. The reſiduum was a porous brittle maſs, weighing eight ounces. This, urged with a ſtronger fire in a crucible, bubbled and frothed much, and at length ſunk down into the appearance of glaſs, without ſeeming to ſuffer any further diminution of its weight in the moſt vehement heat.

The vitreous matter diſſolved in twice or thrice its quantity of water, into a clear, tranſparent, acid liquor, ſomewhat thick, not ill reſembling in conſiſtence concentrated oil of vitriol. This liquor totally corroded zinc into a white powder, which, being diluted with water, appeared in great part to diſſolve, fixed alkalies occaſioning a plentiful precipitation. It acted powerfully upon iron, with ſome effervеſcence; and changed the metal into a kind of muddy ſubſtance inclining to bluiſh, in part ſoluble in water like the preceding. It diſſolved likewiſe a portion of regulus of antimony, and extracted a red tincture from cobalt. On lead and tin it had very little action. Copper it corroded but ſlightly. On biſmuth, ſilver, and gold, it had no effect at all, either by ſtrong digeſtion, or a boiling heat. Nor did the adding of a conſiderable portion of nitrous acid enable it to act upon gold.

"The vitreous ſalt in its dry form, melted with metallic bodies with a ſtrong fire, acts upon them more powerfully. In each of the following experiments, two drachms of the ſalt were taken to two ſcruples of the metal reduced to ſmall parts. (1.) Gold communicated a purple colour to the vitreous ſalt; on weighing the metal, however, its diminution was not conſiderable. (2.) Silver loſt four grains, or $\frac{1}{10}$; and rendered the ſalt yellowiſh, and moderately opaque. (3.) Copper loſt only two grains, or $\frac{1}{20}$, though the ſalt was tinged of a deep green colour. It ſeemed as if a portion of the ſalt had been retained by the metal, which, after the fuſion, was found to be whiter and more brittle than before. (4.) During the fuſion with iron, flaſhes like lightning were continually thrown out; a phoſphorus being generated from the combination of the acid with the inflammable principle of the iron. Great part of the mixture riſes up in froth; which, when cold, appears a vitreous ſcoria, covered on the ſurface with a kind of metallic ſkin, which, on being rubbed, changes its green colour to a yellowiſh. The reſt of the iron remains at the bottom of the crucible, half melted, half vitrified, and ſpongy. (5.) Tin loſt 18 grains, or nearly one-half its weight, and rendered the ſalt whitiſh; the remaining metal being at the ſame time remarkably changed. It was all over leafy and brilliant, very brittle, internally like zinc. Laid on burning coals, it firſt began to melt, then burnt like zinc, or phoſphorus. (6.) Lead loſt 16 grains, and gave the ſame whitiſh colour to the ſcoriæ that tin does. The remaining lead was in like manner inflammable, but burnt leſs vehemently than the tin; from which it differed alſo in retaining its malleability. (7.) Mercury precipitated from aquafortis, and well edulcorated, being treated with the ſalt in a glaſs retort, with a fire raiſed to the utmoſt, only 12 grains of mercury ſublimed; 28 remaining united with the acid, in a whitiſh, ſemi-opaque maſs. A ſolution of this mixed in diſtilled water, depoſited a quantity of a yellowiſh powder; which, by diſtillation in a glaſs retort, was in great part revived into a running mercury. A part alſo remained diſſolved in the clear liquor; for a drop let fall on poliſhed copper inſtantly whitened it. (8.) Regulus of antimony melted with the vitreous ſalt, loſt eight or nine grains, (about $\frac{1}{5}$); the regulus aſſumed a fine, brilliant, ſtriated appearance; the ſcoriæ were ſomewhat opaque. (9.) Biſmuth loſt eight grains; the ſcoriæ were like the preceding, but the biſmuth itſelf ſuffered little change. (10.) Zinc, mixed with the ſalt, and diſtilled in a glaſs retort, yielded a true phoſphorus, which aroſe in a very moderate heat. The reſiduum was of a grey colour, a little melted at the

the bottom, in weight not exceeding two drachms; ſo that two ſcruples had ſublimed. This reſiduum, urged further in a ſmall Heſſian crucible to perfect fuſion, emitted an infinity of phoſphorine flaſhes, with a kind of detonation. The matter, grown cold, looked like the ſcoriæ of melted glaſs. (11.) White arſenic, mixed with this ſalt, ſeparated in the fire, greateſt part of it ſubliming, and only as much remaining behind as increaſed the weight of the ſalt eight or nine grains. This compound appeared at firſt tranſparent; but, on being expoſed to the air, became moiſt, and of an opaque whiteneſs, much reſembling cryſtalline arſenic. (12.) Cinnabar totally ſublimed; ſuffering no change itſelf, and occaſioning none in the ſalt. Sulphur did the ſame. (13.) One part of the ſalt, mixed with ten of mangane ſe, and melted in a cloſe veſſel, gave a ſemitranſparent maſs, ſome parts of which were bluiſh. The crucible was lined with a fine purple glazing, and the edges of the maſs itſelf appeared of the ſame colour.

"The vitreous ſalt diſſolved alſo, in fuſion, metallic calces and earths. Chalk, with one-third its weight of the ſalt, formed a ſemitranſparent vitreous maſs: calcined marble, with the ſame proportion, flowed ſo thin as to run all through the crucible; gypſum, likewiſe, ran moſtly through the crucible; what remained was ſemitranſparent. Lapis ſpecularis ran entirely through the veſſel. Spaniſh chalk gave a ſemitranſparent maſs, which ſparkled on breaking; and fine white clay, a ſimilar one. Saxon topaz and flint were changed into beautiful opal-coloured maſſes; the earth of alum into a ſemitranſparent maſs, and quicklime into an opaque white one. The maſs with flints imbibed moiſture from the air; the others not.

"Oil of vitriol, poured upon one-fourth its weight of this ſalt in a retort, raiſed an efferveſcence, acquired a browniſh colour, and afterwards became turbid and white. On raiſing the fire, the oil of vitriol diſtilled, and the matter in the bottom of the retort melted. In the neck was found a little ſublimate, which grew moiſt in the air; as did likewiſe the remaining ſalt, which was opaque and whitiſh. Concentrated ſpirit of nitre, diſtilled with this ſalt in the above proportion, came over unchanged; no ſublimate appeared; the reſiduum looked like glaſs of borax. The diſtilled ſpirit did not act in the leaſt upon gold, even by coction. Strong ſpirit of ſea-ſalt being diſtilled in the ſame manner, no ſenſible change was made either in the ſpirit or the ſalt.

"Equal parts of the vitrified microcoſmic ſalt and ſalt of tartar being urged with the ſtrongeſt fire that a glaſs retort could bear, nothing ſenſible came over, nor did the mixture appear in thin fuſion. Diſſolved in water, filtered, and duly evaporated, it afforded, very difficultly, oblong cryſtals, ſomewhat alkaline; the quantity of alkali having been more than enough to ſaturate the acid. A whitiſh matter remained on the filter, amounting to ſeven or eight grains, from two drachms of the mixture; this, after being waſhed and dried, melted before a blow-pipe, as did likewiſe the cryſtals.

907 Expels the acids of vitriolated tartar, nitre, and ſea-ſalt.

"This ſalt ſeems to extricate, in part, the acids of vitriolated tartar, nitre, and ſea-ſalt. (1.) On diſtilling a mixture of it with an equal quantity of vitriolated tartar, there came over ſome ponderous acid drops, which, ſaturated with fixed alkali, formed a neutral ſalt greatly reſembling the vitriolated tartar. The reſiduum readily diſſolved in water, and difficultly cryſtallized. (2.) Nitre, treated with the ſame proportion of the ſalt, began to emit red vapours. The reſiduum was of a peach-bloſſom colour, appeared to have melted leſs perfectly than the preceding, and diſſolved more difficultly in water. The ſolution depoſited a little earthy matter; and, on being ſlowly evaporated, ſhot into cryſtals, which did not deflagrate in the fire. (3.) Sea-ſalt, diſtilled in the ſame manner, manifeſtly parted with its acid; the reſiduum was whitiſh, readily diſſolved in water, and afforded ſome cubical cryſtals. (4.) Sal ammoniac ſuffered no change. (5.) Borax, with an equal quantity of vitreous ſalt, run all through the crucibles.

"Solutions of this ſalt precipitated the earthy part of lime-water, of ſolution of alum, of flint diſſolved in fixed alkali, and the combination of marine acid with chalk or quicklime. The precipitate from this laſt liquor is tenacious like glue, and does not diſſolve even in boiling water; expoſed to a ſtrong fire, it froths prodigiouſly, and at laſt melts into a thick ſcoria.

"Solutions of this ſalt precipitate alſo ſundry metallic ſolutions; as butter of antimony, ſolutions of ſilver, copper, lead, iron, mercury, and biſmuth, in the nitrous acid; and of tin in aqua-regis. The precipitate of iron from ſpirit of ſalt is a tenacious maſs; that of ſilver from aquafortis, ſometimes a white powder, ſometimes tenacious. Copper from aquafortis is ſometimes thrown down in form of a white powder, and ſometimes in that of a green oil, according to the proportions and diluteneſs of the liquor. Silver is not precipitated at all by this acid from its ſolution in vinegar, nor gold from aqua-regis.

"An ounce of the vitreous ſalt, well mixed with half an ounce of ſoot, and committed to diſtillation, yielded a drachm of fine phoſphorus. The black reſiduum, being elixated with boiling water, and the liquor paſſed through a filter, there remained upon the filter eight ſcruples of a black matter; and, on evaporating and cryſtallizing the liquor, about ſeven drachms were obtained of oblong cryſtals, which did not deliquate in a moiſt air, but became powdery in a warm one. Theſe cryſtals, treated afreſh with inflammable matter, yielded no phoſphorus. Before a blow-pipe they melted into a tranſparent globular maſs, which on cooling, became turbid and opaque. Diſſolved in water, they precipitated ſolutions of ſilver, mercury, copper, and of chalk; though they did not act upon the latter ſo powerfully, nor produce with it a gluey maſs, as before they had been deprived of their phoſphorine acid."

Mr Wiegleb informs us, that the phoſphoric acid exhibits leſs affinity with calcareous earth, in the moiſt way, than the vitriolic; though it cannot be ſeparated from the ultimate reſiduum of the calcareous earth by that acid. It expels, however, all the liquid acids from their baſis in the dry way. It precipitates iron from a ſolution in vitriolic acid, of a perfectly white colour. For the uſes of this acid as a flux, ſee the article *Blow-pipe*.

§ 10. *Of the Acid of* ANTS.

2d 907 How procured.

The acid may be obtained from theſe inſects either by

Acid of phoſphorus and its combinations.

by diſtillation, or ſimple infuſion in water. From twenty-four ounces of ants, Neumann obtained eleven ounces and a half of acid as ſtrong as good vinegar, by diſtillation in balneo mariæ. Of this acid, Mr Margraaf gives the following account in the Berlin Memoirs for 1749.

908 Its properties.

“ The acid of ants efferveſces with alkaline ſalts, both fixed and volatile. With volatile alkalies it forms a neutral liquor, which, like that compoſed of the ſame alkalies and vinegar, yields no concrete ſalt on diſtillation. With fixed alkalies it concretes, upon proper exhalation, into oblong cryſtals, which deliquate in the air. The cryſtals, or the ſaturated neutral liquor uncryſtallized, on being diſtilled with a fire increaſed till the retort began to melt, yielded, a liquor ſcarce ſenſibly acid, and afterwards a ſmall quantity of an urinous and partly ammoniacal liquor. The remaining black matter, diſſolved in diſtilled water, filtered and evaporated, ſhot into large cryſtals which did not deliquate in the air, though they were in taſte ſtrongly alkaline, efferveſced with acids, and had all the other properties by which fixed alkalies are diſtinguiſhed.

“ This acid diſſolves, with great efferveſcence, coral, chalk and quicklime; and concretes with them all into cryſtals which do not deliquate in the air.

“ It does not precipitate ſilver, lead, or mercury, from the nitrous acid; nor quicklime from the marine. Hence it appears to have no analogy to the marine or vitriolic acids; the firſt of which conſtantly precipitates the metallic ſolutions, and the other the earthy.

“ It does not act upon filings of ſilver; but (like vegetable acids), it totally diſſolves, by the aſſiſtance of heat, the calx of ſilver precipitated from aquafortis by ſalt of tartar.

“ It does not diſſolve calces of mercury, (as vegetable acids do); but revives them into running quickſilver.

“ It acts very weakly upon filings of copper; but perfectly diſſolves copper that has been calcined. The ſolution yields beautiful compact green cryſtals.

“ It diſſolves iron-filings with violence; the ſolution duly evaporated, ſhoots into cryſtals more readily than that made in diſtilled vinegar. It ſcarcely acts at all upon filings of tin.

“ It does not, according to Mr Margraaf, corrode filings of lead; but diſſolves, by the aſſiſtance of heat the red calx of lead. The ſolution cryſtallizes into a ſaccharum ſaturni. In Mr Ray's philoſophical letters, it is ſaid, that *lead* put into the acid ſpirit, or fair water, together with the animals themſelves, makes a good *ſaccharum ſaturni;* and that this ſaccharum, on being diſtilled will afford the ſame acid ſpirit again, which the ſaccharum ſaturni made with vinegar will not do, but returns an inflammable oil with water, but nothing that is acid; and ſaccharum ſaturni made with ſpirit of verdegris doth the ſame in this reſpect with the ſpirit of piſmires.

“ It diſſolves zinc with vehemence, and ſhoots, upon due evaporation, into inelegant cryſtals, not at all like thoſe produced with diſtilled vinegar. On biſmuth, or regulus of antimony, it has little effect, either when calcined or in their metalline ſtate.

§ II. *Of the Acid of* Amber.

Acid of amber and its combinations.

The nature of this acid is as yet but little known, and Mr Pott is the only chemiſt who ſeems to have examined it with accuracy. We ſhall therefore give an abſtract of the principal obſervations and experiments he has made on this ſalt.

909 Mr Pott's experiments.

“ Salt of amber requires a large quantity of water for its ſolution. In the firſt cryſtallization (being much impregnated with the oil which riſes from the amber along with it), it ſhoots into ſpongy flakes, in colour reſembling brown ſugar-candy; the cryſtals which ſucceed prove darker and darker coloured. On repeating the depuration, the cryſtals appear at top of a clear yellow or whitiſh colour, in form of long needles or feathers; at bottom, darker, and more irregular, as are likewiſe the cryſtals which ſhoot afterwards. The cryſtals neither liquefy nor become powdry in the air: rubbed, they emit a pungent ſmell like that of radiſhes, eſpecially if warmed a little; their taſte is acid, not in the leaſt corroſive, but with a kind of oily pungency.

“ This ſalt, kept in the heat of boiling water, loſes nothing of its weight, and ſuffers no alteration. In a great heat it melts like oil; after which a little oily acid ariſes, then oily ſtriæ appear in the lower part of the retort, and the ſalt ſublimes into the neck, partly in the form of a dark yellow butter, and partly in that of feathers, a black coaly matter remaining at bottom; ſo that, by this proceſs, a part of the ſalt is deſtroyed.

“ Oil of turpentine has no action on this ſalt. Highly rectified ſpirit of wine gains from it a yellow colour in the cold; and, on the application of heat, diſſolves a conſiderable quantity, but depoſites great part of it on cooling. The ſalt thus depoſited is ſomewhat whiter than before, but ſtill continues ſenſibly yellow. The dulcified ſpirit of ſal ammoniac diſſolves it readily, without efferveſcence, into a yellow liquour; if the ſalt was foul, the ſolution proves of a red colour; on burning of the vinous ſpirit, a neutral liquor remains.

“ A ſolution of ſalt of amber in water, ſaturated with a pure alkaline lixivium, yielded, on inſpiſſation, a ſaline matter, which would not cryſtallize, and which when exſiccated by heat, deliquated in the air, leaving a conſiderable proportion of an earthy, unctuous matter. Being again gently inſpiſſated, it left a browniſh ſalt very ſoluble, weighing one half more than the ſalt of amber employed. This ſalt efferveſced with the vitriolic and nitrous acids: the vapour, which exhaled, was not acid, but oily and ſulphureous. On repeating the experiment, and fully ſaturating the alkali with the ſalt of amber, the neutral ſalt made no efferveſcence with theſe acids. This ſalt did not perfectly melt before a blow-pipe; continued in the fire for ſome time, it efferveſced with aquafortis. In diſtillation it yielded a bitter, oily, alkaleſcent ſpirit, much reſembling the ſpirit of tartar; and towards the end, an empyreumatic oil. The reſiduum elixated, yielded the alkaline ſalt again of a brown colour.

“ Salt of amber efferveſces ſtrongly with volatile alkalies; and, on ſaturation, forms with them an oily am-

ammoniacal liquor, which, in diſtillation, totally ariſes in a fluid form, except that a ſmall portion of a penetrating, oily, ſaline matter, concretes towards the end.

910 Extricates the acids of ſal ammoniac and nitre.

" On diſtilling ſalt of amber with an equal quantity of common ſal ammoniac, a marine acid ſpirit came over, of a ſtrong ſmell, and a brown colour: afterwards, a little white ſal ammoniac ſublimed; at length aroſe ſuddenly a large quantity of a fuliginous or bituminous matter, leaving behind a ſmall portion of a like ſhining black ſubſtance. The coaly matter was conſiderably more in quantity than the ſalt of amber employed. On treating it with nitre, red vapours aroſe, and the mixture detonated with violence. A mixture of it with borax, frothed and ſwelled up much more than borax by itſelf; and, on raiſing the fire, yielded only ſome oily drops; the acid being deſtroyed by this ſalt, as by fixed alkalies and quicklime.

911 Purified by the marine acid.

" Spirit of ſea-ſalt, poured upon one-fourth its weight of ſalt of amber, made ſcarce any ſolution in the cold: on the application of heat, nearly the whole coagulated into the conſiſtence of a jelly. In diſtillation, the ſpirit of ſalt aroſe firſt; then almoſt the whole of the ſalt of amber, partly like firm butter, partly like long ſtriated plumous alum, very pure, and of a fine white colour, its oily matter being changed into a coal at the bottom. The ſalt, thus purified, makes no precipitation in the ſolution of ſilver, and conſequently retains nothing of the marine acid; nor does it precipitate ſolution of quicklime made in ſpirit of ſalt, and conſequently contains nothing vitriolic. If any of the mineral acids was contained in this ſalt, it could not here eſcape diſcovery; the oil, which in the rough ſalt is ſuppoſed to conceal the acid, being in this proceſs ſeparated.

912 Effects of ſpirit of nitre on it.

" Aquafortis being poured upon one-fourth its weight of ſalt of amber, extracted a yellowiſh colour from it in the cold, but diſſolved little: on the application of heat, the whole diſſolves into a clear liquor, without any coagulation: if the ſalt is very oily, the ſolution proves red. In diſtillation, the greateſt part ariſes in a liquid form, with only a very ſmall quantity of concrete ſalt. The ſpirit does not act upon gold, but diſſolves ſilver, and quickſilver, as at firſt; a proof that it has received no marine acid from the ſalt of amber.

913 Of oil of vitriol.

" Oil of vitriol being added to twice its weight of ſalt of amber diluted with a little water, a moderate fire elevated an acidulous, liquor, which appeared to proceed from the ſalt of amber; for its making no change in ſolution of fixed ſal ammoniac, ſhowed it not to be vitriolic. On continuing the diſtillation by a ſtronger fire, greateſt part of the ſalt ariſes undeſtroyed, and the oil of vitriol along with it; a black, light, porous earth remaining.

914 Of quickſilver.

" Equal parts of quicklime and ſalt of amber gave over in diſtillation only an acidulous phlegm; the reſiduum, elixated with water, yielded a ſolution of the lime in the acid of amber, reſembling a ſolution of the ſame earth in vegetable acids, precipitable by alkaline ſalts, and by the vitriolic acid. Lime, added to a watery ſolution of ſalt of amber, diſſolves with ſome efferveſcence; after which, the whole coagulates into the conſiſtence of a jelly: this, diluted with water, proves ſimilar to the foregoing ſolution.

915 Effects of ſalt of amber on the metals.

" Solution of ſalt of amber makes no precipitation in ſolution of ſilver or quickſilver. It diſſolves zinc, as all acids do: fixed alkalies precipitate the zinc: the volatile do not; and when a ſufficient quantity of the volatile has been added, the fixed make no precipitation. It acts exceedingly ſlowly and difficultly upon copper; but corrodes calcined copper in a ſhorter time. It ſoon corrodes iron, by coction, into a crocus, and diſſolves a part into a liquid form: the ſolution has little colour; but alkaine ſalts readily diſcover that it holds iron, by rendering it turbid and whitiſh, and throwing down a conſiderable quantity of a greeniſh calx."

§ 12. *Of the acid of* Arsenic.

916 How firſt diſcovered.

Mr Scheele firſt perceived, from ſome experiments on manganeſe, that arſenic contained phlogiſton: from whence he was led to an analyſis of this ſubſtance, which produced an acid of a very ſingular kind; by uniting of which with phlogiſton in certain proportions, either white arſenic or its regulus may be compoſed at pleaſure.

917 Two ways of decompounding arſenic.

White arſenic may be decompounded in two ways. 1. Put two ounces of it reduced to a fine powder in a glaſs mortar into a retort of the ſame materials; pour upon it ſeven ounces of pure muriatic acid, whoſe ſpecific gravity is to that of water as 10 to 8; and lute on a receiver. The arſenic is quickly diſſolved in a boiling heat, which muſt be brought on as quickly as poſſible.

918 By means of nitrous acid.

After the ſolution is accompliſhed, while the liquor is ſtill warm, three ounces and a half of nitrous acid, of the ſame ſpecific gravity with the muriatic above-mentioned, is to be added, and the liquid which had already gone over into the receiver poured back. The receiver is then to be put on again, but not luted; the mixture ſoon begins to efferveſce, and red vapours go over into the receiver. The diſtillation is to be continued till theſe vapours ceaſe; when an ounce of finely powdered arſenic is again to be added, the receiver applied as before, and a gentle ebullition continued till the ſecond quantity of arſenic be diſſolved. An ounce and an half of nitrous acid is then to be added, and the mixture diſtilled to dryneſs, increaſing the fire towards the end, ſo as to make the retort red hot. The acid which comes over into the receiver may ſerve again ſeveral times. The white maſs which remains in the retort is the dry acid of arſenic. It may be reduced to a liquid form by pouring upon it, in coarſe powder, twice its weight of diſtilled water, and boiling for a few minutes, pouring back the liquor which comes over, and afterwards filtering the ſolution through blotting paper, which has been previouſly waſhed in hot water.

In this proceſs the nitrous acid attacks the phlogiſton of the arſenic, is volatilized in conſequence of its union with it, and leaves the more fixed but leſs powerful acid of arſenic behind. The nitrous acid would alone be ſufficient for this purpoſe, could it accurately come into contact with the particles of arſenic; but this cannot be done withtout ſolution, and the nitrous acid is capable of diſſolving arſenic only in pro-

Acid of arſenic and its combinations.

proportion to the water it contains. Too great a quantity would therefore be required were this acid to be uſed by itſelf; but by the uſe of muriatic acid for the ſolution, a ſmaller quantity of ſpirit of nitre is admitted to intimate contact with all the arſenical particles, and has an opportunity of depriving them of their phlogiſton. Aqua-regia might be poured upon the arſenic at once; but the greateſt efferveſcence it excites would throw the mineral up to the top in ſuch a manner that the menſtruum could not act upon it. By the operation of dephlogiſtication, arſenic loſes a fifth part, which is ſuppoſed to be pure phlogiſton.

919
By dephlogiſticated ſpirit of ſalt.

The other method of decompoſing arſenic is, by means of the dephlogiſticated ſpirit of ſalt. For this purpoſe, take one part of powdered mangancſe, and mix it with three of the muriatic acid above-mentioned. Put it into a retort, of which it may fill one-fourth; a receiver containing one-fourth of powdered arſenic, with one-eighth of diſtilled water, is to be luted on, and the retort put into a ſand-bath. The dephlogiſticated muriatic acid, going over into the receiver, is inſtantly abſorbed by the arſenic; which ſome hours afterwards will be diſſolved, and two different liquid ſtrata, which cannot be mixed together, will be perceived in the receiver. This ſolution is now to be put into a clean glaſs retort, and diſtilled to dryneſs; increaſing the fire at laſt to ſuch a degree as to make the whole red hot: and in this proceſs alſo two different liquids paſs over into the receiver which do not unite together.

Here the mangancſe attracts the phlogiſton of the muriatic acid; and as this dephlogiſticated acid has a very ſtrong attraction for phlogiſton, it deprives the arſenic of its phlogiſton, and thus recompoſes the ordinary phlogiſticated muriatic acid. This portion of recompoſed acid diſſolves part of the arſenic, forming with it what is called *butter of arſenic*. The other part of the arſenic which has been decompoſed, diſſolves in the water, and forms a liquid ſpecifically lighter than the butter, and therefore ſwims above it. On rectifying the two liquids, the undecompoſed portion of the arſenic ariſes along with the muriatic acid, and goes over into the receiver in form of an heavy oil, while the acid of arſenic remains behind in the retort. The acid obtained in this way is preciſely the ſame with the former, and one would hardly believe that it is an acid, becauſe it has no acid taſte; but after ſome days it grows moiſt in the air, and at laſt deliquates, aſſuming the appearance of oil of vitriol. As the deliqueſcence, however, is very ſlow, it is proper to diſſolve it in a certain quantity of water, when a ſmall quantity of white powder remains undiſſolved, after preparing it by the firſt proceſs, which is ſiliceous earth derived from the retort. This ought to be carefully ſeparated from the acid by filtration; and in order to prevent the glue of the blotting-paper from mixing with the acid, it was directed to waſh the filter with hot water previous to the operation.

920
Acid of arſenic equally poiſonous with the white arſenic itſelf.

The firſt experiment M. Scheele tried on this acid after he had obtained it, was to diſcover if it was as noxious to animals as when combined with phlogiſton. Having mixed a little with honey, the flies that eat of it died in an hour; and eight grains reduced a cat to the point of death in two hours. Some milk, however, being then given to the animal, it vomited violently, and ran away.

921
Eaſily reſumes its phlogiſton.

2. An ounce of dry acid of arſenic, heated in a ſmall phial to near the point of ignition, melts into a clear liquid, which congeals when cold; but if the heat be increaſed till the veſſel begins to melt, the acid begins to boil, reſumes its phlogiſton, and arſenic ſublimes in greater quantity as the heat is longer continued. After ſubjecting the acid to this violent heat in a retort for an hour, the veſſel melted, and the acid had riſen up as high as the neck.

3. In a crucible the arſenic attracts phlogiſton in greater quantity, and is entirely diſſipated in arſenical vapours; a little clear and difficultly fuſible glaſs, conſiſting of clay and the acid of arſenic, remaining in the crucible.

922
Takes fire and ſublimes charcoal.

3. With powder of charcoal the arſenical acid undergoes no change; but if the mixture be put into a retort, the moiſture all driven off, a receiver then luted on, and the heat increaſed till the bottom of the retort becomes red hot, the whole maſs takes fire with violence; all the acid is reduced, and ſublimed into the neck of the retort; a ſhining regulus is obtained, mixed with a little arſenic and charcoal duſt. A few drops of water are found in the receiver, but they do not contain a particle of acid.

923
Appearance with oil of turpentine, &c.

4. The arſenical acid, after ſome days digeſtion with oil of turpentine, unctuous oil, and ſugar, becomes black and thick. If ſome muriatic acid be diſtilled from this, a little nitrous acid added, and the diſtillation repeated, ſome acid of arſenic is left behind. Spirit of wine undergoes no change either by digeſtion or diſtillation with arſenical acid.

924
With ſulphur.

5. Six parts of acid digeſted with one of ſulphur ſuffer no change; but when the mixture is evaporated to dryneſs, and then ſubjected to diſtillation in a glaſs retort, the two unite with great violence at that degree of heat in which ſulphur melts; and the whole maſs riſes almoſt in the ſame inſtant, in form of a red ſublimate; a little ſulphureous acid in the mean time going over into the receiver.

925
Combined with vegetable fixed alkali.

6. Acid of arſenic, ſaturated with vegetable fixed alkali, forms a deliqueſcent ſalt which does not cryſtallize, but turns ſyrup of a violet green, though it produces no change on the tincture of lacmus. On the addition of a little more acid, however, when it reddens lacmus, but makes no alteration on the ſyrup of violets, the liquor will afford fine cryſtals like Mr Macquer's neutral ſalt of arſenic. On keeping this ſalt for an hour in fuſion in a crucible covered with another luted upon it, the inſide of the veſſel was found covered with a white glazing, and a ſalt remained, which was ſtill the ſame arſenicated ſalt with exceſs of acid.

926
This ſalt decompoſed by charcoal.

7. On diſtilling this ſalt in a retort with an eighth part of charcoal-duſt, it began to boil very violently as ſoon as the retort became red-hot, and a very fine regulus of arſenic ſublimed. The black reſiduum contained the alkali entirely ſeparated from the arſenical acid.

927
Combined with mineral alkali.

8. With mineral alkali the acid of arſenic forms cryſtals when perfectly neutralized, but not if added to exceſs. In that caſe, the maſs becomes deliqueſcent like the former when neutral.

928
With volatile alkali.

9. With volatile alkali a ſalt much reſembling the

Acid of arſenic and its combinations.

two former is produced. It does not change lacmus, but turns the ſyrup of violets green. A gentle heat drives off part of its volatile alkali, and leaves the remainder ſuperſaturated with acid; in which caſe it ſhoots into long radiated and deliqueſcent cryſtals. Theſe, urged by a ſtronger heat, part with the whole of their alkali, which is partly decompoſed; ſome arſenic is formed by the union of the phlogiſton of the alkali with part of the arſenical acid; the remainder of which aſſumes a milky colour, and lies in the bottom of the retort.

929 Expels the acid of vitriolated tartar by dry diſtillation.

10. Acid of arſenic diſtilled with vitriolated tartar expels the vitriolic acid in a violent heat, which comes over in a concentrated but ſulphureous ſtate, leaving the arſenical ſalt formed of the acid and alkali united. With Glauber's ſalt the vitriolic acid alſo riſes, and with leſs heat than when vitriolated tartar is made uſe of.

930 Acid of nitre;

11. One part of nitre diſtilled with three of acid of arſenic, yielded a ſpirit of nitre, together with the neutral arſenical ſalt already mentioned.

931 Of common ſalt.

12. One part of common ſalt with three of arſenical acid, yielded ſome ſmoking part of ſalt. The reſiduum diſſolved in water gave cryſtals of common ſalt, and a thick magnum, which would not cryſtallize till the ſuperfluous arſenical acid was taken away by adding powdered chalk, when it yielded cryſtals ſimilar to thoſe produced by the acid and pure alkali.

932 Phenomena with ſal ammoniac.

13. With ſal ammoniac the product was firſt fuming muriatic acid, then volatile alkali in a liquid ſtate, after that arſenic, and laſtly part of the arſenical acid remained in the retort.

633 Decompoſes ſpathum ponderoſum and gypſum.

14. Spathum ponderoſum, and gypſum, both parted with their acids, which were become ſulphureous. The former did not yield its acid till the retort began to melt.

634 Cannot expel the fluor acid.

15. One part of fluor mineral was mixed with four of acid of arſenic, and diſtilled into a receiver having a little water in it. When the retort grew red-hot, firſt a yellow and then a red ſubſtance ſublimed. Some ſulphureous acid, but none of the acid of fluor, went over. A grey-coloured reſiduum was left in the retort; which being divided into two parts, one was mixed with charcoal-powder and diſtilled with a ſtrong fire, without the production of either arſenic or regulus; the other was mixed with four parts of acid of arſenic, and ſubjected to a ſecond diſtillation. When the maſs grew dry, a little yellow ſal ammoniac was ſublimed, and the water was covered with a cruſt of ſiliceous earth, as in the uſual diſtillations of that mineral.

635 Precipitates lime water

16. Arſenical acid precipitates lime-water, by uniting with the calcareous earth diſſolved in it. By the addition of more acid, the precipitate is diſſolved, and the liquor yields ſmall cryſtals, which let fall a ſelenite on the addition of vitriolic acid.

636 Phenomena with chalk.

17. On the addition of powdered chalk to arſenical acid diluted with water, the earth is at firſt diſſolved, but by adding more chalk the whole is coagulated into ſmall cryſtals.

937 With magneſia.

18. Magneſia diſſolves in the arſenical acid, and the ſolution coagulates when it comes to the point of ſaturation. On diſſolving the coagulum in a larger quantity of water, it becomes gelatinous by evaporation; and if the jelly be lixiviated with water, filtered, and evaporated, a viſcid maſs remains, which refuſes to cryſtallize.

Acid of arſenic and its combinations.

938 With earth of alum.

19. Earth of alum precipitated by alkali of tartar, is eaſily ſoluble in arſenical acid, and coagulates as ſoon as it arrives at the point of ſaturation. Evaporated to dryneſs, mixed with ſome charcoal powder, and then ſubjected to ſtrong diſtillation, a little yellow ſublimate ariſes into the neck of the retort, as likewiſe ſome ſhining regulus, while a volatile ſulphureous acid paſſes over into the receiver. The reſiduum diſſolves with difficulty in the vitriolic acid, though ſome cryſtals of alum will form in the ſpace of two months.

939 With white clay.

20. Four parts of arſenical acid mixed with one of powdered white clay, did not diſſolve any part by digeſtion for a fortnight. By diſtillation in a retort till the veſſel began to melt, it was converted into a thick flux, and a little arſenic ſublimed. By mixing the reſiduum with a little powdered charcoal, a ſhining regulus was ſublimed.

940 With terra ponderoſa.

21. Terra ponderoſa diſſolves readily in the acid of arſenic, but precipitates again as ſoon as it has attained the point of ſaturation. The ſolution is precipitated by acid of vitriol, and forms regenerated ponderous ſpar.

941 With gold.

22. Gold is not acted upon by acid of arſenic, either by digeſtion or otherwiſe; nor is its ſolution precipitated, though the retorts uſed in the operation were ſtained with red and yellow ſpots, which could not be taken off; nor is its action increaſed by mixture with muriatic or with nitrous acid.

942 Platina.

23. Pure platina is not acted upon. Its ſolution is not precipitated by the pure arſenical acid, but readily by the arſenical ſalts. The precipitate is yellow, and diſſolves in a large quantity of water, but contains no mark of arſenical acid. Addition of muriatic or of nitrous acid makes no change in its effects.

943 Silver.

24. Pure ſilver is not acted upon by the arſenical acid in digeſtion. On augmenting the fire till the acid melted, and keeping up this degree of heat for half an hour, the metal diſſolved, and on breaking the retort, a colourleſs glaſſy maſs, nearly tranſparent, was found in it; the retort being covered with a flame-coloured glazing, which could not be ſeparated from it. By a great degree of heat the ſilver was reduced without addition. Solution of ſilver is precipitated by pure acid of arſenic, but more effectually by the neutral arſenical ſalts: the precipitate is of a brown colour, and by digeſtion in muriatic acid is changed into lunea cornea; it is alſo ſoluble in ſpirit of ſal ammoniac prepared with quicklime. The action of the arſenical acid upon ſilver is conſiderably increaſed by mixing it with ſpirit of ſea-ſalt; the former attacking the phlogiſton of the metal, while the latter attacks its earthy baſis.

944 Quickſilver.

25. Quickſilver is not acted upon by digeſtion with arſenical acid. On putting the mixture into a retort, diſtilling to dryneſs, and then increaſing the fire, the maſs becomes yellow, quickſilver riſes into the neck of the retort, with a little arſenic, and ſome yellow ſublimate; but though the fire was augmented till the retort began to melt, the maſs could not be fuſed. Three drachms and an half of quickſilver were obtained out of ſix employed in the experiment; the arſenical acid, therefore, contained two and an half. The maſs was ſomewhat yellow: it diſſolved very readily in muriatic acid, but ſcarcely at all in the nitrous or vitriolic; on evaporation to dryneſs and diſtillation, ſome corroſive ſublimate

ſublimate roſe into the neck of the retort; the reſiduum, melted in a very ſtrong fire, proved to be acid arſenic. Another portion of the maſs, diſtilled with two parts of common ſalt, yielded corroſive ſublimate.

945
With corroſive ſublimate.

26. Acid of arſenic diſtilled with corroſive ſublimate undergoes no change; but by ſublimation with mercurius dulcis, a corroſive ſublimate is obtained. Some have aſſerted, that by ſubliming arſenic with corroſive ſublimate, a butter of arſenic is obtained; but Mr Scheele informs us that this is a miſtake; and that by diſtilling this mixture, he conſtantly obtained corroſive ſublimate at firſt, and arſenic afterwards. With regulus of arſenic, however, a ſmoking butter of arſenic, mercurius dulcis, and ſome quickſilver, are obtained. The ſame thing happens with a mixture of orpiment and corroſive ſublimate.

946
Butter of arſenic is not obtained by this proceſs.

947
With copper.

27. Arſenical acid diſſolves copper by a digeſting heat. The ſolution is of a green colour: a quantity of light blue powder is depoſited, and attaches itſelf to the copper. This powder conſiſts of the acid of arſenic and calcined copper. On mixing two parts of dry acid of arſenic, in fine powder, with one of filings of copper, and diſtilling the mixture, ſome arſenic roſe into the neck, and the maſs melted and turned blue. On boiling it with water, the ſolution was ſimilar to one made directly from acid of arſenic and copper. A little copper remained in the bottom of the retort, which was tinged with brown, red, and yellow ſpots, inſoluble in any menſtruum. The ſolutions of this metal are not precipitated by arſenical acid, but the acetous ſolution is. Neutral arſenical ſalts throw down a blue precipitate, which by expoſure to a ſtrong fire, turns brown and covers the inſide of the containing veſſel with a yellow enamel. On mixing the ſcoria in a fine powder with a little lampblack, ſome fine regulus of arſenic ſublimed, and the copper in the reſiduum was reduced.

948
With iron.

28. With iron the acid of arſenic forms a gelatinous ſolution, which by expoſure to the air grows ſo thick that in two hours time it will not flow out at the mouth of a phial. With alkali of tartar a whitiſh green powder is thrown down; which being edulcorated and diſtilled in a glaſs retort, yields ſome arſenic, and leaves a red ochre behind. On diſtilling four parts of arſenical acid with one of iron filings, the maſs effervefced ſtrongly towards the end; and when it became dry, took fire in the retort upon increaſing the heat, when both arſenic and regulus of arſenic were ſublimed. The reſiduum was black, friable, and contained but little acid of arſenic; the retort was covered with yellowiſh brown ſpots. Solutions of iron in mineral acids are not precipitated by acid of arſenic, but the acetous ſolution lets fall a dark brown powder. All the ſolutions are precipitated by the arſenical neutral ſalts, the precipitates by a ſtrong fire, converted into black ſcoriæ; which mixed with powdered charcoal, and calcined, yield copious vapours of arſenic, and are afterwards attracted by the magnet.

949
With lead.

29. Lead digeſted with arſenical acid turns black at firſt, but in a few days is ſurrounded with a light greyiſh powder, containing ſome arſenic which may be ſeparated by ſublimation. On diſtilling one part of ſhavings of lead with two of dry acid of arſenic, the lead was diſſolved, the maſs flowed clear, and a little arſenic roſe into the neck of the retort. A milky glaſs was found in the bottom, which by boiling in diſtilled water, let fall a quantity of white powder, the ſuperfluous acid being diſſolved in the water; the edulcorated powder yielded regulus of arſenic by diſtillation with charcoal. Solutions of lead in nitrous and muriatic acids are precipitated by arſenical acid.

950
With tin.

30. Tin digeſted with acid of arſenic becomes firſt black, then is covered with a white powder, and afterwards becomes gelatinous. One part of tin filings diſtilled with two of acid of arſenic, took fire as ſoon as the retort became red-hot, and immediately after both arſenic and a little regulus were ſublimed. The tin was diſſolved into a limpid liquor, which became milky when cold.—By waſhing in water, a quantity of white powder was ſeparated, inſoluble in any acid, and containing very little of that of arſenic.

251
With zinc.

31. Arſenical acid diſſolves zinc with effervefcence. The metal grows black, and the tranſparency of the acid is deſtroyed by a quantity of black powder. This powder edulcorated, dried, and put on an iron plate heated nearly red-hot, emits a blue flame and white arſenical ſmoke in the dark, leaving behind a white powder; thus manifeſting itſelf to be moſtly regulus of arſenic. One part of filings of zinc diſtilled with two of acid of arſenic, took fire in the retort with a very bright flame, and burſt the veſſel with an exploſion. Some regulus of arſenic and flowers of zinc were found in the neck.

952
With biſmuth.

32. Biſmuth digeſted with acid of arſenic is covered with a white powder; water precipitates the ſolution, and the precipitate conſiſts of calcined biſmuth and acid of arſenic. On diſtilling one part of the biſmuth with three of arſenical acid, the maſs melted, the metal was calcined, but remained undiſſolved in the bottom of the veſſel; a little arſenic roſe into the neck; and after the retort became cool, water was poured on the reſiduum, which diſſolved the acid, but the calx of biſmuth remained unchanged. Solution of this ſemimetal in the acid of nitre was precipitated by arſenical acid. This precipitate, as well as the calx, are very difficult of fuſion, but on adding a little powdered charcoal, the mixture inſtantly melts, the arſenic goes off in vapours, and the biſmuth is reduced.

953
Regulus of antimony.

33. With regulus of antimony a quantity of white powder is produced by digeſtion, and the clear ſolution is likewiſe precipitated by dropping it into pure water. This powder is ſoluble only by muriatic acid, and may be precipitated again by the addition of water. One part of regulus of antimony diſtilled with three parts of arſenical acid, took fire as ſoon as the maſs melted, and regulus of arſenic with a red matter were ſublimed; a little volatile ſulphureous acid came over into the receiver. On boiling the reſiduum in water, the acid was diſſolved, a white ſhining powder remained behind, which on being mixed with charcoal powder and diſtilled, an ebullition took place, ſome regulus of arſenic roſe into the neck of the retort, and the antimony was reduced. Butter of antimony was not precipitated by the pure acid, but very readily by the arſenical ſalts. Acetous and tartareous ſolutions of glaſs of antimony are preciptated by arſenical acid

Acid of arſenic and its combinations.

954 With cobalt.

34. Cobalt is partially diſſolved, and the ſolution aſſumes a roſe-colour; on putting the whole maſs into a retort, diſtilling off the liquid, and then augmenting the fire, the maſs melted, and a little arſenic was ſublimed. The reſiduum when cold had a ſemi-tranſparent violet colour. On pouring water upon it, and putting it on hot ſand, the acid was diſſolved, the violet colour diſappeared, and the ſolution aſſumed a dark-red colour. The bottom of the retort had a blue tinge, which could not be taken off. Solutions of cobalt in mineral acids are readily precipitated by the arſenical neutral ſalts. The precipitate is of a roſe-colour, but melts with difficulty into a dark blue ſcoria.

955 With nickel.

35. Nickel, with acid of arſenic, aſſumes a dark green colour, and lets fall a green powder containing arſenic in ſubſtance, which may be ſeparated from it by a gentle heat. One part of nickel diſtilled with two of dry arſenical acid, melted with ſome appearance of inflammation, yielding ſome arſenic at the ſame time. The maſs was yellow, with a number of grey elevated ſtreaks upon it, which appeared like vegetation, and were formed during the diſtillation. On boiling the yellow maſs in water, the acid was diſſolved, leaving a yellow powder behind; which, when treated with charcoal-powder, yielded regulus of arſenic, but was not reduced itſelf. The ſolutions of nickel in acids are not preciptated by arſenical acid, not even that in vinegar, but the neutral arſenical ſalts throw down a whitiſh green powder.

956 With manganeſe.

36. Manganeſe in its natural ſtate is diſſolved only in ſmall part; but when phlogiſticated it diſſolves readily and totally; though, whenever the acid arrives at the point of ſaturation, the ſolution coagulates into ſmall cryſtals.

957 With regulus of arſenic.

37. Regulus of arſenic digeſted with its own acid ſoon becomes covered with a white powder, which is arſenic in ſubſtance. On diſtilling one part of the regulus with two of the acid, the former ſublimed and the latter melted. If ſmall pieces of regulus of arſenic be gradually added to the acid of arſenic in fuſion, an inflammation takes place, and arſenic is ſublimed.

2d 957 Strange phenomenon of arſenic with terra foliata tartari.

On diſtilling a mixture of equal parts of terra foliata tartari and arſenic, a limpid liquor like water firſt came over, ſmelling ſtrongly of garlic; on changing the receiver, a liquor of a browniſh red colour was collected, which filled the receiver with a thick cloud, emitting an intolerable ſmell of arſenic. On pouring this upon a filter, hardly a few drops had paſſed when a very thick ſtinking ſmoke ſuddenly aroſe as high as the cieling of the room; an ebullition enſued towards the edge of the filtering-paper, and a fine roſe-coloured flame broke out, that laſted for ſome moments.

§ 13. *Of the Acid of* MOLYBDÆNA.

958 How to reduce molybdæna to powder.

Acid of molybdæna and its combinations.

959 Effects of the acid of arſenic upon it.

960 Violent action of concentrated nitrous acid upon this ſubſtance.

We owe this, as well as the ſucceeding acids to the induſtry of the late Mr Scheele. The ſubſtance from which he extracted it is named by Cronſtedt *molybdæna membranacea nitens*.—As this ſubſtance is of a flaky nature, and incapable of pulverization by itſelf, our author mixed ſome pieces of vitriolated tartar along with it in a glaſs mortar; by the attrition of which it was at laſt reduced to a fine powder, and which was afterwards freed from the vitriolated tartar by waſhing with hot water. He then treated this powder with all the known acids, but found none of them to have any effect upon it excepting thoſe of arſenic and nitre. No ſenſible effect was perceived from the acid of arſenic until the water was evaporated; after which, by increaſing the fire, a little yellow orpiment was ſublimed in the neck of the retort, and ſome ſulphureous acid paſſed over into the receiver. On pouring two parts of concentrated nitrous acid upon one part of powdered molybdæna, the mixture was ſcarce warm in the retort, when it paſſed altogether into the recipient with great heat, and in the form of dark red vapours. Had the quantity been larger, he had no doubt that it would have taken fire; for which reaſon the experiment was repeated with diluted nitrous acid. Six ounces of diluted nitrous acid being poured on an ounce and a half of powdered molybdæna, no effect was perceptible till the liquor began to boil; after which a great number of red elaſtic vapours began to appear, and the mixture ſwelled conſiderably. The diſtillation being continued to dryneſs, the reſiduum appeared of a grey colour; the ſame quantity of nitrous acid was poured on, and the proceſs repeated, when the reſiduum was whiter; and on ſtill repeating the operation a fourth and fifth time, the remaining powder became at laſt as white as chalk. This reſiduum, after being edulcorated with hot water, was quite taſteleſs and inſipid when dry. The limpid liquor which ran from it being evaporated to half an ounce, firſt aſſumed a fine blue colour, and then grew thick. On being examined, it was found to contain ſome iron, and was otherwiſe chiefly acid of vitriol. The colour diſappeared on diluting the acid with water.

961 Acid of molybdæna obtained by fire alone.

The white powder juſt mentioned is the true acid of molybdæna, and may be obtained by the help of fire alone. A ſmall piece of molybdæna expoſed on a ſilver plate to the blow-pipe, makes a beautiful appearance, when the white vapours attach themſelves to the plate in the form of ſmall ſhining ſcales, in the direction of the flame. This white ſublimate becomes blue whenever it is in contact with the blue flame; but changes to white whenever the point of the flame is directed againſt it. An ounce of powdered molybdæna was mixed with four ounces of purified nitre, and detonated in a crucible heated thoroughly red hot. The maſs thus obtained was of a reddiſh colour. On diſſolving it in water, the ſolution was clear and colourleſs. A ſmall quantity of red powder fell to the bottom of the veſſel; which, when dry, weighed 11 grains, and ſhowed itſelf to be an iron ochre. By evaporation vitriolated tartar and nitre were obtained; but a good deal of lixivium remained, which refuſed to cryſtallize, though no mark of ſuperfluous alkali remained. It was then mixed with ſome water, to which diluted acid of vitriol was added, until no more precipitate fell. The white powder which precipitated weighed three drachms; but if too much acid be added, the precipitate will be rediſſolved, and the water itſelf retains a part of it in ſolution. A precipitate is likewiſe obtained by means of nitrous or muriatic acid.

962 Its chemical properties.

The precipitate thus obtained, like thoſe which reſult from the two former proceſſes, is the true acid of molybdæna, and has the following chemical properties.

1. The ſolution reddens lacmus, coagulates a ſolution of ſoap, and precipitates hepar ſulphuris. 2. If this ſolution be boiled with the filings of any of the imperfect metals, it aſſumes a bluiſh colour. 3. By the addition of a little alkali of tartar, the earth becomes ſoluble in greater quantity in water; and after evaporation ſhoots into ſmall confuſed cryſtals. 4. Under the blow-pipe this earth is ſoon abſorbed by charcoal; but when placed on a ſilver plate it melts, and evaporates with the ſame phenomena as molybdæna itſelf. 5. By the addition of alkali, the earth is deprived of its property of being volatilized in the fire. 6. The ſolution, whilſt hot, ſhows its acid power more evidently than when cold, and tinges lacmus of a deeper colour. It effervesces with chalk, with magneſia, and with earth of alum; with all of which it forms ſalts very difficult of ſolution in water. 7. It precipitates, from the nitrous acid, ſilver, quickſilver, and lead, as alſo lead diſſolved in marine acid. Theſe precipitates are reduced on burning charcoal, and the melted metal runs into the pores. Corroſive ſublimate is not precipitated; neither are the ſolutions of the other metals. 8. Terra ponderoſa is alſo precipitated from the nitrous and marine acids; and the precipitate is ſoluble in a large quantity of cold water. None of the ſolutions of the other earths are precipitated. 9. Fixed air is alſo expelled by this acid from the fixed and volatile alkalies, and forms with them neutral ſalts which precipitate all other metallic ſolutions. Gold, corroſive ſublimate, zinc, and manganeſe, are precipitated in form of a white powder; iron and tin, from their ſolution in marine acid, of a brown colour; cobalt of a roſe colour; copper of a blue; the ſolutions of alum and quicklime, white; and if the ammoniacal ſalt formed by the earth of molybdæna and volatile alkali be diſtilled, the earth parts with its alkali in a gentle heat, and remains in the retort in form of a grey powder. 10. Concentrated vitriolic acid diſſolves a great quantity of this earth by means of heat. The ſolution acquires a fine blue colour; which, however, diſappears on being heated, or by diluting the acid with water. In a ſtronger heat the acid flies off, leaving the earth unaltered behind. This ſolution becomes thick on cooling. 11. The nitrous acid has no effect upon the earth of molybdæna. 12. Boiled with the muriatic acid it diſſolves in conſiderable quantity; and, on diſtilling the mixture to dryneſs, a dark-blue reſiduum remains. On increaſing the heat, white flowers ariſe, with a little blue ſublimate, and a ſmoking muriatic acid is found in the receiver. The reſiduum is of a grey colour. Theſe flowers are only the earth of molybdæna volatilized by means of the muriatic acid, and therefore manifeſts the ſame properties. 13. If one part of this earth be diſtilled with two parts of vitriolated tartar, a little vitriolic acid paſſes over, at leaſt when the heat is very ſtrong; and the remaining earth is more ſoluble in water than before. 14. With two parts of nitre it expels, by means of diſtillation, a ſtrong nitrous acid; the reſiduum diſſolved in water is a neutral ſalt which precipitates all metallic ſolutions, and is ſimilar to that formed by a direct union of the acid and fixed alkali. 15. Diſtilled with two parts of pure common ſalt, the acid is expelled in a ſmoking ſtate, and white, yellow, and violet-coloured flowers ariſe, which become moiſt in the air, and when ſprinkled on metals give them a blue colour. Theſe flowers, as has been already remarked, are only the acid of molybdæna volatilized by that of ſea-ſalt.

963 Is capable of uniting with phlogiſton.

The blue colour acquired by this earth on the contact of flame, alſo in the moiſt way in ſome caſes, ſhows that it is capable of contracting an union with the phlogiſton. To reduce this to certainty, Mr Scheele diſſolved ſome of the earth of molybdæna in boiling water, with the addition of a little alkali. Into this ſolution he poured ſome drops of muriatic acid, and divided it into ſeveral parts, into each of which he put filings of ſeveral metals. The ſolutions ſoon acquired a bluiſh colour, which grew deeper and deeper; and in an hour's time, during which the bottle was now and then ſhaken, the liquor aſſumed a fine dark blue. That this colour depends on phlogiſton, he infers from the following circumſtances: 1. If, inſtead of the metals themſelves, you take their calces, no blue colour is produced. 2. If there be dropped into the blue ſolution a few drops of acid of nitre, and the ſolution be then put into a warm place, the colour diſappears. It is therefore no matter of ſurpriſe, that both ſilver and quickſilver ſhould be attacked, ſince a double elective attraction takes place; the muriatic acid uniting with the metallic calx, and the earth of molybdæna with the phlogiſton of the metals. Gold, however, is not attacked in this way. 3. Too great a quantity of muriatic acid produces not a blue but a yellowiſh colour, which at laſt turns brown if the mixture be digeſted; but on adding this ſolution to a ſolution of the earth of molybdæna, a blue colour as uſual is produced. 4. Lixivium ſanguinis, in which the acid prevails, throws down the earth of a brown colour, and the infuſion of galls of a dark brown.

964 Shows no ſign of containing any metal.

The acid of molybdæna, treated with various fluxes, and with charcoal, ſhows no ſigns of containing any metallic matter. Moiſtened with oil-olive, and committed to diſtillation in a ſtrong fire, it did not ſublime, but remained in the retort in the form of a black powder; which, on being calcined in a crucible, ſublimed in white flowers as uſual. On inverting another crucible into the former, and luting the juncture, the earth remained unchanged and of a black colour, without any ſign of fuſion. This black powder did not diſſolve in boiling water, nor even with alkali, which on other occaſions ſo readily diſſolves it; but when mixed with a triple quantity of ſalt of tartar, a great effervescence enſued; the produce was a neutral ſalt reſembling that formed by the direct union of the acid and alkali.

965 Properties of the acid obtained by nitre.

The earth of molybdæna, procured by nitre, requires much leſs water for its ſolution; it does not expel the acid from vitriolated tartar; is more eaſily fuſed, and does not ſublime in an open crucible. When fuſed with charcoal-powder, it affords a ſolution with water, containing a neutral ſalt, which precipitates all others. The reaſon of theſe differences is, that it contains a portion of alkali, though it be ever ſo frequently purified by ſolution and cryſtallization. That this is the caſe we know from the following experiments: 1. If to a ſolution of the nitrous earth of molybdæna we add ſome nitrous acid, the latter attacks the alkali, and the greateſt part of the diſſolved earth is precipitated. This, however, does not happen, except by long boiling. 2. The neutral ſalt obtained by fuſion proves the ſame. This neutral ſalt is produced in the following manner. The earth which contains

tains only a ſmall quantity of alkali operates as an acid, as appears from its changing the colour of lacmus to red; but the alkali prevents as much earth from entering into it as is neceſſary to its ſaturation with phlogiſton; for the acid of molybdæna has a greater attraction for alkali than for phlogiſton. The charcoal which remains after lixiviating the compound of acid of molybdæna and charcoal, yields vapours in an open crucible, and gives a ſublimate containing the phlogiſticated earth of manganeſe. This alkali fixes the earth in the open air; and hence we ſee alſo the reaſon why this earth does not expel the acid from vitriolated tartar; for its attraction for the alkali muſt diminiſh in proportion as it comes nearer the point of ſaturation; and as the pure earth contains no alkali, it attracts a little from the vitriolated tartar; and conſequently there can appear but a ſlight veſtige of vitriolic acid. This ſmall quantity of acid likewiſe occaſions its more eaſy ſolubility in water.

966 Molybdæna recompoſed by uniting its acid with ſulphur.

The pure acid of molybdæna recompoſes that ſubſtance by being combined with ſulphur. Mr Scheele having mixed ſome very fine powder of this earth with three parts of ſulphur, and committed the mixture to diſtillation in a glaſs retort, the receiver was filled with the ſuperfluous ſulphureous vapours, which had alſo the fetid ſmell of volatile ſpirit of ſulphur. In the retort a black powder remained, which on every chemical trial was found to be a true molybdæna; ſo that there is now no doubt of this ſubſtance being compoſed of a particular kind of acid united to ſulphur.

§ 14. *Of the Acid of* Lapis Ponderosus, Tungsten, *or* Wolfram.

967 This ſubſtance conſidered as a metallic earth by Mr Bergman.

This ſubſtance has been analyſed both by Mr Scheele and Mr Bergman, though the former has the merit of diſcovering the acid contained in it; which the latter conſiders, as well as the earth of molybdæna, not as truly acid, but as metallic earths. Mr Scheele's experiments for analyſing this ſubſtance were as follow:

968 Scheele's method of analyſing it.

1. On one part of finely powdered tungſten were poured two parts of concentrated acid of vitriol. By diſtillation the acid paſſed over unchanged; the reſiduum, which was of a bluiſh colour, after being boiled for a ſhort time, and the liquor filtered off, depoſited ſome vitriolated lime or gypſum by ſtanding. 2. Twelve ſcruples of common nitrous acid, or pure aquafortis, being poured on two of finely powdered tungſten, no efferveſcence enſued; but on expoſing the mixture to a ſtrong digeſting heat, it aſſumed a citron yellow colour. The acid was then poured off into another phial, and the yellow powder edulcorated with water. 3. On this yellow powder eight ſcruples of cauſtic volatile alkali were poured, and the phial expoſed to heat; on which the yellow colour inſtantly vaniſhed, and the powder became white. This ſolution was in like manner put into a ſeparate phial, and the powder edulcorated; and as the matter was ſenſibly diminiſhed by theſe operations, they were alternately repeated, till at length the whole was diſſolved, excepting three grains, which ſeemed to be ſiliceous earth. The ſame effects enſued on treating this ſubſtance with muriatic acid, only the ſolution was of a deeper yellow colour. 4. The ſolutions made in the foregoing manner with nitrous acid being all mixed together, ſome drops of phlogiſticated alkali were added; by which about three grains of Pruſſian blue were precipitated. 5. The mixture was then ſaturated with cauſtic volatile alkali; but as no precipitate appeared, a ſolution of fixed alkali was added, which threw down two ſcruples and five grains of white earth of a mild calcareous kind. On adding ſome nitrous acid to the extracts made by volatile alkali, a white powder was precipitated, which, on edulcoration, proved to be the true acid of tungſten.

969 Effects of heat upon it.

On treating tungſten with a ſtrong heat in the dry way, the following appearances took place: 1. One part of tungſten mixed with four of alkali of tartar was melted in an iron crucible, and then poured out on an iron plate. Twelve times its weight of boiling water being then poured upon it, a white powder ſubſided to the bottom, which diſſolved in a great meaſure in nitrous acid. 2. The undiſſolved part of the powder was tried; and being again mixed with four parts of alkali, was melted as before: and the maſs being alſo diſſolved in water, and nitrous acid poured on the reſiduum, only a very ſmall portion of grey powder was left undiſſolved. 3. The ley being ſaturated with nitrous acid, grew thick by the precipitation of a white powder; which was afterwards waſhed with cold water and dried, and then proved to be the ſame acid of tungſten with that already deſcribed. The ſolution in nitrous acid precipitated with fixed alkali gave a white precipitate, which was found to be calcareous earth.

970 Its chemical properties.

The properties of the acid of tungſten are, 1. Under the blow-pipe it became firſt of a reddiſh yellow colour, then brown, and at laſt black. It neither ſmoked nor gave any ſigns of fuſion. 2. With borax it produced a blue, and with microcoſmic ſalt, a ſea-green glaſs. 3. Boiled with a ſmall portion of the nitrous or marine acids, the powder becomes yellow, and with the acid of vitriol bluiſh. 4. On ſaturating a ſolution of the acid with fixed alkali, a neutral ſalt in very ſmall cryſtals is obtained. 5. With volatile alkali this acid forms an ammoniacal ſalt, ſhaped like the points of ſmall pins. On diſtillation the alkali ſeparates in a cauſtic ſtate, the acid remaining behind in the retort in form of a dry yellow powder. On mixture with a ſolution of lime in ſpirit of nitre, a double elective attraction takes place, the acid of tungſten uniting itſelf with the lime, and that of nitre with the volatile alkali. 6. With magneſia the acid of tungſten forms a ſalt very difficult of ſolution. 7. It produces no change on ſolutions of alum or lime, but decompoſes a ſolution of terra ponderoſa in acetous acid, and the compound is totally inſoluble in water. 8. It precipitates of a white colour ſolutions of iron, zinc, and copper, in the vitriolic acid; ſilver, quickſilver, and lead, in that of nitre; and lead in the acid of ſea-ſalt. Tin combined with the ſame acid is thrown down of a blue colour; but corroſive ſublimate and ſolutions of gold undergo no change. 9. On calcining the acid of tungſten in a crucible, it loſes its ſolubility in water. 10. It turns black by calcination with inflammable matters and with ſulphur, but in other reſpects continues unaltered. 11. Solution of hepar ſulphuris is precipitated of a green colour by this acid, and the phlogiſticated alkali white; the latter precipitate being ſoluble in water. On the addition of a few drops of muriatic acid to a ſolution of the

Acid of lapis ponderoſus and its combinations.

971 Differences betwixt the acid of tungſten and molybdæna.

acid of tungſten in water, and ſpreading the liquor on poliſhed iron, zinc, or even tin, it acquires a beautiful blue colour; and the ſame thing happens when theſe metals are put into the acid. 12. It differs from the acid of molybdæna in not being volatile in the fire; in having little attraction for phlogiſton or ſulphur; in turning lime yellow, and forming an inſoluble compound with it as well as with ponderous earth. It has alſo a ſtronger attraction for lime than the acid of molybdæna; for if a combination of lime and acid of molybdæna be digeſted in a ſolution of the ammoniacal ſalt formed by uniting the acid of tungſten with volatile alkali, the latter expels the former, and produces regenerated tungſten. 13. By uniting the acid of tungſten to a calcareous earth, a regenerated tungſten is conſtantly procured.

972 Bergman's opinion concerning the acids of tungſten and molybdæna.

Mr Bergman obſerves, that the acid earth of tungſten is nearly allied to that of molybdæna; and both are in a ſtate much reſembling that of white arſenic. "It is well known (ſays he) that arſenic, in its ſemimetallic ſtate, is nothing but a peculiar acid ſaturated with phlogiſton; and that the white calx is an intermediate ſtate between acid and metal, containing juſt phlogiſton enough to coagulate the acid, but remaining ſtill ſoluble in water, and ſhowing ſigns of acidity. If a concluſion from analogy be admiſſible, all the other metals ſhould conſiſt in a combination of the ſame nature of the different radical acids, which with a certain quantity of phlogiſton are coagulated to a dry earthy ſubſtance; and on full ſaturation are reduced to the ſtate of complete metals."

973 Why he ſuppoſed the acids to be metallic earths.

The reaſons which induced Mr Bergman to ſuppoſe that the acids in queſtion are metallic earths, are as follow: 1. They both ſhow a ſtriking reſemblance to white arſenic in form, in producing effects like acids, and in their difficult ſolubility in water. 2. Their ſpecific gravity; that of arſenic being 3750, the earth of molybdæna 3460, and the acid of tungſten 3000. 3. Their precipitation with phlogiſticated alkali; a property hitherto deemed peculiar to metallic calces. Arſenic alſo, properly diſſolved in muriatic acid, gives, with the phlogiſticated alkali, a precipitate ſoluble in water, in the ſame manner as the acid of tungſten. 4. From their property of tinging vitreous matters; which, as well as that of precipitating with the phlogiſticated alkali, is reckoned to be a peculiar property of metals. The acid of tungſten produces by itſelf ſome efferveſcence with mineral alkali. With microcoſmic ſalt it produces a globule at firſt of a light blue; more of the acid makes it a dark blue; but ſtill it remains free from redneſs by refraction. A further addition makes it brown. Borax requires a ſlight tinge of blue, and with more of the acid becomes of a yellowiſh brown colour; but remains tranſparent, provided no further addition be made. This ultimate brown colour cannot be driven off either by nitre or the point of the flame urged by a blow-pipe. Acid of molybdæna is no leſs powerful; for with microcoſmic ſalt it produces a beautiful green colour: borax well ſaturated with it appears grey when viewed by the reflected rays, but of a dark violet by the refracted.

§ 15. *Of the Acid of* MILK.

Acid of milk and its combinations.

974 Milk moſt ſtrongly acid after ſtanding a fortnight.

975 Component principles of ſour whey.

It is univerſally known, that in the ſummer-time milk grows ſour and thick in a few days, and that this ſourneſs continues for ſome time to increaſe. It is ſtrongeſt after a fortnight has elapſed; after which, if the whey be filtered and evaporated to one-half the quantity, a few curds will ſtill ſettle to the bottom. By ſaturating the whey with volatile alkali, a ſmall quantity of animal earth precipitates; and the ſame thing takes place on the addition of lime-water. On the addition of a ſmall quantity of acid of tartar, the latter ſoon becomes partially ſaturated with vegetable alkali, and is converted into tartar. Thus the acid of milk beſides its proper acid part, contains animal earth and vegetable alkali in a looſe ſtate, and which is attracted by the acid of tartar; beſides all theſe it has alſo a ſmall quantity of the ſame alkali ſaturated with muriatic acid. It is no eaſy matter to ſeparate theſe ſubſtances from one another; becauſe the acid is not ſufficiently volatile to riſe in diſtillation by a gentle heat, nor are its principles ſufficiently fixed to bear the action of a ſtrong fire. With the one therefore it remains almoſt entirely in the retort, and with the other it is deſtroyed. Mr Scheele therefore uſed the following proceſs.

976 Scheele's method of procuring the pure acid of milk.

He evaporated ſour whey till only one-eighth part remained; when the cheeſy part being totally ſeparated, he ſtrained the acid; and in order to obtain the animal earth, ſaturated the liquor with lime, diluting the ſolution with a triple quantity of water. In order to ſeparate the lime, he employed the acid of ſugar, which has a ſtronger attraction than any other for lime. This earth therefore being ſeparated, the matter was evaporated to the conſiſtence of honey, and highly rectified ſpirit of wine poured upon it to diſſolve the acid part; which being accompliſhed, the other ſaline ſubſtances were left by themſelves: and, laſtly, the acid ſolution being diluted with pure water, and the ſpirit ſeparated by diſtillation, the pure acid remained in the retort.

977 Properties of this acid.

The properties of the acid of milk are, 1. Evaporated to the conſiſtence of a ſyrup, it yields no cryſtals; and when evaporated to dryneſs, it deliqueſces. 2. By diſtillation it yields firſt water, then a weak acid like ſpirit of tartar; afterwards ſome empyreumatic oil, with more of the ſame acid, fixed air, and inflammable air; in the retort was left a fixed coal. 3. By ſaturation with fixed vegetable alkali it yields a deliqueſcent ſalt, ſoluble in ſpirit of wine. 4. A ſalt of a ſimilar kind is obtained by combining it with mineral alkali. 5. With volatile alkali a deliqueſcent ſalt is produced, which by diſtillation yields a great deal of its alkali before the acid is deſtroyed by heat. 6. It forms deliqueſcent ſalts with terra ponderoſa, lime, and clay; but with magneſia it forms ſmall cryſtals, which, however, are again deliqueſcent. 7. It has no effect either by digeſtion or boiling on biſmuth, cobalt, regulus of antimony, tin, quickſilver, or gold. However, after digeſtion with tin, it precipitated gold from its ſolution in aqua-regia, in the form of a black powder. 8. It diſſolves iron and zinc, producing inflammable air during the ſolution. The liquor produced by the diſſolution of iron was brown, and yielded no cryſtals; but the ſolution of zinc cryſtallizes. 9. Copper diſſolved in this acid communicates to the liquor firſt a blue, then a green, and then a dark blue colour, without cryſtallizing. 10. Lead was diſſolved after

ſome

Acid of milk and its combinations.

ſome days digeſtion; the ſolution had a ſweet aſtringent taſte, and would not cryſtallize. A ſmall quantity of white matter fell to the bottom, which on examination was found to be vitriol of lead.

978 It ſeems to be of the acetous kind.

“ From theſe experiments (ſays Mr Scheele) it appears, that the acid of milk is of a peculiar kind; and though it expels the vinegar from the acetated vegetable alkali, yet it ſeems deſtined, if I may ſo ſpeak, to be vinegar; but from the want of ſuch ſubſtances as, during fermentation, produce ſome ſpirituous matter, it ſeems not to be volatilized, though a portion of it indeed arrives at this point, and really becomes vinegar: for without a previous ſpiritous fermentation, or without brandy, there never ariſes any vinegar.

979 Milk capable of complete fermentation.

But that the milk enters into a complete fermentation though there be no ſign of brandy preſent, appears from the following experiment: If a bottle full of freſh milk be inverted into a veſſel containing ſo much of the ſame liquor that the mouth of the bottle reaches below the ſurface of the latter, and if you expoſe this bottle to a degree of heat a little greater than our ſummer, you will find, in the ſpace of 24 hours, that the milk is not only coagulated, but in part expelled out of the bottle; and that in a couple of days afterwards, the aerial acid extricated from the milk will have expelled the greater part of it. It was ſaid above, that the acid of milk cannot be converted into vinegar, from the want of ſuch ſubſtances as during fermentation produce brandy;

2d 979 Converted into vinegar.

which appears to be evident from this: If to a kanne of milk you add five ſpoonfuls of good brandy, and expoſe the veſſel, well corked, in ſuch a manner, however, that you now and then give vent to the air developed during fermentation, you will find in a month, ſooner or latter, that the whey will be changed into good vinegar, which, ſtrained through a cloth, may be kept in bottles.”

980 Acid of ſugar of milk how procured.

The acid of ſugar of milk is conſiderably different from that juſt now deſcribed. To procure it, Mr Scheele poured 12 ounces of diluted nitrous acid on four ounces of finely powdered ſugar of milk contained in a glaſs retort, to which a receiver was adapted. The retort was placed in a ſand-bath, and as ſoon as the mixture acquired a certain degree of heat, it began to efferveſce violently; for which reaſon, the retort and receiver were taken away from the fire. The mixture, however, continued to grow hotter and hotter, with a great emiſſion of dark red vapours continually increaſing, for half an hour. A conſiderable quantity of nitrous air and aerial acid were extricated during that time. Care muſt be taken, therefore, to have the retort and receiver both of a ſufficient ſize, and not to make the luting too tight. When the efferveſcence had ſubſided, the retort was again placed in the ſand-bath, and the nitrous acid thus diſtilled off till the maſs acquired a yellowiſh colour; on which the retort was immediately taken away from the fire. In two days time the ſolution ſeemed to have undergone no remarkable change, nor was there any appearance of cryſtals. Eight ounces more of the ſame nitrous acid were therefore added, and the whole expoſed to the ſame degree of heat as before. When the maſs grew warm, another efferveſcence, though weaker than the former, enſued; the yellow colour diſappeared, and the nitrous acid was again abſtracted, till the ſolution, which had been rendered opaque by the appearance of a white powder in it, aſſumed a yellowiſh colour, on which the retort was again removed from the ſand. After it was grown cool, the maſs in the retort was found to be inſpiſſated; it was rediſſolved in eight ounces of water, and filtered. Seven and a half drachms of white powder remained on the filter; the ſolution which paſſed through the filter was very acid. It was evaporated to the conſiſtence of a ſyrup, four ounces more nitrous acid poured upon it, and the evaporation repeated in a ſand-heat. After the whole was cool, ſome ſmall long acid cryſtals were found, together with a ſmall quantity of white powder which was ſeparated from it, and ſome more nitrous acid poured on the remaining maſs, and on evaporation, more ſuch cryſtals made their appearance. The ſame proceſs was repeated ſeveral times; by which means the whole maſs was at laſt changed into ſuch cryſtals, and weighed about five drachms, ſhowing in every reſpect the ſame phenomena produced by acid of ſugar. The white powder, weighing ſeven and a half drachms, was the true acid of ſugar of milk; and its properties are,

981 Properties of this acid.

1. It burns in a red hot-crucible like oil, without leaving behind it any mark or aſhes. 2. It diſſolves in boiling water in the proportion of one of ſalt to 60 of the liquid. 3. One fourth part of the diſſolved powder ſeparates from the liquid on cooling, in form of very ſmall cryſtals. 4. Half an ounce of the ſalt was diſſolved in a glaſs veſſel in 30 ounces of boiling water, and the ſolution filtered when cold. It had a ſouriſh taſte, reddened the tincture of lacmus, and efferveſced with chalk. 5. Two drachms of the ſalt expoſed to an open fire in a glaſs retort, melted, grew black, and frothed very much; a brown ſalt was found ſublimed into the neck of the retort, which ſmelled like a mixture of ſalt of benzoin and ſalt of amber, eleven grains of coal remaining in the retort. The receiver contained a brown liquid without any mark of oil, ſmelling like the ſublimed ſalt. It contained alſo ſome of the ſalt diſſolved, which was ſeparated from it by a gentle evaporation. The ſublimed ſalt weighed 35 grains, had a ſour taſte, and was eaſily ſoluble in ſpirit of wine, but with more difficulty in water, and burned in the fire with a flame. 6. Concentrated vitriolic acid, diſtilled with this ſalt, became very black, frothed much, and decompoſed the ſalt entirely. 7. Acid of ſugar of milk, gradually added to a hot ſolution of alkali, occaſioned an efferveſcence and coagulation in conſequence of the formation of a vaſt number of cryſtals, which require eight times their weight of water to diſſolve them, and ſeparate again in a great meaſure from the liquid on cooling. The ſame phenomena took place with the mineral alkali, only the ſalt was ſomewhat more ſoluble, requiring only five times its weight of water for ſolution. If to a ſolution of it a ſolution of alkali of tartar be added, a number of ſmall cryſtals will ſoon be formed at the bottom of the veſſel, on account of the greater attraction of this acid with the vegetable alkali. 8. With volatile alkali it forms a kind of ſal ammoniac, which, after being gently dried, has a ſouriſh taſte. By diſtillation, the volatile alkali is firſt ſeparated, the lime-water precipitates, and the reſiduum yields the ſame products by diſtillation as the pure acid. 9. With all the earths, acid of ſugar of milk forms inſoluble ſalts.

Lithiſiac acid and its combinations.

ſalts. If a ſolution of ponderous earth in muriatic or nitrous acid be dropped into a ſolution of acid of ſugar of milk, the former is inſtantly decompoſed, and the earth falls to the bottom in combination with the acid of ſaccharum lactis. The ſame phenomena take place with ſolutions of lime in the nitrous and marine acids; but ſolution of gypſum is not decompoſed. The ſame alſo takes place with ſolutions of magneſia in vegetable or mineral acids, and with earth of alum; all of which are decompoſed by the neutral ſalts abovementioned. 10. The ſolution of this acid, by reaſon of the ſmall quantity diſſolvable in water, has no ſenſible effects on metals in their perfect ſtate; but when they are reduced to calces, it then acts upon them, and forms ſalts, very little or not at all ſoluble in water. Silver, mercury, and lead are precipitated in form of a white powder; blue, green, and white vitriol, as well as manganeſe combined with acid of vitriol, are not precipitated; but all metallic ſolutions are precipitated by the neutral ſalts.

§ 16. *Of the* LITHISIAC *Acid, or Acid of the human Calculus.*

982 Calculi all of the ſame nature.

THE calculi examined by Mr Scheele, with a view to diſcover their conſtituent parts, were, as he informs us, all of the ſame nature, whether flat and poliſhed, or rough and angular. A ſmall quantity of calculus in powder was put into a retort, and ſome diluted vitriolic acid, poured upon it. The powder was not affected by a digeſting heat; however, it was diſſolved when the humidity was abſtracted by diſtillation. After the diſſipation of the acid, a black coal was left in the retort, and the vitriolic acid which had paſſed into the receiver was become ſulphureous. The marine acid, whether diluted or concentrated, had no effect upon the calculus, not even when boiled with it. The nitrous acid diluted, or aquafortis, had ſome effect on the calculus, even when cold. On the application of heat, an efferveſcence enſued with red vapours, and the calculus was diſſolved. Repeating the experiment in a retort with lime-water, the latter was precipitated. The ſolution of calculus is acid, though the menſtruum be boiled with a ſuperabundant quantity of powder, ſo that there may remain a portion of it undiſſolved.

983 Properties of the acid of calculus.

It produces deep red ſpots on the ſkin in half an hour after it is applied; and if the ſaturated ſolution be a little more evaporated, it aſſumes of itſelf a blood-red colour, which however, diſappears on dropping in a ſingle drop of nitrous acid. Terra ponderoſa is not precipitated by it from the muriatic acid; nor are metallic ſolutions ſenſibly changed. With alkalies it becomes ſomewhat more yellow when the alkali is ſuperabundant. The mixture, in a ſtrong digeſting heat aſſumes a roſe colour, and ſtains the ſkin in the ſame manner, without any ſenſation of burning. The mixture likewiſe precipitates metals of different colours; vitriol of iron, black; of copper, green; ſolution of ſilver, grey; corroſive ſublimate, zinc, and lead, of a white colour. Lime water precipitates a white powder ſoluble in muriatic and nitrous acids without efferveſcence; and though there be an exceſs of precipitated powder, the ſolution will be acid. This white powder, therefore, is the acid of the calculus itſelf, the exiſtence of which is alſo confirmed by Mr Bergman's experiments. The further analyſis of this is related under the article CALCULUS, below.

Flowers of benzoin, &c.

§ 17. *Of the* FLOWERS *of* BENZOIN, ACID *of* LEMONS, *with other anamolous vegetable acids, and the reſemblance which the vegetable acids in general bear to one another.*

984 Flowers of benzoin obtained by ſublimation.

IT has long been known, that the reſinous ſubſtance, improperly called gum benzoin, yields by ſublimation with a gentle heat a quantity of fine ſaline matter of a moſt agreeable odour, and ſlightly acid taſte, called *flowers* of *benzoin*.

985 By lixiviation.

Another method of obtaining this ſubſtance is by lixiviating the gum with water, and cryſtallizing the ſalt.

986 Quantities obtained by both methods.

Mr Scheele, determined to try what quantity of the flowers could be obtained from the reſin, found that, by ſublimation, he was able to obtain from one pound of benzoin between nine and twelve drachms of flowers. By lixivation the quantity obtained was conſiderably leſs than the former, owing to the ſaline particles being ſo much covered by the reſin, that the water could not have ſufficient acceſs to diſſolve them all.

987 Attempts to procure all the flowers the reſin is capable of yielding.

It was next attempted to procure all the flowers which the benzoin was capable of yielding.

988 Boiling with chalk inſufficient;

This was firſt done by boiling pounded chalk and benzoin in water, and then filtering the decoction; but no cryſtals appeared. On pouring ſome drops of vitriolic acid into the liquor, the ſalt of benzoin ſoon afterwards precipitated (for this ſalt, which is an acid, was united to the chalk); but the quantity of ſalt was no greater than that obtained by lixiviation.

989 And with alkaline ley.

Alkaline ley was next tried, and the ſolution ſaturated with an acid. Thus the ſalt of benzoin was obtained by precipitation; but here this inconvenience was met with, that the powder of benzoin ran together during the boiling, and floated on the ſurface like a tenacious reſin.

990 Boiling with lime the beſt method.

One only method, therefore, remained to be tried, and that was to boil the benzoin with quick-lime; and as the particles of lime, by interſperſing themſelves betwixt thoſe of the benzoin would prevent their running together, and lime has likewiſe the property of acting upon the reſinous particles, this ſeems to be the beſt method of procuring the flowers of benzoin in the greateſt quantity, and alſo of the beſt quality; and thus we may obtain from 12 to 14 drachms of flowers from a pound of benzoin.

991 Mr Scheele's receipt for preparing the flowers of benzoin by this method.

Mr Scheele's receipt for preparing them after this new method, is as follows: " Pour 12 ounces of water upon four of unſlaked lime, and after the ebullition is over, add eight pounds (of 12 ounces each) of water; put then a pound of finely powdered reſin of benzoin into a tinned pan, pour upon it firſt about ſix ounces of the lime-water abovementioned; mix them well together, and thus add all the reſt of the lime-water in ſucceſſion. The reaſon of adding the lime-water thus by portions, is, that if it be poured in all at once, it will not mix with the benzoin, which will likewiſe coagulate and run together into a maſs. This mixture muſt be boiled over a gentle fire for half an hour, agitating it conſtantly; then taking it from the fire, let it ſtand quiet for ſome time to ſettle, after which the clear liquor is to be poured off into a glaſs veſſel. Pour then eight pounds of water more upon the lime in the veſſel, and uſe this lime-water as before, repeating this proceſs twice more, making four times in all; and laſtly, putting all the reſiduum together on a filter, pour hot water upon them. During this proceſs, the calcareous earth of the lime-water combines with the acid of benzoin, and ſeparates it from the reſinous particles of this ſubſtance; but a ſmall quantity of reſin is diſſolved by the lime-water, and gives it a yellow colour.

"All theſe liquors being mixed together and boiled down to two pounds, are then to be ſtrained into another glaſs veſſel. They are inſpiſſated ſo far, becauſe the ſuperfluous water would hold a great quantity of the ſalt in ſolution; and a little of the reſin being ſoluble in a large quantity of lime-water, but not in a ſmall, falls to the bottom on the liquor being inſpiſſated. When the liqour has become cold, after being ſtrained the laſt time, add muriatic acid till the flowers be totally precipitated, which happens by reaſon of the ſtronger attraction of the marine acid for the calcareous earth. The precipitated coagulum is then to be put upon a filter; and, after being well dried, to be edulcorated ſufficiently, by repeatedly pouring cold water upon it, when it muſt be dried with a gentle heat. As the water made uſe of for this purpoſe, however, is capable of diſſolving a little of the ſalt of benzoin, it ought to be evaporated, and afterwards ſet to cryſtallize. In order to give this ſalt a ſhining appearance, let it be diſſolved in a ſufficient quantity, ſix, ounces, for inſtance, of water by gentle boiling; then ſtrain it immediately, while yet warm, through a cloth, into a glaſs veſſel which has been heated before; and thus a number of fine cryſtals will ſhoot as ſoon as the ſolution is grown cold. The water is then to be ſtrained from the cryſtals, and the reſt of the ſalt ſuſpended in the water may be obtained by repeated evaporation and cryſtallization. In this method, however, a great quantity of the flowers are loſt by reaſon of their volatility; it will therefore be more convenient to keep them in the form of their original precipitate, which is always in fine powder. Cloth anſwers beſt for the filtration of the hot ſolution: when blotting paper is uſed, the ſalt ſometimes cryſtallizes in the filter, and obſtructs it. The filteration itſelf might be omitted, were it not that about two grains of reſin of benzoin remain united to the liquor, from whence it cannot be ſeparated but by the operation juſt mentioned."——The properties of this ſalt as an acid are but little known. It has a moſt agreeable flavour; which, however, ceaſes as ſoon as it unites with calcareous earth, but is recovered again on being ſeparated by any other acid.

992 Flavour of the flowers may be taken away and produced at pleaſure.

993 Anomalous vegetable acids how divided.

994 Of the eſſential acids.

With regard to the other vegetable acids, they may be divided into the eſſential, the fermented, and empyreumatic. The eſſential acids are pure, as exemplified in thoſe of lemons, ſorrel, and ſorrel-dock; or but little altered by the admixture of other matters, as thoſe of cherries, barberries, tamarinds, &c. In ſweet fruits they are generally ſo much covered when ripe as ſcarce to be diſtinguiſhed: however, theſe latent acids become more evident, partly in fermentation, and partly by dry diſtillation. By the former method, all flowers, excepting a few which bear cruciform flowers, are made to yield vinegar; and by dry diſtillation only a very few yield a volatile alkali.

995 Empyreumatic acids.

The acid which paſſes over in dry diſtillation is ſcarce perceptible while the ſubject retains its natural form; but when once produced, has the ſame eſſential qualities with the other; whence it was naturally ſuppoſed that all vegetable acids are at bottom the ſame. Chemiſts, however, have been divided in their opinions on this ſubject; ſome ſuppoſing that the acid of ſugar or of tartar is the baſis, and others that vinegar is the baſis of them all. In proof of this latter hypotheſis, it has been urged, that the acid of lemons may be cryſtallized; of which we have the following account in Scheele's Eſſays. "The juice will not ſhoot into cryſtals by mere evaporation, even when thickened to the conſiſtence of a ſyrup. This our author ſuppoſed to proceed from the great quantity of mucilaginous matter with which the juice abounds; for which reaſon he mixed the inſpiſſated juice with ſtrong ſpirit of wine which coagulated the whole: but even thus he could obtain no cryſtals by evaporation. He therefore employed the method uſed for procuring the pure acid of tartar, and which is formerly deſcribed. The lemon juice, while boiling, was ſaturated with pulveriſed chalk, and the compound immediately fell to the bottom in a form nearly reſembling tartariſed lime. To ſeparate the acid, a quantity of oil of vitriol, equal in weight to the chalk employed, but diluted with ten times it weight of water was neceſſary. This mixture muſt be boiled in a glaſs veſſel for a few minutes; and when grown cold, the acid is to be ſeparated from the gypſum by filtration. In order to cryſtallize it, we muſt evaporate the whole to the conſiſtence of a thin ſyrup; but great care is to be taken, leſt any of the calcareous earth remain in the evaporated liquour: to determine which, a little of it is to tried with freſh oil of vitriol, which will throw drown the remainder: and in this caſe ſome more muſt be added to the whole quantity; for the leaſt particle of lime remaining prevents the cryſtallization, while the ſuperfluous quantity of oil of vitriol, if too much happens to be added, remains in the liquor. The cryſtals ſhoot equally well in a hot as in a cold temperature, which is very unuſual."

996 Whether the acid of ſugar or of tartar is the baſis of vegetable of acids.

997 Dr Crell's method of cryſtallizing the acid of lemons.

998 The cryſtallization prevented by the ſmalleſt particle of lime.

999 Salt of lemons cannot be converted into acid of ſugar.

It is very remarkable that this cryſtallized ſalt of lemons cannot be converted into acid of ſugar by means of that of nitre, though the extract of the juice itſelf may. Sour cherries afford acid of ſugar, and another ſalt ſuppoſed to be tartar; and a kind of ſugar may be obtained not only from roots of various kinds, but from fine raiſins, and, as Dr Crell thinks, from expreſſed muſt; but whether the ſaccharine acid can be procured from this kind of ſugar in equal quantity as from the common, or even whether it yields the ſame products with common ſugar by dry diſtillation, is ſtill a matter of doubt.

1000 Product of acid of tartar by dry diſtillation.

Pure acid of tartar yields on diſtillation *per ſe* an empyreumatic acid, and a coal conſiſting of oily particles and calcareous earth. Dr Crell therefore aſks, May not the acetous acid be mere acid of tartar, which did not meet with alkaline ſalt and earth enough with which it might combine and become more fixed; but, on the contrary, attracted more ſubtile oily particles, and thus become more volatile? In diſtilling terra foliata tartari in the dry way, the acid of vinegar which enters its compoſition is almoſt entirely deſtroyed, only $\frac{1}{480}$th of pure acid being obtained, the reſiduum in the retort, as well as the reſt of that which comes over into the receiver, being entirely alkakine; and the

1001 Acetous acid almoſt entirely deſtoyed by fire.

ſame thing happens to the acid of tartar, the empyreumatic acid abovementioned being extremely weak. Mr Beaumé likewiſe informs us, that if any calcareous earth, egg-ſhells, for inſtance, be diſſolved in vinegar, and the cryſtallized ſalt be diſtilled, we obtain $\frac{23}{64}$ of a red and very fiery inflammable fluid, ſmelling like empyreumatic acetous ether, which reddens tincture of turnſole. Muſt, diſtilled before fermentation, yields only an empyreumatic acid reſembling ſpirit of tartar. The conjecture therefore ſeems reaſonable, that vinegar and tartar have for their baſis the ſame ſpecies of acid, which in the caſe of vinegar is combined with a greater proportion of oil, and in tartar with more earth.

1002 Requiſites for bringing vinegar nearer the ſtate of tartar.

To bring vinegar therefore nearer the ſtate of tartar, we muſt deprive it of its fine volatilizing phlogiſton, combine it with more fixed matter, and reſtore its groſſer oil. All this, however, is extremely difficult to be effected.

1003 Mr Weſtrumb's unſucceſsful attempt.

Mr Weſtrumb, who attempted it, added nitrous acid in various proportions, but could only produce a phlogiſtication of the latter, and dephlogiſtication of the vinegar; but as he could not think of any method of ſeparating the two acids from one another, he was unable to inveſtigate the properties of vinegar thus dephlogiſticated.

1304 Dr Crell's opinion of the poſſibility of tranſmutation.

Dr Crell is of opinion, that this might have been done by vegetable alkali, lime, and terra ponderoſa. The nitrous acid, with vegetable alkali, would have ſhot into the ordinary hexangular cryſtals of nitre: the acetous acid would have formed a compound not eaſily cryſtallized, provided it had remained unchanged; and, though it had approached the nature of ſaccharine acid, would ſtill have formed a compound difficultly cryſtallizable. The effects of theſe acids, indeed, on lime, are directly oppoſite to what they are on terra ponderoſa. With the former, nitrous acid forms a liquor which can ſcarce be cryſtallized; with the latter it produces ſalts difficult to be diſſolved: while the acetous acid, with terra ponderoſa, forms deliqueſcent ſalts; with lime, ſuch as effloreſce in the air. But if the vinegar, by means of the operation already mentioned, had been made to approach towards the nature of acid of ſugar, tranſparent cryſtals would immediately have fallen by reaſon of the ſtrong attraction of this acid for lime.

1005 Method recommended by him for attempting the experiment.

Dr Crell therefore recommends the following method. Let nitrous acid be ſeveral times diſtilled off from vinegar; and when the former, upon being newly added, produces no more red vapours, ſaturate the liquor with lime or terra ponderoſa, ſeparating the ley, which will not ſhoot, from the cryſtals. The nature of the ſalt which does not contain nitrous acid, may be determined from the figure of its cryſtals, or from the effects of other ſalts in conſequence of a double elective attraction. We might likewiſe add freſh nitrous acid to the ſeparated ſalt, or to the whole mixture, without any ſeparation of the nitrous ſalt, till the earthy ſalt, which does not contain any nitrous acid, be ſaturated. The vinegar, if unaltered by the operation, would riſe on diſtilling the liquor; and if converted into ſaccharine acid, would not be diſlodged from lime by ſpirit of nitre. In like manner, diſtilled vinegar ſhould be ſaturated with chalk, the compound reduced to cryſtals, and then expoſed to as ſtrong a fire as it can bear without expelling the acid, in order to diſſipate ſome phlogiſtic particles. Let it then be diſſolved, filtered, and cryſtallized again; after which it may be treated with nitrous acid as above directed. "Perhaps (ſays Dr Crell), the acetous acid may by this combination acquire more fixity; ſo that the nitrous acid ſhall be able to produce a greater change. Should it paſs over again in the form of acetous acid unchanged, let it be combined once more with calcareous earth; and let the foregoing experiment be repeated, in order to try whether ſome ſenſible change will not enſue. Should this method fail, try the oppoſite; that is, endeavour to add more groſs phlogiſtic matter to the vinegar. Try to combine ſtrong vinegar, and that which has been diſtilled, with unctuous oils. Thus we might perhaps bring it nearer to tartar; and again, by means of nitrous acid, convert it into acid of ſugar.

1006 His attempts to prove that all the vegetable acids may be reduced to one.

In another diſſertation on this ſubject, Dr Crell undertakes to ſhow, that all the vegetable acids may be converted into one, and that this is contained in the pureſt ſpirit of wine. The following are adduced as proofs.

1007 From the reſiduum of dulcified ſpirit of nitre.

1. If the reſiduum of dulcified ſpirit of nitre be boiled with a large quantity of nitrous acid, care being taken at the ſame time to condenſe the vapours by a proper apparatus; and if the liquid which has paſſed over be ſaturated with vegetable alkali, nitre and terra foliata tartari will be obtained; and on ſeparating the latter by means of ſpirit of wine, the vinegar may be had in the ordinary way of decompoſing the ſalt.

2. On boiling the reſiduum over again with nitrous acid, the ſame products are obtained; and the more frequently this proceſs is repeated, the leſs acid of ſugar is procured, until at length no veſtige of it is to be met with.

1008 From the decompoſition of acid of ſugar.

3. Pure acid of ſugar, boiled with 12 or 14 times its quantity of nitrous acid, is entirely decompoſed, and the receiver is found to contain phlogiſticated nitrous acid, vinegar, fixed air, and phlogiſticated air, while a little calcareous earth remains in the retort.

1009 From the production of acid of tartar from the reſiduum of dulcified ſpirit of nitre.

4. Acid of ſugar is likewiſe decompoſed by boiling with ſix times its quantity of vitriolic acid. In the receiver we find vinegar phlogiſticated with vitriolic acid, aërial acid; while pure vitriolic acid remains in the retort.

5. By ſaturating the reſiduum of dulcified ſpirit of nitre with chalk, there is formed an inſoluble ſalt, which by treatment with vitriolic acid yields a real acid of tartar, conſtituting a cream of tartar with vegetable alkali.

1010 From the production of empyreumatic acid of tartar from the liquor in which tartarous ſelenite is boiled.

6. On evaporating the liquor from which the tartareous ſelenite was obtained, a dark-coloured matter remains, yielding on diſtillation an empyreumatic acid of tartar, and a ſpongy coal. Hence it would ſeem, that ſpirit of wine conſiſts of acid of tartar, of water, and phlogiſton; ſo that it is a native dulcified acid: and nitrous acid, on being mixed with it in moderate quantity, diſlodges the acid of tartar. On the addition of more nitrous acid, the acid of tartar is reſolved into acid of ſugar and phlogiſton; and by a ſtill greater addition, the ſaccharine acid is changed into vinegar.

1011 From the ſolution of mangaueſe by nitrous acid and acid of ſugar.

7. On boiling one part of the acid of ſugar with one and an half of mangancſe and a ſufficient quantity of nitrous

nitrous acid, the mangane$e will be almoſt entirely diſſolved, and phlogiſticated nitrous acid along with vinegar will paſs over into the receiver.

8. On boiling together acid of tartar, mangane$e, and nitrous acid, we obtain a ſolution of the mangane$e, with phlogiſticated nitrous acid and vinegar as before.

1012 From the ſolution of the ſame with vitriolic acid and that of tartar.

9. If acid of tartar be boiled along with vitriolic acid and mangane$e, the latter will be diſſolved, and vinegar with vitriolic acid will paſs over into the receiver.

1013 From the digeſtion of acid of tartar with ſpirit of wine.

10. On digeſting acid of tartar and ſpirit of wine for ſeveral months, the whole is converted into vinegar, the air in the veſſel being partly converted into cretaceous acid, and partly into phlogiſticated air.

1014 From the ſolution of mangane$e with vitriolic acid and ſpirit of wine.

11. On boiling ſpirit of wine with vitriolic acid and mangane$e, it will be converted into vinegar and phlogiſticated air.

1015 From the diſtillation of ſpirit of wine with cauſtic alkali.

12. By diſtilling ſpirit of wine upwards of 20 times from cauſtic alkali, it was changed into vinegar, and a conſiderable quantity of water was obtained.

Hence it appears, ſays Dr Crell, that the acids of tartar, ſugar, and vinegar, are modifications of the ſame acid, as it contains more or leſs phlogiſton. The acid of tartar has the greateſt quantity, the acid of ſugar ſomewhat leſs, and vinegr the leaſt of all. In theſe experiments, however, care muſt be taken that neither the nitrous acid nor fixed alkali employed contain any marine acid, otherwiſe the reſults will be uncertain.

§ 18. *Of the Acid of Fat.*

2d 1015 How procured.

This may be obtained from ſuet by means of many repeated diſtillations. A ſmall quantity is ſeparated at each diſtillation; but by diſtilling the empyreumatic oil into which the ſuet is thus converted over and over, a freſh quantity is always obtained. The acid of fat in ſome reſpects has a reſemblance to that of ſea-ſalt; but in others is much more like the vegetable kind, as being deſtructible in a ſtrong fire, forming compounds which do not deliqueſce with calcareous earth, and uniting intimately with oily ſubſtances.

3d 1015 Its effects on alkalies, &c.

With alkalies it forms ſalts entirely different from thoſe yielded by the other acids; with the volatile alkali, particularly, it produces a concrete volatile ſalt. When ſaturated with calcareous earth, it yields brown cryſtals; and a ſalt of the ſame kind was obtained by Dr Crell from a mixture of quicklime and ſuet diſtilled to dryneſs, and boiling up the reſiduum with water. The cryſtals were hexagonal, and terminated by a plane ſurface; their taſte was acrid and ſaltiſh; they did not deliqueſce in the air, and were eaſily and copiouſly diſſolved in water. With magneſia and earth of alum a gummy maſs is obtained, which refuſes to cryſtallize.

4th 1015 On metals.

With regard to the metals, Dr Crell informs us, that the acid of fat copiouſly diſſolves mangane$e into a clear and limpid liquor. It diſſolves the precipitate of cobalt, but not the regulus. White arſenic is acted upon but ſparingly, and nickel not at all, though it forms a green ſolution with the precipitate from nitrous acid. Regulus of antimony, by the aſſiſtance of heat is diſſolved into a clear liquor, which became milky in the cold: it cryſtallized on evaporation, and did not deliquate in the air. Zinc readily diſſolved, and imparted a peculiar metallic taſte, falling to the bottom in the form of a white powder on the addition of an alkali. Biſmuth in the metallic ſtate was not diſſolved; but the precipitate was. It acted upon mercury after being twice diſtilled from it, and poured afreſh upon the metal. The mercury could not be entirely precipitated by common ſalt. It acted more vigorouſly upon a precipitate from corroſive ſublimate; from the ſolution of which a white ſublimate was obtained after the liquor had been drawn off by diſtillation. A gold-coloured ſolution was obtained from platina by diſtilling the acid from it to dryneſs, and then pouring it back again; the precipitate of this metal from aqua-regia by ſpirit of wine was diſſolved in great abundance. Iron was very eaſily diſſolved in it, and exhibited a liquor of an aſtringent taſte, which ſhot into needle-like cryſtals that did not deliqueſce in the air. Lead was corroded and rendered the acid turbid. Minium was converted into a white powder, and then diſſolved with greater eaſe. The ſolution has a ſweet taſte, and cannot be precipitated by ſea-ſalt. Tin was corroded into a yellow calx, and diſſolved but in very ſmall quantity. Copper was diſſolved, even in the cold, into a green liquor; but the ſolution was greatly promoted by heat. On evaporation it ſhowed ſome diſpoſition to cryſtallize, but again attracted moiſture from the air. Silver-leaf was attacked only in a very ſmall degree; however, ſome was precipitated by means of copper, and the marine acid rendered the liquor turbid. The calx precipitated from aquafortis was diſſolved more copiouſly. Silver was precipitated of a white colour from aquafortis by the pure acid itſelf, as well as by its ammoniacal ſalt. Half an ounce of the acid diſtilled four times almoſt to dryneſs from ſome gold-leaves, and at length poured back upon them, the precipitate of a dilute ſolution of tin obtained by it, gained only a faint colour, rather inclining to red; but a mixture of two parts of acid with one of aquafortis, diſſolved gold very readily.

§ 19. *Of Fixed Alkaline Salts.*

1016 How procured.

Of theſe there are two kinds; the vegetable and mineral. The former is never found by itſelf, and but rarely in combination with any acid; but is always prepared from the aſhes of burnt vegetables. It is got in the greateſt quantity from crude tartar; from which, if burned with proper care and attention, we may obtain one pound of alkali out of $2\frac{1}{4}$ of the tartar. The latter is found native in ſome parts of the earth. It is likewiſe found in very large quantities combined with the marine acid, in the waters of the ocean, and in the bowels of the earth; thus forming the common alimentary ſalt. It is alſo produced from the aſhes of certain ſea-plants, and of the plant called *kali;* from whence both the mineral and vegetable alkalies have taken their name.

1017 Vegetable alkali cryſtallized.

The vegetable alkali difficultly aſſumes a cryſtalline form; nevertheleſs, it may be partially united with ſome acids in ſuch a manner as to cryſtallize, and loſe its property of deliquating in the air, without at the ſame time ceaſing to be an alkali. Of this we have an example in the acid of ants abovementioned. Something

thing of the ſame kind we have obſerved in treating vegetable fixed alkali with ſpirit of wine. A gallon of pretty ſtrong ſpirit of wine being drawn over from a pound of ſalt of tartar, a black unctuous liquor was left, which ſhot into cryſtals very much reſembling vitriolated tartar, and which did not deliquate in the air, but were nevertheleſs ſtrongly alkaline. Dr Black, however, informs us, that the vegetable alkali may be ſhot into fine cryſtals; but which cannot be preſerved, on account of their great attraction for moiſture, unleſs cloſely ſhut up from the air. They have not ſuch a quantity of water as to undergo the aqueous fuſion.

1018 Change on the vegetable alkali.

The mineral alkali in its natural ſtate always aſſumes a cryſtalline form, ſomewhat reſembling that of ſal mirabile. It does not deliquate in the air, nor does it ſeem to have ſo ſtrong an attraction for water, even when in its moſt cauſtic ſtate, as the vegetable alkali: hence mineral alkali is preferable to it in making ſoap, which is always of a firmer conſiſtence with mineral than with vegetable alkali. If vegetable alkali is combined with ſpirit of ſalt, ſome change ſeems to be thereby induced upon it; as the ſalt produced by expelling the marine acid by means of the vitriolic, and then cryſtallizing the maſs, cryſtallizes differently from vitriolated tartar. Whether the vegetable alkali might by this means be entirely converted into the mineral, deſerves a further inquiry.

1019 Difference between vegetable and mineral alkalies.

Both mineral and vegetable alkalies, when applied to the tongue, have a very ſharp, pungent, and urinous taſte; but the vegetable conſiderably more ſo than the mineral. They both unite with acids, and form different neutral ſalts with them: but the vegetable alkali ſeems to have rather a greater attraction for acids than the other; although this difference is not ſo great as that a neutral ſalt, formed by the union of mineral alkali with any acid, can be perfectly decompoſed by an addition of the vegetable alkali, unleſs in conſiderable exceſs.

1020 Compoſed of a cauſtic ſalt and fixed air.

Both vegetable and mineral alkali appear to be compoſed of an exceedingly cauſtic ſalt united with a certain quantity of fixed air. This may be increaſed ſo far, as to make the vegetable alkali aſſume a cryſtalline form, and loſe great part of its alkaline properties: but as the adheſion of great part of this air is very ſlight, it eaſily ſeparates by a gentle heat. Some part, however, is obſtinately retained; and the alkali cannot be deprived of it by the moſt violent calcination *per ſe*. The only method of depriving it entirely of its fixed air is, by mixing an alkaline ſolution with quicklime.

Fixed Alkalies COMBINED,

1021 Hepar ſulphuris.

I. *With Sulphur.* The produce of this is the red fetid compound called *hepar ſulphuris*, or liver of ſulphur. It may be made by melting ſulphur with a gentle heat, and ſtirring into it, while melted, four times its weight of dry alkaline ſalt. The whole readily melts and forms a red maſs of a very fetid ſmell, and which deliquates in the air. If ſulphur is boiled in a ſolution of fixed alkaline ſalt, a like combination will take place.

1022 Decompoſed.

In this proceſs, when the hepar is made either in the dry or the moiſt way, the fixed air of the alkali is diſcharged, according to Dr Prieſtley's obſervation. Neither does a fixed alkali, when combined with fixed air, ſeem capable of uniting with ſulphur; nor will the union be accompliſhed without heat, unleſs the alkali is already in a cauſtic ſtate. Hence a cold ſolution of hepar ſulphuris may be decompounded, partly at leaſt, by fixed air. On adding an acid, however, the decompoſition takes place much more rapidly; and the ſulphur is precipitated to the bottom, in form of a white powder.

1023 Inflammable vapour in the compoſition of it.

During the precipitation of the ſulphur from an alkali, by means of acids, a thick white ſmoke ariſes, of a moſt fetid ſmell and ſuffocating nature. It burns quietly, without exploſion, on a candle's being held in it. Calces of ſilver, lead, iron, or biſmuth, are rendered black by it. Hence, if any thing is wrote with a ſolution of lead, and a ſolution of hepar ſulphuris is paſſed over it when dry, the writing, formerly inviſible, will immediately appear of a blackiſh brown colour. Silver, in its metallic ſtate, is prodigiouſly blackened either by the contact of this vapour, or by being immerſed in a ſolution of the hepar ſulphuris itſelf. Litharge is inſtantly reſtored to its metallic ſtate, on being immerſed even in a cold ſolution of hepar ſulphuris.

1024 Phlogiſton of ſulphur diſpoſed to quit the acid.

By being united with an alkali, the acid of ſulphur ſeems very much diſpoſed to quit the phlogiſton. If a ſolution of hepar ſulphuris is expoſed to the air for ſome time, it is ſpontaneouſly decompoſed; the phlogiſton of the ſulphur flying off, and the acid remaining united with the alkali into a vitriolated tartar. This decompoſition takes place ſo remarkably, when liver of ſulphur is diſſolved in water, that, by a ſingle evaporation to dryneſs, it will be almoſt totally changed into vitriolated tartar. If this ſubſtance, in a dry ſtate, be expoſed to a moderate degree of heat, and the maſs kept conſtantly ſtirring, a like decompoſition will follow; the phlogiſton of the ſulphur will fly off, and the acid unite with the alkali.

1025 Metals and charcoal diſſolved by it.

Liver of ſulphur is a great ſolvent of metallic matters; all of which, except zinc, it attacks, particularly in fuſion. It ſeems to diſſolve gold more effectually than other metals. This compound alſo diſſolves vegetable coals, even by the humid way; and theſe ſolutions, if ſuffered to ſtand in the open air, always precipitate a black powder, no other than the coal they had diſſolved, in proportion to the quantity of hepar ſulphuris decompoſed. When vegetable coal is thus diſſolved by liver of ſulphur in fuſion, it is of a much deeper red than in its natural ſtate. The ſolution in water is of a green colour.

1026 Soap.

II. *With Expreſſed Oils.* The reſult of this combination is *ſoap*; for the preparation of which in large quantities in the way of trade, ſee SOAP. The ſoap which is uſed in medicine is prepared without heat, in the following manner, according to the author of the Chemical Dictionary.

"One part of quicklime, and two parts of good Spaniſh ſoda (the ſalt prepared from the aſhes of the herb kali), are boiled together during a ſhort time in an iron caldron. This lixivium is to be filtered, and evaporated by heat, till a phial, capable of containing an ounce of water, ſhall contain an ounce and 216 grains of this lixivium. One part of this lixivium is to be mixed with two parts of oil of olives, or of ſweet almonds, in a glaſs or ſtone-ware veſſel. The mixture ſoon becomes thick and white; and muſt be ſtirred from time to time with an iron ſpatula. The combi-

Fixed alkaline ſalts and their combinations.

nation is gradually completed, and in ſeven or eight days a very white and firm ſoap is obtained."

In attempting combinations of this kind, it is abſolutely neceſſary that the alkali be deprived of its fixed air as much as poſſible; otherwiſe the ſoap will be quite unctuous and ſoft: for fixed alkalies have a greater attraction for fixed air than for oil, and hence ſoap is decompounded by blowing fixed air into a ſolution of it in water. It may be made either with tallow, wax, ſpermaceti, butter of cocoa, the coarſer reſinous ſubſtances, or animal oils.

1027 Starkey's ſoap. III. *With Eſſential Oils.* The volatility of theſe oils in a great meaſure hinders them from being acted upon by alkalies: nevertheleſs, combinations of this kind have been attempted; and the compounds ſo produced have been called *Starkey's ſoap*, from one Starkey a chemiſt, who endeavoured to volatilize ſalt of tartar by combining it with oil of turpentine. His method was to put dry ſalt of tartar into a matraſs, and pour upon it eſſential oil of turpentine to the height of two or three fingers breadth. In five or ſix months, a part of the alkali and oil were combined into a white ſaponaceous compound. This muſt be ſeparated from the mixture, and more of it will afterwards be formed by the ſame method.

Chemiſts, imagining this ſoap to be poſſeſſed of conſiderable medical virtues, have endeavoured by various methods to ſhorten this tedious proceſs. Of theſe one of the moſt expeditious is that recommended by Mr Beaumé; which conſiſts in triturating, for a long time, alkaline ſalt upon a porphyry, and adding oil of turpentine during the trituration. According to him, the thick reſinous part of the oil only can combine with the ſalt; and, during the time this combination is effected, the more ſubtile and attenuated parts will fly off. Hence he finds that the opeartion is conſiderably abridged by the addition of a little turpentine or common ſoap. The moſt expeditious of all, however, is that mentioned by Dr Lewis; which conſiſts in heating the alkali red hot, and then throwing it into oil of turpentine, ſtirring them well together; on which they immediately unite into a ſaponaceous maſs.

This kind of ſoap is ſubject to great alterations from keeping; particularly the loſs of its colour, and a kind of decompoſition occaſioned by the extraction of an acid from the oil of turpentine, which unites with the alkali, and cryſtallizes not only all over the ſurface, but in the very ſubſtance of the ſoap. The nature of this ſalt is unknown, but certainly deſerves conſideration.

1028 Phlogiſticated alkalies. IV. *With Phlogiſton.* This combination is effected by calcining them with the charcoal either of vegetable or animal matters. The conſequence is, that they are greatly altered in their properties; ſometimes ſo much as to be enabled to precipitate calcareous earths from their ſolutions in acids. Metallic ſolutions precipitated by them in this ſtate, aſſume different colours.

Differences obſerved between Fixed Alkalies obtained from different *Vegetables*.

Theſe differences we muſt conceive to ariſe from ſome proportion of the oily and phlogiſtic matter of the vegetable remaining in the aſhes from whence the ſalts are extracted; for when reduced to their utmoſt purity, by repeated calcinations in a ſtrong fire, and deliquations in the air, all of them, the marine alkali excepted, appear to be the very ſame.

1029 Mr Gmelin's experiments. On this ſubject Mr Gmelin has given a great number of experiments in the fifth volume of the *Commentaria Petropolitana*; and found very conſiderable differences, not only between the alkaline ſalts, but likewiſe the pure vegetable earths obtained from different vegetables by burning. The ſalts of the ſeveral plants examined were prepared with great care, and all of them exactly in the ſame manner; each vegetable being burnt in a ſeparate crucible, with the ſame degree of fire, till no remains of coaly matter could any longer be perceived; and the aſhes elixated in glaſs veſſels with cold diſtilled water. The ſalts, thus obtained, were found to produce different colours on mixture with certain liquors, and to effervеſce in very different degrees with acids: certain metallic ſolutions were by ſome precipitated, by others only rendered thicker, by others both precipitated and rendered thick; whilſt ſome occaſioned neither the one nor the other of theſe changes, but left the fluid clear and tranſparent. Thus, with the vitriolic acid, the ſalts of ſouthernwood and ſage ſtruck a pale brown colour; thoſe of pine-tops and rue, a yellow; that of fern, a reddiſh yellow; and that of ſanicle, a dark leek-green: that of dill yielded a leek-green precipitate, with elegant green flakes floating in the liquor. This laſt ſalt alſo gave a greeniſh precipitate with the marine acid, and a red one with the nitrous. Solution of corroſive ſublimate was changed yellow by ſalt of ſouthernwood; of a browniſh colour, by that of colt's-foot; of a deep red, by that of wormwood; and of a pitch-colour, by that of dill. That of fern threw down an opal-colour; of ſage, a ſulphur-yellow; of elder flowers, a citron yellow; of ſanicle, a ſaffron colour; and of milfoil, a deep-red precipitate. From ſolution of ſilver, ſalt of *carduus benedictus* threw down a white; of camomile, a grey; of hyſſop, a browniſh; of dill, a blackiſh brown; of ſcabious, a yellowiſh; and that of pine-tree tops, a ſulphur yellow precipitate. Solution of vitriol of copper was changed by ſalt of ſouthernwood to a bright ſea-green; by that of dill, to an unſightly green; of agrimony, to a greeniſh blue; and by that of milfoil, to a bright ſky-blue: the ſalt of penny-royal made the liquor thick as well as blue, and that of feverfew made it thick and green: the ſalt of hyſſop threw down a green precipitate, that of ſcurvy-graſs a blue one, and that of fumitory a greeniſh blue:—whilſt the ſalt of fern made ſcarcely any change either in the colour or conſiſtency of the liquor.

§ 19. *Of Volatile Alkali.*

1030 Whence obtained. This is a kind of ſalt obtained from all animal, ſome vegetable, ſubſtances, from ſoot by diſtillation with a ſtrong heat, and from all vegetable ſubſtances by putrefaction. Though a volatile alkali is procurable from all putrid animal ſubſtances by diſtillation, yet the putrefactive proceſs does not ſeem to prepare volatile alkali in all of theſe. Putrid urine, indeed, contains a great quantity of alkali ready formed, whence its uſe in ſcouring, *&c.* but the caſe is not ſo with putrid blood or fleſh. Theſe afford no alkali till after the phlegm has ariſen; and this they would

Volatile alkali and its combinations.

would do, though they had not been putrefied. According to Mr Wiegleb, volatile alkali is found in limeſtone, lapis ſuillus, chalk, marble, coals, turf, loam, clay, and many other kinds of earth. Its exiſtence in theſe ſubſtances may be diſcovered merely by diſtilling them with a briſk fire, but ſtill better by the addition of ſome quantity of fixed alkali or quicklime before the diſtillation.—It has even been found in all mineral ſalts and their acids, as vitriol, nitre, common ſalt, and the acid liquors drawn from theſe ſubſtances, alſo in gypſum and ſulphur: from all which it may be ſeparated by means of quicklime.—In the vegetable kingdom it is produced by dry diſtillation from muſtard-ſeed, elder flowers and leaves; the leaves of the wild cherry-tree, white water-lilies, tobacco, and ſage; as well as from many other plants. According to our author, the plaineſt proof of its exiſting almoſt univerſally in the vegetable kingdom, is, that the ſoot of our chimneys affords a volatile alkali by diſtillation, either with or without quicklime.

Volatile alkali, when pure, appears of a ſnowy whiteneſs; has a very pungent ſmell, without any diſagreeable empyreuma; is very eaſily evaporable, without leaving any reſiduum; effervesces with acids much more ſtrongly than fixed alkali; and forms with them neutral compounds called *ammoniacal ſalts*, which we have already deſcribed, and which are different according to the nature of the acid made uſe of; for all volatile alkalies, when perfectly purified, appear to be the very ſame, without the ſmalleſt difference.

Like fixed alkalies, theſe ſalts contain a great quantity of fixed air, on which their ſolidity depends; and which may be ſo increaſed as perfectly to neutralize, and deprive them of their peculiar taſte and ſmell. When neutralized by fixed air, they have a very agreeable pungent taſte, ſomewhat reſembling that of weak fermenting liquors. When totally deprived of fixed air, by means of lime, they cannot be reduced to a ſolid form; but are diſſipated in an inviſible and exceedingly pungent vapour, called by Dr Prieſtley *alkaline air*. When volatile alkaline ſalt is diſſolved in water, the ſolution is called *volatile alkaline ſpirit.*

Diſtillation and Purification of *Volatile Alkalies*.

1031
Diſtilling veſſel, and method of performing the operation.

The materials moſt commonly uſed for preparing volatile alkalies are the ſolid parts of animals, as bones, horns, *&c.* Theſe are to be put into an iron pot of the ſhape recommended for ſolution; to this muſt be fitted a flat head, having a hole in the middle about two inches diameter. From this a tube of plate-iron muſt iſſue, which is to be bent in ſuch a manner that the extremity of it may enter an oily jar, through an hole made in its upper part, and dip about half an inch under ſome water placed in the lower part. The mouth of the jar is to be fitted with a cover, luted on very exactly; and having a ſmall hole, which may be occaſionally ſtopped with a wooden peg. The junctures are to be all luted as cloſe as poſſible, with a mixture of clay, ſand, and ſome oil; and thoſe which are not expoſed to a burning heat, may be further ſecured by quicklime and the white of an egg, or by means of glue. A fire being now kindled, the air contained in the diſtilling veſſel is firſt expelled, which is known by the bubbling of the water; and to this vent muſt be given by pulling out the wooden peg. A conſiderable quantity of phlegm will then come over, along with ſome volatile alkali, a great quantity of fixable air, and ſome oil. The alkali will unite with the water, and likewiſe ſome part of the fixed air, the oil ſwimming above. A great many incoercible vapours, however, will come over, to which vent muſt be given from time to time, by pulling out the peg. The diſtillation is to be continued till all is come over; which may be known by the ceſſation, or very ſlow bubbling of the water. The iron pipe muſt then be ſeparated from the cover of the diſtilling veſſel, leſt the liquid in the jar ſhould return into it, on the air being condenſed by its cooling. In the jar will be a volatile ſpirit, more or leſs ſtrong according as there was leſs or more water put in, with an exceedingly fetid black oil floating upon it.

1032
Rectification.

The rectification of the volatile alkali is moſt commodiouſly performed at once by combining it with an acid; and, as ſpirit of ſalt has the leaſt affinity with inflammable matter, it is to be choſen for this purpoſe, in preference to the vitriolic or nitrous. As the ſpirit is exceſſively oily, though already much weakened by the admixture of the water in the jar, if a very large quantity was not originally put in, an equal quantity of water may ſtill be added, on drawing off the ſpirit. That as little may be loſt as poſſible, the ſpirit ſhould be received in a ſtone bottle; and the marine acid, likewiſe in a diſtilled ſtate, added by little and little, till the effervefcence ceaſes. The liquor, which is now an impure ſolution of ſal ammoniac, is to be left for ſome time, that the oil may ſeparate itſelf; it is then to be filtered, evaporated, and cryſtallized in a leaden veſſel. If the cryſtals are not ſufficiently pure at the firſt, they will eaſily become ſo on a ſecond diſſolution.

1033
Volatile ſal ammoniac.

From ſal ammoniac thus obtained pure, the volatile alkali may be extricated by diſtillation with chalk, alkaline ſalts, or quicklime. Alkaline ſalts act more briſkly than chalk, and give a much ſtronger volatile alkali. The ſtrength of this, however, we know may be altered at pleaſure, by adding to, or depriving it of, its natural quantity of fixed air. Hence, perhaps, the beſt method would be, to prepare volatile alkalies altogether in a fluid ſtate, by means of quicklime; and then add fixed air to them, by means of an apparatus ſimilar to that directed by Dr Prieſtley for impregnating water with fixed air. To prevent lime from adhering to the diſtilling veſſels in which it is put, the tranſlator of Wiegleb's chemiſtry recommends the putting in three or four ounces of common ſalt along with the other ingredients.

Volatile alkalies COMPINED,

1034
Cuprum ammoniacale.

I. *With Metals.* There are only three metals, *viz.* copper, iron, and lead, upon which, while in their metallic form, volatile alkalies are capable of acting. Copper-filings are diſſolved by volatile alkali, eſpecially in its cauſtic ſtate, into a liquor of a moſt admirable blue colour. It is remarkable, that this colour depends entirely upon the air having acceſs to the ſolution: for if the bottle containing it is cloſe ſtopt, the liquor becomes colourleſs; but, however, reſumes its blue colour on being expoſed to the air. On evapoporation, a blue ſaline maſs is obtained, which, mixed with fats, or other inflammable matters, tinges their flame green, leaving a red calx of copper, ſoluble again in volatile ſpirits as at firſt. This ſaline ſubſtance

ſtance has beed received into the laſt edition of the Edinburgh Diſpenſatory, under the name of *cuprum ammoniacale*, as an antiepileptic.

1035 Copper, fulminating.

The blue mixture of ſolution of copper in aquafortis with volatile ſpirits, yields ſapphire-coloured cryſtals, which diſſolve in ſpirit of wine, and impart their colour to it. If, inſtead of cryſtallization, the liquor be totally evaporated, the remaining dry matter explodes, in a moderate heat, like aurum fulminans. This is given as a fact by Dr Lewis; but hath not ſucceeded upon trial by Dr Black. Various phenomena, ſays Mr Wiegleb, occur in the diſſolution of copper by the volatile alkali.—On ſaturating dilute ſpirit of ſal ammoniac with copper-filings, cryſtals are formed of a dark-blue colour, but which, by expoſure to the air, fall to pieces and become green. Vinous ſpirit of ſal ammoniac impregnated with copper, loſes in an inſtant its blue colour, on the affuſion of an equal quantity of ſaturated ſolution of fixed alkaline ſalt. The copper is then taken up by the fixed alkaline ſolution, which of conſequence acquires a blue colour, while the ſpirit of wine, deprived of the metal, floats clear on the top. When filings of copper are put into a bottle, and that bottle quite filled with cauſtic volatile alkali, and is immediately ſtopped up, no ſolution takes place: but when the bottle is left open, only for a ſhort time, or an empty ſpace is left in it, a colourleſs ſolution is obtained, which in the air obtains a blue colour; but which may be deprived of this colour as often as we pleaſe, by ſhutting it up exactly from the air, and letting it ſtand, in this ſituation, on freſh filings of copper.—From theſe phenomena Mr Wiegleb concludes, that copper does not diſſolve in volatile alkali until it has loſt part of its phlogiſton, to which the air, by the attraction it exerts upon it, contributes its ſhare. If this has taken place only in a ſmall proportion, and the farther acceſs of air be prevented, the remainder will be diſſolved without any colour; which, however, appears in the inſtant that, by a freſh acceſſion of air, the phlogiſton ſtill remaining finds means to eſcape. The diſſolved copper is always precipitated when the ſolution meets with phlogiſticated copper. The colourleſs ſolution is precipitated by zinc and vitriolic acid, but not by iron. It taſtes rather ſweet, and does not ſmell very ſtrong of volatile alkali; while, on the contrary, the blue ſolution has a pungent ſmell, and is precipitated by diſtilled water.

On the other two metals the action of volatile alkali is by no means ſo evident; it diſſolves iron very ſlowly into a liquor, the nature of which is not known; and lead is corroded by it into a mucilaginous ſubſtance.

1036 Sal volatile oleoſum.

II. *With Inflammable Subſtances.* With expreſſed oils, the cauſtic volatile alkali unites into a ſoft unctuous maſs, of a very white colour, imperfectly ſoluble in water, and which is ſoon decompoſed ſpontaneouſly. Compoſitions of this kind are frequently uſed for removing pains, and ſometimes with ſucceſs. With eſſential oils, volatile alkalies may be united, either in their dry or liquid form, by means of diſtillation. The produce is called *ſal volatile oleoſum*; it is much more frequently uſed in a liquid than in a dry form. The general method of preparation is by diſtilling volatile alkali along with eſſential oils and ſpirit of wine, or the aromatic ſubſtance from whence the eſſential oils are drawn. Theſe compoſitions are variable at pleaſure; but certain forms are laid down in the diſpenſatories, with which it is expected that all the chemiſts ſhould comply in the preparation of theſe medicines.

1037 Spiritus volatilis ſuccinatus.

III. *Eau de Luce.* This is the name given to an exceedingly volatile ſpirit, which ſome years ago was pretty much in vogue; and indeed ſeems very well calculated to anſwer all the purpoſes for which volatile alkalies can be uſed. It was of a thick white colour, and ſmelled ſomewhat of oil of amber. A receipt appeared in Lewis's Diſpenſatory for the preparation of this fluid, under the name of *ſpiritus volatilis ſuccinatus*. The method there directed, however, did not ſucceed; becauſe, though the alkaline ſpirit is capable of keeping a ſmall quantity of oil of amber ſuſpended, the colour is greatly more dilute than that of genuine eau de luce. In the Chemical Dictionary we have the following receipt: “Take four ounces of rectified ſpirit of wine, and in it diſſolve 10 or 12 grains of white ſoap; filter this ſolution; then diſſolve in it a drachm of rectified oil of amber, and filter again. Mix as much of this ſolution with the ſtrongeſt volatile ſpirit of ſal ammoniac, as will be ſufficient, when thoroughly ſhaken to give it a beautiful milky appearance. If upon its ſurface be formed a cream, ſome more of the oily ſpirit muſt be added.”

This receipt likewiſe ſeems inſufficient. For the oil of amber does not diſſolve in ſpirit of wine: neither is it probable that the ſmall quantity of ſoap made uſe of could be of any ſervice; for the ſoap would diſſolve perfectly in the alkaline ſpirit, without ſuffering any decompoſition. The only method which we have found to anſwer is the following. Take an ounce, or any quantity at pleaſure, of balſamum Canadenſe; place it in a ſmall china baſon, in a pan of boiling water, and keep it there till a drop of it taken out appears of a reſinous conſiſtence when cold. Extract a tincture from this reſin with good ſpirit of wine; and having impregnated your volatile ſpirit with oil of amber, lavender or any other eſſential oil, drop in as much of the ſpiritous tincture as will give it the deſired colour. If the volatile ſpirit is very ſtrong, the eau de luce will be thick and white, like the cream of new milk; nor is it ſubject to turn brown with keeping

1038 Volatile alkali combined with ſulphur.

IV. *With Volatile Tincture of Sulphur.* This is a combination of the cauſtic volatile alkali, or ſpirit of ſal ammoniac, with ſulphur. It is uſually directed to be made by grinding lime with the ſulphur and afterwards with the ſal ammoniac, and diſtilling the whole in a retort, but the produce is by this method very ſmall, and even the ſucceſs uncertain. A preferable method ſeems to be, to impregnate the ſtrongeſt cauſtic volatile ſpirit with the vapour which ariſes in the decompoſitions of hepar ſulphuris by means of an acid, in the ſame manner as directed for impregnating water with fixed air.

1039 Sympathetic ink.

This preparation has a moſt nauſeous fetid ſmell, which ſpreads to a conſiderable diſtance; and the effluvia will blacken ſilver or copper, if barely placed in the neighbourhood of the unſtopped bottle. This property renders it capable of forming a curious kind of ſympathetic ink; for if paper is wrote upon with a ſolution of ſaccharum ſaturni, the writing, which diſappears when dry, will appear legible and of a

browniſh

Phenomena from mixtures of acid, &c. ſalts.

browniſh black, by barely holding it near the mouth of the bottle containing volatile tincture of ſulphur. The vapours of this tincture are ſo exceedingly penetrating, that it is ſaid they will even penetrate through a wall, ſo as to make a writing with ſaccharum ſaturni appear legible on the other ſide; but this is much to be doubted. It is even ſaid that it cannot penetrate through the ſubſtance of paper, but only inſinuates itſelf betwixt the leaves; and hence if the edges of the leaves are glued together no black colour will appear.

§ 20. *Of the* PHENOMENA *reſulting from different mixtures of the Acid, Neutral, and Alkaline* SALTS, *already treated of.*

1040 Of mixing the acid ſpirits with one another.

1. IF concentrated oil of vitriol is mixed with ſtrong ſpirit of nitre, or ſpirit of ſalt, the weaker acid will become exceedingly volatile, and emit very elaſtic fumes; ſo that if a mixture of this kind is put into a cloſe ſtopt bottle, it will almoſt certainly burſt it. The ſame effect follows upon mixing ſpirit of ſalt and ſpirit of nitre together. In this caſe, both acids become ſurpriſingly volatile; and much of the liquor will be diſſipated in fumes, if the mixture is ſuffered to ſtand for any conſiderable time. Such mixtures ought therefore to be made only at the time they are to be uſed.

1041 Diſſolving vitriolic ſalts in nitrous or marine acids.

2. If vitriolated tartar is diſſolved in an equal quantity of ſtrong ſpirit of nitre, by heating them together in a matraſs, the ſtronger vitriolic acid will be diſplaced by the weaker nitrous one, and the liquor, on cooling, will ſhoot into cryſtals of nitre. The ſame thing happens alſo upon diſſolving vitriolated tartar, or Glauber's ſalt, in ſpirit of ſalt. This obſervation we owe to Monſ. Beaumé, and the reaſon of it has been already explained. See n° 285.

1042 Decompoſition of vitriolic ſalts by ſolutions of earth, &c. in nitrous or marine acids.

3. If vitriolated tartar, or Glauber's ſalt, is diſſolved in water, and this ſolution mixed with another conſiſting of calcareous earth, ſilver, mercury, lead, or tin, diſſolved in the nitrous or marine acids, the vitriolic acid will leave the fixed alkali with which it was combined, and, uniting with the calcareous earth or metal, fall with it to the bottom of the veſſel. This decompoſition takes place only when the vitriolic acid meets with ſuch bodies as it cannot eaſily diſſolve into a liquid, ſuch as thoſe we have juſt now mentioned; for though vitriolated tartar is mixed with a ſolution of iron, copper, &c. in the nitrous or marine acids, no decompoſition takes place. The caſe is not altered, whatever acid is made uſe of; for the marine acid will effectually ſeparate ſilver, mercury, or lead, from the vitriolic or nitrous acids.

1043 By lime-water.

4. According to Dr Lewis, if a ſolution of vitriolated tartar is dropt into lime-water, the acid will unite with the lime, and precipitate with it in an indiſſoluble ſelenite, the alkali remaining in the water in a pure and cauſtic ſtate.

1044 Of green vitriol by ſaccharum ſaturni.

5. If green vitriol is mixed with any ſolution containing ſubſtances which cannot be diſſolved into a liquid by the vitriolic acid, the vitriol will be immediately decompoſed, and the liquor will become a ſolution of iron only. Thus, if green vitriol is mixed with a ſolution of ſaccharum ſaturni, the vitriolic acid immediately quits the iron for the lead, and falls to the bottom with the latter, leaving the vegetable acid of the ſaccharum ſaturni to combine with the iron.

Phenomena from mixtures of acids, &c. ſalts.

1045 Of ſolution of tin by ſaccharum ſaturni.

6. If ſolution of tin in aqua-regia is mixed with ſolution of ſaccharum ſaturni, the marine acid quits the tin for the lead contained in the ſaccharum; at the ſame time, the acetous acid, which was combined with the lead, is unable to diſſolve the tin which was before kept ſuſpend by the marine acid. Hence, both the ſaccharum ſaturni, and ſolution of tin, are very effectually decompoſed, and the mixture becomes entirely uſeleſs. Dyers and callico-printers ought to attend to this, who are very apt to mix theſe two ſolutions together; and no doubt many of the faults of colours dyed or printed in particular places, ariſe from injudicious mixtures of a ſimilar kind. See DYEING.

1046 Of calcareous ſolutions by mild volatile alkali.

7. If mild volatile alkali, that is, ſuch as remains in a concrete form, by being united with a large quantity of fixed air, is poured into a ſolution of chalk in the nitrous or marine acids, the earth will be precipitated, and a true ſal ammoniac formed. If the whole is evaporated to dryneſs, and a conſiderable heat applied, the acid will again part with the alkali, and combine with the chalk. Thus, in the purification of volatile alkalies by means of ſpirit of ſalt, the ſame quantity of acid may be made to ſerve a number of times. This will not hold in volatile ſpirits prepared with quicklime.

1047 Sal alembroth.

8. If equal parts of ſal ammoniac and corroſive ſublimate mercury are mixed together and ſublimed, they unite in ſuch a manner as never to be ſeparable from one another without decompoſition. The compound is called *ſal alembroth*; which is ſaid to be a very powerful ſolvent of metallic ſubſtances, gold itſelf not excepted. Its powers in this, or any other reſpect, are at preſent but little known. By repeated ſublimations, it is ſaid this ſalt becomes entirely fluid, and refuſes to ariſe in the ſtrongeſt heat.

1048 Solution of ſalts promoted by vitriolic acid.

9. If vitriolic acid is poured upon any ſalt difficult of ſolution in water, it becomes then very eaſily ſoluble. By this means, vitriolated tartar, or cream of tartar, may be diſſolved in a very ſmall quantity of water.

SECT. II. *Earths.*

THE general diviſions and characters of theſe ſubſtances we have already given; and moſt of their combinations with ſaline ſubſtances have been mentioned, excepting only thoſe of the terra ponderoſa; a ſubſtance whoſe properties have been but lately inquired into, and are not yet ſufficiently inveſtigated. In this ſection, therefore we have to take notice only of their various combinations with one another, with inflammable, or metallic ſubſtances, &c. As they do not, however, act upon one another till ſubjected to a vitrifying heat, the changes then induced upon them come more properly to be treated of under the article GLASS. Upon metallic and inflammable ſubſtances (ſulphur alone excepted), they have very little effect; and therefore what relates to theſe combinations ſhall be taken notice of in the following ſections. We ſhall here confine ourſelves to ſome remarkable alterations in the nature of particular earths by combination with certain ſubſtances, and to the phoſphoric quality of others.

§ 1. *The Terra Ponderosa.*

1049 Uſually found united with the vitriolic acid.

This earth is of the true calcareous kind, and capable of being converted into a very acrid lime; but in other reſpects is very different. It is moſt commonly met with in the veins of rocks, united with the vitriolic acid in a maſs ſomewhat reſembling gypſum, but much heavier and more opaque; and from the great weight of this ſubſtance the earth itſelf has its name, though when freed from the acid it is by no means remarkable for this property. Its properties were firſt taken notice of by the foreign chemiſts; but they have been more accurately inveſtigated by Dr Withering, who has publiſhed his obſervations in the 74th volume of the Philoſophical Tranſactions. His experiments were not made on the gypſeous ſubſtance abovementioned; but on a combination of the earth with fixed air, which is much more uncommon, and like the other poſſeſſes a very conſiderable degree of ſpecific gravity. Both theſe combinations have the general name of *ſpathum ponderoſum*, or *ponderous ſpar;* the former being alſo called *baroſelenite*, &c.

1050 Dr Withering's experiment.

1051 Combination of terra ponderoſa with aërial acid deſcribed.

The ſpar uſed by Dr Withering was got out of a lead mine at Alſton moor in Cumberland. Its appearance was not unlike that of a lump of alum; but on cloſer inſpection it appeared to be compoſed of ſlender ſpiculæ in cloſe contact, more or leſs diverging, and ſo ſoft that it might be cut by a knife; its ſpecific gravity from 4.300 to 4.338. It efferveſced with acids, and melted, though not very readily, under the blow-pipe.

1052 Effects of fire upon it.

In a common fire it loſt its tranſparency; and on being urged with a ſtronger heat in a melting furnace, it adhered to the crucible, and ſhowed ſigns of fuſion; but did not appear to have loſt any of its fixed air, either by diminution in weight, becoming cauſtic, or loſing its power of efferveſcing with acids.

1053 Treated with marine acid.

Five hundred grains of this ſpar, by ſolution in muriatic acid, loſt 104 grains in weight, and left an inſoluble reſiduum of three grains. In another experiment, 100 grains of ſpar loſt 21; and there remained only 0.6 of a grain of inſoluble matter.

On diſſolving another hundred grains in dilute muriatic acid, 25 ounce-meaſures of air were obtained, which by proper trials appeared to be pure aërial acid; and, on precipitating the ſolution with mineral alki, 100 grains of earth were again obtained; but on diſſolving the precipitate in freſh muriatic acid, only 20 ounce-meaſures of air were produced.

1054 Precipitated by mild and cauſtic fixed alkalies.

Mild vegetable alkali precipitated a ſaturated ſolution of this ſpar in marine acid, with the eſcape of a quantity of fixed air; and the ſame effect took place on the addition of foſſil alkali; but with cauſtic alkalies there was no appearance of efferveſcence, though a precipitate likewiſe fell.

Fifty parts of ſpar, diſſolved in marine acid, loſt $10\frac{1}{2}$; and with cauſtic vegetable alkali, a precipitate weighing $45\frac{1}{2}$ was obtained. Phlogiſticated alkali precipitated the whole of the earth, as appeared by the addition of mild fixed alkali afterwards, which occaſioned no farther precipitation.

1055 Convertible into lime capable of decompoſing vitriolic ſalts.

Part of the precipitate thrown down by the mild alkali was expoſed to a ſtrong heat in a crucible, and then put into water. The liquid was inſtantly converted into a very acrid lime-water, which had the following remarkable properties: The ſmalleſt portion of vitriolic acid, added to this water, occaſioned an immediate and copious precipitation, which appeared even after the liquid was diluted with 200 times its bulk of pure water. 2. A ſingle drop let fall into a ſolution of Glauber's ſalt, vitriolated tartar, alum, vitriolic ammoniac, Epſom ſalt, or ſelenite, occaſioned an immediate and copious precipitate in all of them: the reaſon of which was the ſuperior attraction of the ponderous earth for the acid of theſe ſalts, which forming with it an indiſſoluble concrete, inſtantly fell to the bottom.

1056 Inſoluble precipitate thrown down by cauſtic alkali.

The precipitate thrown down by the cauſtic vegetable alkali was put into water, but exhibited no ſuch appearances as the other: even the mixture was boiled; nor had it any acrimonious taſte. On adding the three mineral acids to ſeparate portions of the precipitate itſelf, neither efferveſcence, nor any ſign of ſolution, appeared. After ſtanding an hour, water was added, and the acids were ſuffered to remain another hour on the powder; but on decanting them afterwards, and adding foſſile alkali to the point of ſaturation, no precipitate appeared.

The precipitate thrown down by the phlogiſticated alkali, mixed with nitre and borax, and melted with a blow-pipe on charcoal, formed a black glaſs; on flint-glaſs, a white one; and on a tobacco-pipe, a yellowiſh white one. Another portion, melted with ſoap and borax in a crucible, formed a black glaſs.

The ſmall quantity of inſoluble reſiduum formerly mentioned, appeared to be the combination of ponderous earth with vitriolic acid, called *heavy* gypſum, marmor metallicum, baroſelenite, *&c.*

1057 Analyſis and properties of aërated ponderous ſpar.

From theſe experiments the Doctor concludes, that 100 parts of this ſpar contain 78.6 of pure ponderous earth, $\frac{6}{10}$ of a grain of marmor metallicum, and 20.8 grains of fixed air. 2. The quantity of mild alkali neceſſary to ſaturate any given portion of acid, contains a greater quantity of fixed air than can be abſorbed by that quantity of terra ponderoſa which the acid is able to diſſolve. 3. The terra ponderoſa, when precipitated by means of a mild alkali, readily burns to lime; and this lime-water proves a very nice teſt of the preſence of vitriolic acid. 4. In its native ſtate the terra ponderoſa will not burn to lime; when urged with a ſtrong fire, it melts and unites with the crucible, without becoming cauſtic; nor can it be made to part with its fixed air by any addition of phlogiſton. He conjectures, therefore, that as cauſtic lime cannot unite to fixed air without moiſture, and as this ſpar ſeems to contain no water in its compoſition, it is the want of water which prevents the fixed air aſſuming its elaſtic aerial ſtate. "This ſuppoſition (ſays he) becomes ſtill more probable, if we obſerve, that when the ſolution of the ſpar in an acid is precipitated by a mild alkali, ſome water enters into the compoſition of the precipitate; for it has the ſame weight as before it was diſſolved, and yet produces only 20 ounce-meaſures of fixed air, while the native ſpar contains 25 of the ſame meaſures: ſo that there is an addition of weight equal to five ounce-meaſures of air, or three one-half grains, to be accounted for; and this can only ariſe from the water. 5. The precipitate formed by the cauſtic alkali, taking ſome of the latter down with it, forms a ſubſtance neither ſoluble in acids nor water. This inſoluble compound is alſo formed by adding the lime-water already

Terra ponderoſa and its combinations.

1058 Terra ponderoſa a teſt of the preſence of vitriolic acid.

1059 White matter contained in vitriolic acid found to be gypſum.

ready mentioned, to a ſolution of cauſtic vegetable, or foſſile fixed alkali, but not with volatile alkali. 6. Fixed vegetable as well as mineral alkali, and even volatile alkalies, whether mild or cauſtic, are capable of ſeparating terra ponderoſa from any other acid excepting the vitriolic; but from it neither mild nor cauſtic alkalies are capable of ſeparating this earth, excepting the vegetable fixed alkali, which will partly do it by an intenſe heat in the dry way. 7. This earth affords an excellent method of purifying the nitrous and marine acids from any portion of the vitriolic; for the attraction between terra ponderoſa and this acid is ſo ſtrong, that the leaſt portion of the latter will be inſtantly detected by the lime-water above mentioned. The vitriolic acid, Dr Withering obſerves, is commonly adulterated with a white powder, which diſcovers itſelf by turning the liquor milky when the acid is diluted with water; and this powder he finds to be gypſum, from the following properties:

1. By repeated boiling in water, ſix grains and a half were reduced to two. 2. By gentle evaporation this ſolution afforded five grains of cryſtals as hard and taſteleſs as ſelenite. 3. A precipitate was formed by mild foſſile alka on adding it to a ſolution of theſe cryſtals in water. 4. On expoſing this powder to a pretty ſtrong heat, and then putting it into water, the latter became acrid, and acquired the taſte of lime-water. 5. The inſoluble part ſuffered no change by boiling in nitrous acid: one half of it mixed with borax, and expoſed to the blow-pipe upon charcoal, melted into glaſs; the other half, mixed with borax, and expoſed to the blow-pipe upon charcoal, did the ſame; whence it appears, ſays our author, that the greateſt part of this ſubſtance was calx vitriolate or ſelenite; the remainder a vitrifiable earth. He had before found, that the heavy gypſum, or marmor metallicum, would diſſolve in concentrated vitriolic acid, but always ſeparated upon the addition of water; and from his experiments it now appears that ſelenite does the ſame.

1060 Experiments on the marmor metallicum.

1061 Deſcription of a kind found near Edinburgh.

Dr Withering next proceeds to give a ſet of experiments on the heavy gypſum, marmor metallicum of Cronſtadt, or the Baroſelenite of others, already mentioned. The ſpecimens he obtained were from Kilpatrick hills near Glaſgow, and a ſort with ſmaller cryſtals found among the iron ore about Ketley in Shropſhire, and in the lead-mines at Alſton-Moor. He deſcribes it as white, nearly tranſparent, but without the property of double refraction; compoſed of laminæ of rhomboidal cryſtals, and decrepitating in the fire; the ſpecific gravity from 4.402 to 4.440. The ſpecimens we have ſeen differ conſiderably from this deſcription, being compoſed, to appearance, of thin laminæ; which all together form a very opaque white maſs, which has not the leaſt tranſparency unleſs ſplit exceſſively thin. They are found about three miles to the ſouthweſt of Edinburgh, near Pentland hills, and likewiſe betwixt Edinburgh and Leith. In the former place they lie in ſmall veins of a rock conſiſting of a kind of iron ſtone, and ſo cloſely adhering to it, that it would ſeem either that the ſtone is converted into the ſpathum ponderoſum, or the latter into the ſtone. It is therefore often intermixed with the rock ſo intimately, that it is impoſſible to ſeparate them perfectly from each other.

Terra ponderoſa and its combinations.

1062 Effects of heat upon it.

1063 May be diſſolved in very concentrated vitriolic acid.

Dr Withering having expoſed 100 grains of the marmor metallicum to a red heat for an hour, in a black crucible, found that it had loſt five grains of its weight; but as a ſulphureous ſmell was perceptible, he ſuſpected that a decompoſition had taken place, and therefore expoſed another portion to a ſimilar heat in a tobacco-pipe, which had no ſmell of ſulphur, nor was it diminiſhed in weight. It melted with borax into a white opaque glaſs, but was barely fuſible by itſelf under the blow pipe. It did not ſeem to diſſolve in water, nor in any of the acids, except the vitriolic, when by long boiling it had become very concentrated and almoſt red hot. It then appeared perfectly diſſolved; but ſeparated again unchanged on the addition of water. On expoſing the vitriolic ſolution to the atmoſphere for ſome days, beautiful radiated cryſtals were formed in it.

1064 Precipitated from it unchanged by vegetable fixed alkali.

1065 May be decompoſed in the dry way by ſalt of tartar.

On adding a ſolution of mild vegetable alkali to this vitriolic ſolution, a precipitate appeared; but it conſiſted of marmor metallicum unchanged. An ounce of it in fine powder was then fuſed with two of ſalt of tartar until it ran thin, when ſix drachms of a reſiduum inſoluble in water were left. On the addition of nitrous acid, only 52 grains were left, which appeared to be marmor metallicum unchanged. On ſaturating the alkaline ſolution with diſtilled vinegar, and waſhing the precipitate, the liquor was found to contain terra foliata tartar, formed by the union of the acetous acid with part of the alkali; and of vitriolated tartar, formed by that of the alkali with the native acid of the marmor metallicum.

1066 Nitrous ſolution ſhoots into fine cryſtals.

The ſalt formed by the nitrous acid ſhot readily into beautiful permanent cryſtals of a rough bitteriſh taſte. Some of the ſalt deflagrated with nitre and charcoal, left by waſhing the terra ponderoſa very white, capable of being burnt into lime, and again forming an inſoluble compound with vitriolic acid. An hundred grains of aerated terra ponderoſa, diſſolved in marine acid, and precipitated by the vitriolic, were augmented 17 grains in weight. Hence it appears,

1067 Analyſis and properties of the marmor metallicum.

1. That the marmor metallicum is compoſed of vitriolic acid and terra ponderoſa. 2. That this compound has very little ſolubility in water. 3. That it can only be diſſolved in highly concentrated oil of vitriol, from which it ſeparates unchanged on the addition of water. 4. That it cannot be decompoſed in the moiſt way, by mild fixed alkali, though it may be ſo in the dry. 5. That it may be decompoſed by the union of inflammable matter to its acid, by which ſulphur is formed, though the acid cannot be diſſipated by mere heat. 6. An hundred parts of this ſubſtance contain 32.8 of pure vitriolic acid, and 57.2 of terra ponderoſa. The marmor metallicum, our author remarks, may poſſibly be uſeful in ſome caſes where a powerful flux is wanted; for having mixed ſome of it with the black flux, and given the mixture a ſtrong heat in a crucible, it ran entirely through the pores of the veſſel.

1068 Cauk, a ſubſtance of this kind, found in Derbyſhire in England.

Dr Withering deſcribes two other kinds of this ſubſtance, known by the name of *cauk*, and found in the mines of Derbyſhire, and other places. Theſe differ from the other only in containing a ſmall proportion of iron. On the whole, he concludes, that "the terra ponderoſa ſeems to lay claim to a middle place betwixt the earths and metallic calces. Like the for-

Tranſmutation of flints into an earth ſoluble in acids.

mer it cannot be reduced to a metallic form, though like the latter it may be precipitated by phlogiſticated alkali. In many of its properties it much reſembles the clax of lead, and in others the common calcareous earth. Its moſt remarkable properties are its decompoſing the vitriolic neutral ſalts, and forming, with the nitrous and marine acids, cryſtals which do not deliqueſce.

§ 2. *Tranſmutation of* Flints *into an* Earth *ſoluble in Acids.*

1069 Solution of flint.

This is effected by mixing powdered flints with alkaline ſalt, and melting the mixture by a ſtrong fire. The melted maſs deliquates in the air, like alkaline ſalts; and if the flint is then precipitated, it becomes ſoluble in acids, which it entirely reſiſted before.

In this proceſs the alkali, by its union with the flint, is deprived of its fixed air, and becomes cauſtic. To this cauſticity its ſolvent power is owing; and therefore the flint may be precipitated from the alkali, not only by acids, but by any ſubſtance capable of furniſhing fixed air; ſuch as magneſia alba or volatile alkali. The precipitate in both caſes proves the ſame; but the nature of it hath not hitherto been determined. Some have conjectured that the vitriolic acid exiſted in the flint; in which caſe, the alkali made uſe of in this proceſs ought to be partly converted into vitriolated tartar.

1070 Solubility of this earth denied by Mr Bergman.

The above proceſs is delivered on the authority of former chemiſts; but Mr Bergman, who has publiſhed a diſſertation on this ſubject, aſſerts that it cannot be diſſolved except by the fluor acid. The vitriolic, nitrous, or marine acids, have no effect upon it, even when newly precipitated from the liquor of flints waſhed and ſtill wet, and though a thouſand parts of acid be added to one of the earth, and boiled upon it for an hour: but when three parts of alkaline ſalt are melted in a crucible with one of quartz, the ſalt diſſolves at the ſame time about ſeven hundreth parts of its own weight of the clay which compoſes the crucible; and the ſolubility of this has given occaſion to the miſtake abovementioned. If the fuſion be performed in an iron veſſel, no ſoluble part will be obtained, excepting the very ſmall portion of clay which the quartz contains; and when this is once exhauſted by an acid, no more can be procured by any number of fuſions with alkali.

1071 Reaſon of the miſtake of former chemiſts.

1072 Cryſtals of flint artificially formed by Mr Bergman.

The fluor acid, he obſerves, is never obtained entirely free from ſiliceous earth, and conſequently its power as a menſtruum muſt be weakened in proportion to the quantity it contains. In order to obſerve its ſolvent power, however, our author, in the year 1772, put ſome quartz, very finely powdered, into a bottle containing $\frac{1}{8}$ of a kanne of fluor acid. The bottle was then ſlightly corked, and ſet by in the corner of a room. Two years afterwards it was examined; and on pouring out the liquor there were found concreted at the bottom of the veſſel, beſides innumerable ſmall priſmatic ſpiculae, 13 cryſtals of the ſize of ſmall peas, but moſtly of an irregular form. Some of theſe reſembled cubes, whoſe angles were all truncated, ſuch as are often found in the cavities of flints. Theſe were perfect ſiliceous cryſtals, and very hard, but not comparable with quartz, though they agreed with it in eſſential properties. "Poſſibly (ſays he) the length of a century may be neceſſary for them to acquire, by exſiccation, a ſufficient degree of hardneſs. The bottom itſelf, as far as the liquor had reached, was found covered with a very thin ſiliceous pellicle, which was ſcarcely viſible, but ſeparated on breaking the bottle. It was extremely pellucid, flexible, and ſhowed priſmatic colours. Theſe phenomena ſhow that much ſiliceous matter is diſſolved and ſuſpended." (in the fluor acid). "Whether any of the quartz was taken up in this experiment is uncertain; but it appears probable that little or none was diſſolved; ſince, by the help of heat during the diſtillation, the acid had previouſly taken up ſo much ſiliceous earth, that upon ſlow evaporation it was unable to retain it. Hence appears the origin of the cryſtals and the pellicle; and hence appears the cauſe which impedes the action of fluor acid upon flint; namely, that the acid obtained in the ordinary way is already ſaturated with it.

1073 Why the fluor acid will not diſſolve flint directly.

1074 Siliceous earth moſt completely precipitated by volatile alkali.

The volatile alkali precipitates ſiliceous earth moſt completely from fluor acid: and thus we find, that one part of it is contained in 600 of the acid, diluted to ſuch a degree, that its ſpecific gravity is only 1.064. This precipitate has all the properties of pure flint; but that precipitated either by vegetable or mineral fixed alkali does not afford a pure ſiliceous earth, but a peculiar kind of triple ſalt, formed of the earth, fluor acid, and fixed alkali, which diſſolves, though with difficulty, in warm water, eſpecially the earth procured by vegetable alkali, but is eaſily decompoſed by lime-water and lets fall the mineral fluor regenerated.

1075 A triple ſalt formed by precipitation with fixed alkali.

1076 Siliceous earth diſſolved by boiling in ſolution of alkali.

Fixed alkaline ſalts attack this earth by boiling, but not unleſs it be reduced to very fine powder, and newly precipitated from the liquor. Oil of tartar per deliquium takes up about one-ſixth of its weight, and the liquor becomes gelatinous on cooling, though at firſt diluted with 16 times its weight of water. This ſolution is effected only by the cauſtic part; for when fully ſaturated with fixed air, it cannot enter into any union with it. Volatile alkali, even though cauſtic, has no effect.

1077 Has a remarkable attraction for it in the dry way.

The attraction betwixt ſiliceous earth and fixed alkali is much more remarkable in the dry way; for thus it melts with one half its weight of alkali into an hard, firm, and tranſparent glaſs, the aerial acid and water going off in a violent efferveſcence. In proportion as the alkali is increaſed, the glaſs becomes more ſoft and lax, until at laſt it diſſolves totally in water, as has been already mentioned. The ſiliceous matter thus precipitated is of a very rare and ſpongy texture, and ſo much ſwelled by water, and its bulk when wet is at leaſt twelve times greater than when dry; nor does it contract more though ſuffered to remain a long time in the water. Hence it is eaſy to reduce the liquor of flints to a jelly, by diluting it with four or eight times its weight of water, and adding a ſufficient quantity of precipitate; but if an overproportion of water be uſed, for inſtance, 24 times the weight, the liquor will then remain limpid though we add as much acid as is ſufficient for ſaturating the alkali. The reaſon of this Mr Bergman ſuppoſes to be, that the ſiliceous particles are removed to ſuch a diſtance from one another, that they cannot overcome the

1078 Is very rare and ſpongy when precipitated.

1079 Why it cannot ſometimes be precipitated by an acid without heat.

the friction they muſt neceſſarily meet with in their paſſage downwards through the fluid; but if the liquor be boiled, which at once diminiſhes its quantity and tenacity, the ſiliceous matter is inſtantly ſeparated.

1080 **Liquor of flints decompoſed by too great a quantity of water, and by fluor acid**

Liquor of flints is alſo decompoſed by too great a quantity of water; for by this the efficacy of the menſtruum is weakened, and it is alſo partly ſaturated by the aerial acid contained in the water. A precipitate alſo falls when the fluor acid is made uſe of; the reaſon of which is the ſame as the precipitation by other acids: in this caſe, however, the alkali makes part of the precipitate, as has been already obſerved; and therefore the matter which falls is fuſible before the blowpipe, and ſoluble in a ſufficient quantity of water.

§ 3. *Of* PHOSPHORIC *Earths.*

1081 **Bolognian ſtone.**

THESE are ſo called from their property of ſhining in the dark. The moſt celebrated and anciently known of this kind is that called the *Bolognian ſtone*, from Bologna, a city in Italy, near which it is found. The diſcovery, according to Lemery, was accidentally made by a ſhoe-maker called *Vincenzo Caſciarolo*, who uſed to make chemical experiments. This man, having been induced to think, from the great weight and luſtre of theſe ſtones, that they contained ſilver, gathered ſome, and calcined them; when carrying them into a dark place, probably by accident, he obſerved them ſhining like hot coals.

Mr Margraaf deſcribes the Bolognian ſtone to be an heavy, ſoft, friable, and cryſtallized ſubſtance, incapable of effervescence with acids before calcination in contact with burning fuel. Theſe properties ſeem to indicate this ſtone to be of a ſelenitic or gypſeous nature.

1082 **How rendered luminous.**

When theſe ſtones are to be rendered phoſphoric, ſuch of them ought to be choſen as are the cleaneſt, beſt cryſtallized, moſt friable and heavy; which exfoliate when broken, and which contain no heterogeneous parts. They are to be made red hot in a crucible; and reduced to a very fine powder in a glaſs-mortar, or upon a porphyry. Being thus reduced to powder, they are to be formed into a paſte with mucilage of gum tragacanth, and divided into thin cakes. Theſe are to be dried with a heat, which at laſt is to be made pretty conſiderable. An ordinary reverberating furnace is to be filled to three quarters of its height with charcoal, and the fire is to be kindled. Upon this charcoal the flat ſurfaces of the cakes are to reſt, and more charcoal to be placed above them, ſo as to fill the furnace. The furnace is then to be covered with its dome, the tube of which is to remain open; all the coal is to be conſumed, and the furnace is to be left to cool; the cakes are then to be cleanſed from the aſhes by blowing with bellows upon them. When they have been expoſed during ſome minutes to light, and afterwards carried to a dark place, they will ſeem to ſhine like hot coals; particularly if the perſon obſerving them has been ſome time in the dark, or have ſhut his eyes, that the pupils may be ſufficiently expanded. After this calcination through the coals, if the ſtones be expoſed to a ſtronger calcination, during a full half hour, under a muffle, their phoſphoric quality will be rendered ſtronger.

1083 **Analyſis of the phoſphorus.**

From attending to the qualities of this ſtone, and the requiſites for making this phoſphorus, we are naturally led to think, that the Bolognian phoſphorus is no other than a compoſition of ſulphur and quicklime. The ſtone itſelf, in its natural ſtate, evidently contains the vitriolic acid, from its not effervescing with acids of any kind. This acid cannot be expelled from earthy ſubſtances by almoſt any degree of fire, unleſs inflammable matter is admitted to it. In this caſe, part of the acid becomes ſulphureous, and flies off; while part is converted into ſulphur, and combines with the earth. In the abovementioned proceſs, the inflammable matter is furniſhed by the coals in contact with which the cakes are calcined, and by the mucilage of gum tragacanth with which the cakes are made up. A true ſulphur muſt therefore be formed by the union of this inflammable matter with the vitriolic acid contained in the ſtone; and part of this ſulphur muſt remain united to the earth left in a calcareous ſtate, by the diſſipation, or converſion into ſulphur, of its acid.

1084 **All calcareous ſtones phoſphoric, according to Mr du Fay.**

In the year 1730, a memoir was publiſhed by Mr du Fay; wherein he aſſerts, that all calcareous ſtones, whether they contain vitriolic acid or not, are capable of becoming luminous by calcination: with this difference only, that the pure calcareous ſtones require a ſtronger, or more frequently repeated, calcination to convert them into phoſphorus; whereas thoſe which contain an acid, as ſelenites, gypſum, ſpars, *&c.* become phoſphoric by a ſlighter calcination. On the contrary, Mr Margraaf aſſerts, that no other ſtones can be rendered phoſphoric but thoſe which are ſaturated with an acid; that purely calcareous ſtones, ſuch as marble, chalk, limeſtone, ſtalactites, *&c.* cannot be rendered luminous, till ſaturated with an acid previouſly to their calcination.

We have already taken notice, that the compounds formed by uniting calcareous earths with the nitrous and marine acids become a kind of phoſphori; the former of which emits light in the dark, after having been expoſed to the ſun through the day; and the latter becomes luminous by being ſtruck. **1085 Signior Beccaria's obſervation.** Signior Beccaria found, that this phoſphoric quality was capable of being given to almoſt all ſubſtances in nature, metals perhaps excepted. He found that it was widely diffuſed among animals, and that even his own hand and arm poſſeſſed it in a very conſiderable degree. **1086 Mr Wilſon's experiments.** In the year 1775, a treatiſe on this kind of phoſphori was publiſhed by B. Wilſon, F. R. S. and member of the Royal Academy at Upſal. In this treatiſe he ſhows, that oyſter-ſhells, by calcination, acquire the phoſphoric quality in a very great degree, either when combined with the nitrous acid or without it.

The firſt experiment made by our author was the pouring ſome aquafortis, previouſly impregnated with copper, on a quantity of calcined oyſter-ſhells, ſo as to form them into a kind of paſte; he put this paſte into a crucible, which was kept in a pretty hot fire for about 40 minutes. Having taken out the maſs, and waited till it was cool, he preſented it to the external light. On bringing it back ſuddenly into the dark, he was ſurpriſed with the appearance of a variety of colours like thoſe of the rainbow, but much more vivid. In conſequence of this appearance of the priſmatic colours, he repeated the experiment in various ways, combining the calcined oyſter-ſhells with different metals and metallic ſolutions, with the different acids, alkaline and neutral ſalts, as well as with ſulphur, charcoal, and other inflammable ſubſtances; and by all of theſe he produced phoſphori, which emitted variouſly coloured light.

1087 Surpriſing phoſphoric quality of oyſter-ſhells.

What is more remarkable, he found that oyſter-ſhells poſſeſſed the phoſphoric quality in a ſurpriſing degree; and for this purpoſe nothing more was requiſite than putting them into a good ſea-coal fire, and keeping them there for ſome time. On ſcaling off the internal yellowiſh ſurface of each ſhell, they become excellent phoſphori, and exhibit the moſt vivid and beautiful colours. As we know that neither the vitriolic nor any other acid is contained in oyſter-ſhells, we cannot as yet ſay any thing ſatisfactory concerning the nature of this phoſphorus.

§ 4. *Of the* Vegetable *Earth.*

1088 DrLewis's opinion.

This is produced from vegetables by burning, and, when perfectly pure, by lixiviating the aſhes with water, to extract the ſalt; and then repeatedly calcining them, to burn out all the inflammable matter; and is perhaps the ſame from whatever ſubſtance it is obtained: in this ſtate, according to Dr Lewis, it is of the ſame nature with magneſia. In the ſtate, however, in which this earth is procurable by ſimply burning the plant, and lixiviating the aſhes, it is conſiderably different, according to the different plants from which it is obtained.

1089 Mr Gmelin's experiments.

The aſhes of mugwort, ſmall centaury, chervil, and dill, are of a browniſh grey; goat's beard and lungwort afford white aſhes; thoſe of ſanicle are whitiſh; thoſe of Roman wormwood of a greeniſh grey; thoſe of rue, agrimony, ſaxifrage, brown; thoſe of tanſey, of a duſky green; thoſe of dodder, of a fine green; eyebright, ſouthern-wood, common wormwood, and ſcabious, afford them grey; ſcurvy-graſs, of a whitiſh grey; hyſſop, yarrow, and ſowbane, of a duſky grey; melilot, and oak-leaves, as alſo plantain, colts-foot, pine-tops, and fumitory, of a duſky brown; penny-royal, of a pale brown, with ſome ſpots of white; elder-flowers, ſage, and mother of thyme, afford yellow aſhes; thoſe of ſtrawberry-leaves are of a pale brimſtone colour; thoſe of cat-mint, of a duſky red; of prunella, brick-coloured; of honey-ſuckle, blue; of fern, blackiſh; and thoſe of St John's wort, feverfew, origanum, and pimpernel, all of a deep black. The only uſe to which this kind of earth has yet been put, is that of glaſs-making and manure.

Sect. III. *Of Metallic Subſtances.*

§ 1. *Gold.*

This metal is reckoned of all others the moſt perfect and indeſtructible. When in its greateſt purity, it has very little elaſticity, is not ſonorous, its colour is yellow, it is exceedingly ſoft and flexible, and is more ductile than any other metal whatever. (See Gold *Leaf*, and Wire-Drawing.) Of all bodies it is the moſt ponderous, except platina; its gravity being to that of water, according to Dr Lewis, as 19,280, or 19,290, to one. For its fuſion it requires a low degree of white heat, ſomewhat greater than that in which ſilver melts. Whilſt fluid, it appears of a bluiſh green colour; when cold, its ſurface looks ſmooth, bright, and conſiderably concave: it ſeems to expand more in the act of fuſion, and to ſhrink more in its return to ſolidity, than any of the other metals; whence the greater concavity of its ſurface. Before fuſion it expands the leaſt of all metals, except iron. By ſudden cooling it becomes, as well as other metals, brittle; which effect has been erroneouſly attributed to the contact of fuel during fuſion.

1090 Unites readily with all the metals.

Gold amalgamates very readily with mercury, and mingles in fuſion with all the metals. It is remarkably diſpoſed to unite with iron; of which it diſſolves many times its own weight, in a heat not much greater than that in which gold itſelf melts; the mixture is of a ſilver colour, very brittle and hard. All the metals, except copper, debaſe the colour of gold; and, if their quantity is nearly equal to that of the gold, almoſt entirely conceal it.

1091 Said to loſe its malleability remarkably with tin.

The malleability of gold is impaired by all the metals, but leſs by copper and ſilver than any others. Tin has had a remarkably bad character in this reſpect; and it has been a received opinion among metallurgiſts, that the ſmalleſt quantity of this metal entirely deſtroys the ductility of gold; and Dr Lewis tells us, that "the moſt minute portion of tin or lead, and even the vapours which riſe from them in the fire, though not ſufficient to add to the gold any weight ſenſible on the tendereſt balance, make it ſo brittle, that it flies to pieces under the hammer."

1092 Mr Alchorne's experiments in oppoſition.

On ſo reſpectable an authority, this continued to be believed as an undoubted fact, until, in the year 1784, a paper appeared in the Philoſophical Tranſactions by Mr Alchorne of the mint: in which it was clearly diſproved by the following experiments:

1. Sixty Troy grains of pure tin were put into 12 ounces of pure gold in fuſion; after which the mixture was caſt into a mould of ſand, producing a flat bar an inch wide, and an eight of an inch thick. The bar appeared ſound and good, ſuffered flatting under the hammer, drawing ſeveral times between a pair of ſteel-rollers, and cutting into circular pieces of near an inch diameter, which bore ſtamping in the money-preſs by the uſual ſtroke, without ſhowing the leaſt brittleneſs, or rather with much the ſame ductility as pure gold.
2. With 90 grains of tin the bar was ſcarce diſtinguiſhable from the former.
3. With 120 grains it was rather paler and harder; and on drawing between the rollers the edges were a little diſpoſed to crack.
4. With 140 grains, the paleneſs, hardneſs, and diſpoſition to crack, were evidently increaſed; nevertheleſs it bore every other operation, even ſtamping under the preſs, without any apparent injury.
5. With an ounce of tin the bar was lead-coloured and brittle, ſplitting into ſeveral pieces on the firſt paſſing between the rollers.

1093 Gold not rendered brittle by the fumes of tin.

6. A ſmall crucible filled with ſtandard gold $\frac{11}{12}$ fine, was placed in a larger one, having in it an ounce of melted tin. The whole was covered with a large crucible inverted, in order to direct the fumes of the tin downward upon the gold. The metals were kept in fuſion

fuſion for half an hour, during which time a full quarter of the tin was calcined; yet the gold remained altogether unchanged.

7. The mixture of gold and tin produced in exp. 1. was melted a ſecond time in a ſtronger fire than at firſt, and kept in fuſion for half an hour; during which time ſix grains of weight were loſt, but the gold remained equally perfect as before.

1094 Nor by the addition of copper.

8. and 9. The mixtures of exp. 2. and 4. viz. 90 and 140 grains to 12 ounces of gold, were re-melted ſeparately, and an ounce of copper added to each. On being caſt as uſual, they bore all the operations of manufacturing as before, though ſenſibly harder. The laſt cracked at the edges as it had done without the copper, but bore cutting rather better than in its former ſtate.

10. and 11. A quarter of an ounce of the laſt mixture, being tin 140 grains, and copper an ounce, and gold 12 ounces, with as much of the bar from experiment 3. conſiſting of 140 grains of tin to 12 ounces of gold, were each melted by a jeweller in a common ſea-coal fire, into ſmall buttons, without any loſs of weight. Theſe buttons were afterwards forged into ſmall bars, nealing them often with the flame of a lamp, and afterwards drawn each about twenty times through the apertures of a ſteel plate, into fine wire, with as much eaſe as coarſe gold commonly paſſes the like operation.

12. Sixty grains of tin were added to 12 ounces of ſtandard gold $\frac{11}{12}$ fine; and the compound paſſed every one of the operations already deſcribed, without ſhowing the leaſt alteration from the tin.

1095 Malleability of gold deſtroyed by regulus of arſenic.

Several other trials were made with different mixtures of copper, tin, and ſilver, with gold, even as low as two ounces and a half of copper, with half an ounce of tin, to twelve ounces of gold; all of which bore hammering and flatting by rollers to the thinneſs of ſtiff paper, and afterwards working into watch-caſes, cane-heads, &c. with great eaſe. They grew more hard and harſh indeed in proportion to the quantity of alloy; but not one of them had the appearance of what workmen call brittle gold. Mr Alchorne therefore is of opinion, that when brittleneſs has been occaſioned by the addition of tin to gold, the former has been adulterated with arſenic; as he has found, that by adding 12 grains of regulus of arſenic to as many ounces of fine gold, the compound has been rendered altogether unmalleable,

1096 Surpriſing tenacity of its parts.

When gold is ſtruck during a certain time by a hammer, or when violently compreſſed, as by the wire-drawers, it becomes more hard, elaſtic, and leſs ductile; ſo that it is apt to be cracked and torn. Its ductility is, however, reſtored by the ſame means uſed with other metals, namely, heating it red hot, and letting it cool ſlowly. This is called *annealing* metals; and gold ſeems to be more affected by this operation than any other metal. The tenacity of the parts of gold is alſo very ſurpriſing; for a wire of $\frac{1}{10}$ of an inch in diameter will ſupport a weight of 500 pounds.

1097 Not liable to ruſt.

Gold is unalterable by air or water. It never contracts ruſt like other metals. The action of the fierceſt furnace-fires occaſions no alteration in it. Kunckel kept gold in a glaſs-houſe furnace for a month, and Boyle kept ſome expoſed to a great heat for a ſtill longer time, without the loſs of a ſingle grain. It is ſaid, however, to be diſſipable in the focus of a large burning mirror.

1098 Mr Boyle's experiments for the deſtructibility of gold.

Mr Boyle relates a very curious and extraordinary experiment, which he thought was ſufficient to prove the total deſtructibility of gold. About an eighth part of a grain of powder, communicated by a ſtranger, was projected upon two drachms of fine gold in fuſion, and the matter kept melted for a quarter of an hour. During the fuſion, it looked like ordinary gold; except only once, that his aſſiſtant obſerved it to look exactly of the colour of opal. When cold, it was of a dirty colour, and, as it were, overcaſt with a thin coat, almoſt like half-vitrified litharge: the bottom of the crucible was overlaid with a vitrified ſubſtance, partly yellow, and partly reddiſh brown; with a few ſmall globules, more like impure ſilver than gold. The metal was brittle, internally like braſs or bell-metal; on the touchſtone more like ſilver than gold: its ſpecific gravity was to that of water only as $15\frac{6}{5}$ to 1. There was no abſolute loſs of weight. By cupellation, 60 grains of this maſs yielded 53 grains of pure gold, with ſeven grains of a ponderous, fixed, dark-coloured ſubſtance.

1099 Solution in aqua-regia.

We have already mentioned, that in certain circumſtances gold is ſoluble in the nitrous and marine acids ſeparately. It is, however, always ſoluble by the two united, but diſſolves ſlowly even then. The moſt commodious method of obtaining this ſolution is, by putting the gold, either in leaves, or granulated, or cut into ſmall thin pieces, into a proper quantity of aquafortis; then adding, by degrees, ſome powdered ſal ammoniac, till the whole of the gold is diſſolved. By this means a much ſmaller quantity of the menſtruum proves ſufficient, than if the ſal ammoniac was previouſly diſſolved in the aquafortis; the conflict, which each addition of the ſalt raiſes with the acid, greatly promoting the diſſolution. Aquafortis of moderate ſtrength will, in this way, take up about one-third of its weight of gold; whereas an aqua-regis, ready prepared from the ſame aquafortis, will not take up above one-fifth its weight. Common ſalt anſwers better for the preparation of the aqua-regis than ſal ammoniac.

1100 Properties of the ſolution.

This ſolution, like all other metallic ones, is corroſive. It gives a violet colour to the fingers, or to any animal matters. If the ſolution is evaporated and cooled, yellow tranſparent cryſtals will be formed: but, if the evaporation is carried too far, the acids with which the gold is combined may be driven from it by heat alone; and the gold will be left in the ſtate of a yellow powder, called *calx of gold*.

1101 Gold precipitated from it.

Gold may be precipitated from its ſolution by thoſe ſubſtances which commonly precipitate metals, ſuch as alkaline ſalts and calcareous earths. It may alſo be precipitated in a fine purple powder, by tin or its ſolution.

When fixed alkalies are made uſe of, the precipitate weighs about one-fourth more than the gold employed. With volatile alkalies alſo, if they are added in no greater proportion than is ſufficient to ſaturate the acid, the quantity of precipitate proves nearly the ſame: but if volatile ſpirit is added in an over-proportion, it rediſſolves part of the gold which it had before precipitated, and the liquor becomes again conſiderably yellow. The whole of the precipitate, however,

ever, could not be rediſſolved, either by the mild or cauſtic alkali; nor did either of theſe ſpirits ſenſibly diſſolve or extract any tinge from precipitates of gold which had been thoroughly edulcorated with boiling water.

1102 Separated from other metals by vitriol of iron.

All the metallic bodies which diſſolve in aqua-regia, precipitate gold from it. Mercury and copper throw down the gold in its bright metalline form; the others, in that of a calx or powder, which has no metallic aſpect. Vitriol of iron, though it precipitates gold, yet has no effect upon any other metal; hence it affords an eaſy method of ſeparating gold from all other metals. The precipitation with tin ſucceeds certainly only when the metal in ſubſtance is uſed, and the ſolution of gold largely diluted with water. It is obſervable, that though the gold is precipitated from the diluted ſolution by tin, yet, if the whole is ſuffered to ſtand till the water has in a great meaſure exhaled, the gold is taken up afreſh, and only a white calx of tin remains.

1103 Aurum fulminans.

1104 Known in the 15th century.

1105 Baſil Valentine's directions for its preparation.

Gold precipitated from its ſolution in aqua-regia explodes by heat with much greater violence than any other ſubſtance in nature. This property was known in the 15th century; but whether the ancient alchemiſts knew any thing of it or not, is a matter of uncertainty. Baſil Valentine firſt gave any diſtinct account of it. He directs the gold to be diſſolved in aqua-regia made with ſal ammoniac, and then precipitated by vegetable fixed alkali, to be twelve times waſhed with water, and laſtly dried in the open air, where the ſun's rays cannot reach it. He forbids it to be dried over a fire, as it explodes with a gentle heat, and flies off with inconceivable violence.

1106 Uſe of volatile alkali but lately known.

Succeeding chemiſts have performed this operation with ſome little differences; but the neceſſity of employing volatile alkali was but little regarded till the beginning of the preſent century.

1107 Increaſe of the weight of gold by being changed into aurum fulminans.

1108 Prodigious force with which it explodes.

1109 Does not explode in cloſe veſſels.

1110 Heat requiſite for the exploſion.

1111 Explodes readily by friction.

1112 Inſtances of its miſchievous effects.

The calx of gold is always ſomewhat increaſed in weight by being converted into aurum fulminans; but authors are not agreed about the quantity of augmentation. Becher makes it heavier by one-fifth part; Lemery by one-fourth; and Juncker by one-fourth. All agree, however, that it explodes with a violence almoſt inconceivable. Crollius relates, that 20 grains of this powder explodes with more force than half a pound of gun powder, and exerts its force downwards, though M. Teykmeyer frequently ſhowed in his lectures that it would throw a florin upwards above ſix ells. A great number of experiments were made before the Royal Society at London, in order to determine the comparative forces of theſe two powders. Equal parts of gunpowder and aurum fulminans were included in iron globes placed among burning coals; thoſe which contained the former burſt with great violence, but the globes containing the aurum fulminans remained perfectly ſilent. But though no exploſion takes place in cloſe veſſels, the utmoſt caution is neceſſary in managing this ſubſtance in the open air; eſpecially when it is ſubjected to friction, or to a ſlight degree of heat; for ſuch is the nature of the calx we ſpeak of, that it is not neceſſary, in order to cauſe it explode, to touch it with an ignited ſubſtance, or to make it red-hot. The heat requiſite for this purpoſe is, according to Dr Lewis, intermediate between that of boiling water and the heat which makes metals of an obſcure red. With friction, however, it ſeems ſtill more dangerous; for in this caſe it explodes with what we ſhould think ſcarce ſufficient to communicate any degree of heat whatever. Orſchal relates, that this powder ground in a jaſper mortar, exploded with ſuch violence as to burſt the veſſel in a thouſand pieces; Dr Lewis gives an inſtance of a ſimilar kind in England; and Dr Birch tells us of doors and widows torn to pieces by the violence of this exploſive matter. Mr Macquer relates the following accident to which he was witneſs. "A young man, who worked in a laboratory, had put a drachm of fulminating gold into a bottle, and had neglected to wipe the inner ſurface of the neck of the bottle, to which ſome of the powder adhered. When he endeavoured to cloſe the bottle, by turning round the glaſs ſtopper, the friction occaſioned an exploſion of part of the powder. By this the young man was thrown ſome ſteps backward, his face and hands wounded by the fragments of the bottle, and his eyes put out; yet, notwithſtanding this violent exploſion, the whole drachm of fulminating gold certainly did not take fire as much of it was afterwards found ſcattered about the laboratory."

1113 Force of the exploſion is not directed entirely downwards.

It has already been mentioned, that ſome imagine the force of this exploſion to be directed downwards; but Dr Lewis is of opinion that it is equally directed every way. Certain it is, that the quantity of from 10 to 12 grains of aurum fulminans, exploded on a metalline plate, lacerates it; a ſmaller quantity forms a cavity, and a ſtill ſmaller only ſcratches the ſurface; effects which are never produced by gunpowder in ever ſo large a quantity. A weight laid upon the powder is thrown upwards in the moment of exploſion. If it be of ſilver or copper, this weight is marked with a yellowiſh ſpot, as the ſupports will alſo be, if made of either of theſe metals. A large grain, ſays Mr Bergman, brought near to the ſide of the flame of a candle, blows it out with great noiſe; and a few ounces exploding together by incautious drying, has been known to ſhatter the doors and windows of the apartment: hence it is evident, that aurum fulminans exerts its force in all directions; yet it cannot be denied, that it ſtrikes bodies with which it is in contact more violently than thoſe which are at a ſmall diſtance, though in its vicinity: thus, if a ſmall portion of it explodes in a paper box, it lacerates only the bottom, unleſs the top be preſſed down cloſe, in which caſe it perforates both the top and bottom. When carefully and gradually exploded in a glaſs phial or a paper box, it leaves a purple ſoot, in which are found many particles of ſhining gold; and if the quantity exploded be large, ſeveral grains remain totally unchanged, as it is only the lowermoſt ſtratum that is inflamed.

1114 Exploſion of moiſt aurum fulminans.

Aurum fulminans, when moiſt, does not explode at all: but as it dries, the grains go off in ſucceſſion like the decrepitation of common ſalt.—In glaſs veſſels cloſed, or with their mouths immerſed in water, it explodes, but with a very weak report. An elaſtic vapour, in the quantity of ſeven inches, from half a drachm of the powder, broke forth in the moment of exploſion, which, by our author's account, ſeems to be phlogiſticated air. In metallic veſſels ſufficiently ſtrong, the gold is ſilently reduced when they are perfectly

fectly ſound; but if they have any very ſmall chinks in them, the vapour makes its way through them with a hiſſing noiſe.

1115 Cauſe of this exploſion attributed to a ſaline principle.

1116 This opinion ſhown to be erroneous by Mr Bergman.

The cauſe of this extraordinary exploſive force of gold has been attributed chiefly to a ſaline principle, *viz.* The combination of nitrous acid with volatile alkali; and this opinion has been ſupported by an aſſertion, that the fulminating property is deſtroyed by treating the calx with vitriolic acid or with fixed alkali; the former expelling the nitrous acid, and the latter diſengaging the volatile alkali. Mr Bergman allows that fixed alkali deſtroys the fulminating property; but affirms, that it acts only by ſeparating the particles when the two are triturated together; and this might be done by many other ſubſtances as well as fixed alkali: But when the alkali, inſtead of being triturated in the dry way with the calx, was boiled in water along with it, the exploſion not only took place, but was much more violent than uſual. It muſt be obſerved, however, that heat alone deſtroys the fulminating property of this calx; and therefore, if the alkaline ſolution be made too ſtrong, the additional heat which it then becomes capable of ſuſtaining, is ſufficient to deprive the calx of its fulminating property. The caſe is the ſame with the vitriolic acid; for this has no effect upon the calx, either by digeſtion in its concentrated ſtate, or by boiling in its diluted ſtate. If it be boiled in its concentrated ſtate indeed with the fulminating calx, the heat conceived by the acid is ſufficient to deſtroy the fulminating property of the former; and in like manner, unleſs the calx be in ſome meaſure deſtroyed, or reduced to its metallic ſtate, it can never be deprived of its fulminating property.

1117 Aurum fulminans can be made without nitrous or marine acids.

It was further proved, that the fulminating property did not depend on the preſence either of nitrous or marine acids, for it can be made without them. A calx of gold, not fulminating, diſſolved in vitriolic acid, and precipitated by cauſtic volatile alkali, had acquired this property. A ſolution of the ſame calx in nitrous acid, let fall a precipitate by the addition of pure water; and this precipitate edulcorated, and digeſted with volatile alkali, fulminated as if it had been originally precipitated with that alkali. The experiment was repeated on the other non-fulminating precipitates with the ſame ſucceſs. Leſt any ſuſpicion, however, ſhould remain, that a ſmall quantity of aqua-regia might ſtill be left, which, by combining with the volatile alkali, would make a proportionable quantity of nitrum flammans, the precipitate was digeſted 24 hours in vitriolic acid, then waſhed in pure water, and immerſed in aqueous and ſpirituous ſolutions of alkali, both mild and cauſtic; but the event was the ſame. Laſtly, an inert calx of gold may always be made to fulminate by digeſting it with volatile alkali; nor can this property be communicated to it by any means without the uſe of this alkali.

1118 Fixed air not the cauſe of the exploſion.

It has been ſuppoſed by ſome very eminent chemiſts, among whom we may number Dr Black, that fixed air is the cauſe of the fulmination of gold: but it is evident that this cannot be the caſe: becauſe, 1. Gold fulminates as well when precipitated by the cauſtic volatile alkali, as by that which contains fixed air, 2. This metal does not combine, during precipitation, with fixed air. 3. Gold, when precipitated by mild fixed alkali, does not fulminate, unleſs the menſtruum contain volatile alkali.

1119 Menſtruum ſine ſtrepitu.

The fulminating calx of gold may be prepared either with the compound aqua-regia of pure nitrous and marine acids; of pure nitrous acid and ſal ammoniac; or of a compound of alum, nitre, and ſea-ſalt. When this kind of liquor is made uſe of, the acid of the alum expels the other two, and thus forms an aqua-regia. This was formerly called *menſtruum ſine ſtrepitu.* By whatever method the gold is diſſolved, it always affords a yellow calx with alkalies, but the volatile alkali moſt readily throws down the metal. Dephlogiſticated ſpirit of ſalt very readily diſſolves gold, and produces a fulminating precipitate as well as aqua-regia.

1120 Mr Bergman's theory of the cauſe of the exploſion.

We ſhall conclude this account of aurum fulminans with an abſtract of Mr Bergman's theory of the exploſion.—He obſerves, that volatile alkali contains phlogiſton; an undoubted proof of which is given by Dr Prieſtley, by coverting alkaline into phlogiſticated air. This phlogiſton, ſays he, may be ſeparated by means of a ſuperior attraction; ſo that the volatile alkali is decompoſed, and the reſiduum diſſipated in form of an elaſtic fluid, altogether ſimilar to that which is extricated during the fulmination: the ſource then from whence the elaſtic fluid is derived muſt be obvious; and it only remains to examine the medium by which the volatile alkali is dephlogiſticated.

'In thoſe metals which are called *perfect*, ſo great is the firmneſs of texture, and ſo cloſe the connection of the earthy principle with the phlogiſton, that by means of fire alone theſe principles cannot be diſunited: but when diſſolved by acid menſtrua, they muſt neceſſarily loſe a portion of their phlogiſton; and therefore, when afterwards precipitated by alkalies which cannot ſupply the loſs, they fall down in a calcined ſtate, though they attract phlogiſton ſo ſtrongly, that they can be reduced to a metallic ſtate, merely by an intenſe heat penetrating the veſſels. It may therefore be laid down as a fundamental poſition, that gold is calcined by ſolution.

1121 Volatile alkali the cauſe of the exploſion.

" Let us now conſider the conſequence of expoſing the powder conſiſting of calx of gold and volatile alkali intimately united, to an heat gradually increaſed. The calx which is united with the volatile alkali, by the aſſiſtance of a gentle heat, ſeizes its phlogiſton; and when this is taken away, the reſiduum of the ſalt is inſtantaneouſly expanded into the form of an elaſtic fluid, which is performed with ſo much violence, that the air muſt yield a very acute ſound."

1122 Volatile alkali exhibits a flaſh when thrown into a hot crucible.

1123 Great quantity of elaſtic fluid produced by aurum fulminans.

Our author proceeds to explain this phenomenon upon the principles aſſumed by him and Mr Scheele, of heat being a compoſition of light, and the phlogiſton or principle of inflammability; but as this hypotheſis is by no means ſatisfactory, we ſhall omit his reaſoning founded upon it: That the volatile alkali, however, is really capable of producing a flaſh is eaſily proved, becauſe it exhibits one when thrown into a hot crucible. A ſingle cubic inch of gun-powder generates about 244 of elaſtic fluid; but the ſame quantity of aurum fulminans yields at leaſt four times as much; and hence we may eaſily underſtand the difference in their exploſive force.

" That careful calcinations ſhould deſtroy the ful-

1124 Why ſlight calcination deſtroys the fulminating property.

minating property, is not to be wondered at, as the volatile alkali is the indiſpenſible material cauſe; but, the peculiar alacrity which it acquires before the exploſive force is totally extinguiſhed, depends upon the nature of the materials, and of the operation. Thus the heat, when inferior to that neceſſary for fulmination, acts upon both the principles of the aurum fulminans, it prepares the metallic calx for a more violent attraction for phlogiſton; it alſo acts upon the phlogiſton of the volatile alkali, and leſſens its connection; which two circumſtances muſt tend to the union producing the exploſion. But this effect has a maximum; and at this period the ſlighteſt friction ſupplies the defect of neceſſary heat, and produces the fulmination. The calcined gold alſo ſeems to collect and fix the matter of heat, though ſtill inſufficient by means of its phlogiſton, in a certain degree; ſo that by means of friction, though but very ſlight, it becomes capable of exerting its force; but when the heating is often repeated without procuring its effect, the volatile alkali is by degrees diſſipated, and at length ſo much diminiſhed that the calx becomes inert.

1125 Why it will not explode in cloſe veſſels.

“ But if aurum fulminans is capable of producing ſuch a prodigious quantity of elaſtic fluid, how does it happen that it remains mute and inert when reduced in cloſe veſſels? Of this the reaſon may be, that every elaſtic fluid, in the act of breaking forth, requires a ſpace to expand in; and if this be wanting, it remains fixed. Taking this for granted, a calx of gold cannot be reduced in cloſe veſſels either by heat or by the phlogiſton of volatile alkali; for in either caſe it muſt evolve its elaſtic fluid, which by ſuppoſition it cannot do. Nothing remains to ſolve this difficulty but the ignition of the ſurrounding metal; by means of which the calx, in virtue of its ſuperior attraction, ſeizes the phlogiſton of the metal, which that ſubſtance here, as well as in other inſtances, is capable of loſing without the eruption or abſorption of any fluid whatever.”

1126 Mr Bergman's opinions of the ſublimation of other calces.

Several chemiſts have aſſerted, that the calces of copper or ſilver may be made to fulminate like that of gold. But Mr Bergman informs us, that theſe experiments never ſucceeded with him; “ ſo (ſays he) they have either been ſilent upon ſome circumſtances neceſſary in the operation, or perhaps have been deceived by the detonation of nitrum flammans, or ſome other accidental occurrence. It is not ſufficient for the volatile alkali to adhere to the precipitate; for platina thrown down by this alkali retains a portion of it very obſtinately, but yet does not fulminate on the expoſure of fire —Beſides the preſence of volatile alkali, it ſeems to be neceſſary that the metallic calx ſhould be reducible by a gentle heat, in order to decompoſe it; but every exploſion is not to be derived from the ſame cauſes; nay, in this reſpect, aurum fulminans, gun-powder, and pulvis fulminans, differ very much, though they agree in ſeveral particulars.” Of late, however, it has been found that the calx of ſilver may be made to fulminate in a manner ſtill more extraordinary than that of gold. See the next article.

1127 Solution of gold by hepar ſulphuris.

If gold is melted with an hepar ſulphuris, compoſed of equal parts of ſulphur and fixed alkaline ſalt, the metal readily unites with it into an uniform maſs, capable of diſſolution in water without any ſeparation of its parts. The ſolution, beſides a nauſeous taſte from the ſulphur, has a peculiar penetrating bitterneſs, not diſcoverable in any other metalline ſolution made by the ſame means.

Though the compoſitions of ſulphur and alkali ſeem to unite more intimately with gold than any other metal, their affinity with it is but ſlight; copper, or iron, added to the matter in fuſion, diſunite, and precipitate the gold. The metal thus recovered, and purified by the common proceſſes, proves remarkably paler-coloured than at firſt. In an experiment related by Dr Brandt, in the Swediſh Memoirs, the purified gold turned out nearly as pale as ſilver, without any diminution of weight.

1128 Medicinal virtues of gold.

Gold has been thought to be poſſeſſed of many extraordinary virtues as a medicine; which, however, are long ago determined to be only imaginary. It is not indeed very eaſy to prepare this metal in ſuch a manner that it can be ſafely taken into the human body. The ſolution in aqua-regia is poiſonous; but if any eſſential oil is poured on this ſolution, the gold will be ſeparated from the acid, and united to the eſſential oil; with which, however, it contracts no laſting union, but in a few hours ſeparates in bright yellow film to the ſides of the glaſs. Vitriolic ether diſſolves the gold more readily and perfectly than the common eſſential oils; and keeps it permanently ſuſpended, the acid liquor underneath appearing colourleſs. The yellow ethereal ſolution poured off, and kept for ſome time in a glaſs ſtopt with a cork, ſo that the ſpirit may ſlowly exhale, yields long, tranſparent, priſmatic cryſtals, in ſhape like thoſe of nitre, and yellow like topaz. What the nature of theſe cryſtals is, either as to medicinal effects, or other purpoſes, is as yet unknown.

1129 Etheral ſolution.

Rectified ſpirit of wine mingles uniformly with the ſolution of gold made in acids: if the mixture is ſuffered to ſtand for ſome days in a glaſs ſlightly covered, the gold is by degrees revived, and ariſes in bright pellicles to the ſurface. Groſſer inflammable matters, wine, vinegar, ſolutions of tartar, throw down the gold, in its metallic form, to the bottom. Gold is the only metal which is thus ſeparable from its ſolution in acids by theſe ſubſtances; and hence gold may be purified by theſe means from all admixtures, and ſmall proportions of it in liquors readily diſcovered.

1130 Colour of gold reſtored.

When the colour of gold is by any means rendered pale, it may be recovered again by melting it with copper, and afterwards ſeparating the copper; or by a mixture of verdigris and ſal ammoniac with vitriol or nitre. The colour is alſo improved by fuſion with nitre, injecting ſal ammoniac upon it in the fuſion, quenching it in urine, or boiling it in a ſolution of alum. When borax is uſed as a flux, it is cuſtomary to add a little nitre or ſal ammoniac, to prevent its being made pale by the borax. Juncker reports, that by melting gold with four times its weight of copper, ſeparating the copper by aquafortis unpurified, then melting the gold with the ſame quantity of freſh copper, and repeating this proceſs eight or nine times, the gold becomes at length of a deep red colour, which ſuſtains the action of lead, antimony, and aquafortis.

§. 2. *Silver.*

1131 Ductility of ſilver. THIS, next to gold, is the moſt perfect, fixed, and ductile of all the metals. Its ſpecific gravity is to that of water nearly as 11 to 1. A ſingle grain has been drawn into a wire three yards long, and flatted into a plate an inch broad. In common fire it ſuffers no diminution of its weight; and, kept in the vehement heat of a glaſs-houſe for a month, it loſes no more than one ſixty-fourth. In the focus of a large burning-glaſs, it ſmokes for a long while, then contracts a greyiſh aſh on the ſurface, and at length is totally diſſipated.

Silver is ſomewhat harder and more ſonorous than gold, and is fuſible with a leſs degree of heat. The tenacity of its parts alſo is nearly one half leſs than that of gold; a ſilver wire of $\frac{1}{10}$ of an inch diameter being unable to bear more than 270 pounds.

Mercury unites very readily with ſilver-leaf, or with the calx of ſilver precipitated by copper; but does not touch the calces precipitated by alkaline ſalts. 1132 Effects of ſulphur on it. The vapours of ſulphureous ſolutions ſtain ſilver yellow or black. Sulphur, melted with ſilver, debaſes its colour to a leaden hue, renders it more eaſily fuſible than before, and makes it flow ſo thin as to be apt in a little time to penetrate the crucible: in a heat juſt below fuſion, a part of the ſilver ſhoots up, all over the ſurface, into capillary efflorefcence. Aquafortis does not act upon ſilver in this compound; but fixed alkaline ſalts will abſorb the ſulphur, and from a hepar ſulphuris, which, however, is capable of again diſſolving the metal. If the ſulphurated ſilver is mixed with mercury ſublimate, and expoſed to the fire, the mercury of the ſublimate will unite with the ſulphur, and carry it up in the form of cinnabar, whilſt the marine acid of the ſublimate unites with the ſilver into a luna cornea, which remains at the bottom of the glaſs. Fire alone is ſufficient, if continued for ſome time, to expel the ſulphur from ſilver.

1133 Purification. From the baſer metals, ſilver is purified by cupellation with lead. (See REFINING.) It always retains, however, after that operation, ſome ſmall portion of copper, ſufficient to give a blue colour to volatile ſpirits, which has been erroneouſly thought to proceed from the ſilver itſelf. It is purified from this admixture by melting it twice or thrice with nitre and borax. The ſcoria, on the firſt fuſion, is commonly blue; on the ſecond, green; and on the third, white, which is a mark of the purification being completed.

1134 Luna cornea reduced. The moſt effectual means, however, of purifying ſilver, is by reviving it from luna cornea; becauſe ſpirit of ſalt will not precipitate copper as it does ſilver. The ſilver may be recovered from luna cornea, by fuſion with alkaline and inflammable fluxes; but, in theſe operations, ſome loſs is always occaſioned by the diſſipation of part of the volatile calx, before the alkali or metal can abſorb its acid. 1135 Mr Margraaf's method. Mr Margraaf has diſcovered a method of recovering the ſilver with little or no loſs; mercury aſſiſted by volatile ſalts, imbibing it by trituration without heat. One part of luna cornea, and two of volatile ſalt, are to be ground together in a glaſs-mortar, with ſo much water as will reduce them to the conſiſtence of a thin paſte, for a quarter of an hour, or more; five parts of pure quickſilver are then to be added, with a little more water, and the triture to be continued for ſome hours. A fine amalgam will thus be obtained; which is to be waſhed with freſh parcels of water, as long as any white powder ſeparates. Nearly the whole of the ſilver is contained in the amalgam, and may be obtained perfectly pure by diſtilling off the mercury. The white powder holds a ſmall proportion ſeparable by gentle ſublimation; the matter which ſublimes is nearly ſimilar to mercurius dulcis.

The colour of ſilver is debaſed by all the metals, and its malleability greatly injured by all but gold and copper. The Engliſh ſtandard ſilver contains one part of copper to twelve and one-third of pure ſilver. 1136 Attraction for lead. This metal diſcovers in ſome circumſtances a great attraction for lead; though it does not retain any of that metal in cupellation. If a mixture of ſilver and copper be melted with lead in certain proportions, and the compound afterwards expoſed to a moderate fire, the lead and ſilver will melt out together, bringing very little of the copper with them; by this means ſilver is often ſeparated from copper in large works. The effect does not wholly depend upon the different fuſibility of the metals; for if tin, which is ſtill more fuſible than lead, be treated in the ſame manner with a mixture of ſilver and copper, the three ingredients are found to attract one another ſo ſtrongly as to come all into fuſion together. Again, if ſilver be melted with iron, and lead added to the mixture, the ſilver will forſake the iron to unite with the lead, and the iron will float by itſelf on the ſurface.

1137 Whitened externally. Silver is purified and whitened externally by boiling in a ſolution of tartar and common ſalt. This is no other than an extraction of the cupreous particles from the ſurface of the ſilver, by the acid of the tartar acuated by the common ſalt.

1138 Fulminating ſilver. M. Berthollet has lately diſcovered a method of imparting to the calx of ſilver a fulminating property, and that much more terrible than fulminating gold itſelf. 1139 How prepared. His receipt for making it is, "Take cupelled ſilver, and diſſolve it in the nitrous acid; precipitate the ſilver from the ſolution by lime-water, decant the clear liquor, and expoſe the precipitate three days to the open air. Mix this dried precipitate with the cauſtic volatile alkali, it will turn black; and when dried in the air, after decanting the clear liquor, is the fulminating powder required."

The properties of this powder are ſaid to be ſo extraordinary, that it is impoſſible to imagine how any part of it can ever be ſeparated from the reſt after it is once prepared. 1140 Fulminates by the touch of any ſubſtance whether cold or hot. To make this fulminate, it ſeems no ſenſible degree of heat is neceſſary, the contact of a cold body anſwering that purpoſe as well as any other. After it is once made, therefore, it muſt not be touched, but remain in the veſſel in which it is dried; and ſo violent is the exploſion, that it is dangerous to attempt it in larger quantities than a grain at a time. 1141 Dangerous when more than a grain is fulminated at a time. For the ſame reaſon it undoubtedly follows, that no more than a grain ought to be made at a time, or at leaſt in one veſſel, becauſe no part of it could ever afterwards be ſeparated from the reſt. We are told, that, "the wind having turned over a paper containing ſome atoms of this powder," (we ought to have been

been informed how the atoms came there, conſidering what we have juſt now related,) "the portion touched by the hand fulminated, and of courſe that which fell upon the ground. A drop of water which fell upon this powder cauſed it to fulminate. A ſingle grain of fulminating ſilver, which was in a glaſs cup, reduced the glaſs to powder, and pierced ſeveral doubles of paper.

1142 Fulminating cryſtals.

"If the volatile alkali, which has been employed with the above powder, be put into a thin glaſs matraſs and boiled, then, on ſtanding in the cold, ſmall cryſtals will be found ſublimed on the interior ſides of the veſſel, and covering the liquor. On touching one of theſe cryſtals the matraſs will be burſt with conſiderable exploſion.

1143 Cautions to be uſed in preparing it.

"The dangerous properties of this powder ſuggeſt the neceſſity of not preparing it but when the face is covered with a maſk with glaſs eyes; and to avoid the rupture of the glaſs cups, it is prudent to dry the fulminating ſilver in ſmall metalline veſſels." To this we may add, that as the powder does not fulminate when wet, it may in that ſtate be put up in very ſmall quantities on paper, to be fulminated afterwards as occaſion offers. This will perhaps account for the appearance of the few atoms abovementioned on the paper which the wind overturned.

1144 Abſurd theory of the antiphlogiſtons.

With regard to the cauſe of this extraordinary fulmination we can ſay nothing ſatisfactory; the following curious reaſon is aſſigned by the antiphlogiſtons; which at once ſhows the futility of their theory, and ſets in a very ridiculous light the hard words with which they would obſcure the ſcience of chemiſtry. "The oxygenous principle * (ſay they) unites with the hydrogenous principle † of the volatile alkali, and form water in a vaporous ſtate. This water (in a vaporous ſtate) being inſtantaneouſly *thrown into a ſtate of vapour*, poſſeſſing elaſticity and expanſive force, is the principal cauſe of this phenomenon, in which the *azotic* ‡ air which is diſengaged from the volatile alkali, with its whole expanſile power, has a great ſhare."

* Dephlogiſticated air.
† Inflammable air.
‡ Phlogiſticated air.

1145 Remarks on this and other theories.

1146 The phenomenon probably owing to electricity.

On this, as well as other theories, in which elaſtic fluids are alleged to be the cauſe of exploſions, it is obvious to remark, that ſhould we allow this to be the caſe, we are utterly at a loſs to find a ſource of heat ſufficient to rarefy the vapour to ſuch a degree as is neceſſary for producing the effect aſcribed to it. In the preſent caſe, we can ſcarce ſuppoſe a grain weight of metalline calx, already dry, to contain as much either of fire or water as is neceſſary to produce the effect; nor can we explain why the touch of any cold body, and which may be ſuppoſed to contain leſs fire than the calx itſelf, ſhould produce ſuch an effect. As to the oxygenous and hydrogenous principles, they were there before the touch, and ought to have produced their effects, not to mention that the water produced by them could not have amounted to the thouſandth part of a grain. It is much more probable, therefore, that the whole is to be conſidered as an effect of electricity, though we cannot tell how the fluid comes here to be excited in ſuch a violent manner.

§ 3. *Copper.*

1147 Always ſofter than iron.

This is one of thoſe metals which, from their deſtructibility by fire, and contracting ruſt in the air, are called *imperfect*. Of theſe, however, it is the moſt perfect and indeſtructible. It is of a reddiſh colour when pure; eaſily tarniſhes in a moiſt air, and contracts a green ruſt. It is the moſt ſonorous of all the metals, and the hardeſt and moſt elaſtic of all but iron. In ſome of its ſtates, copper is as difficultly extended under the hammer as iron, but always proves ſofter to the file; and is never found hard enough to ſtrike a ſpark with flint or other ſtones; whence its uſe for chiſſels, hammers, hoops, *&c.* in the gunpowder works. When broke by often bending backwards and forwards, it appears internally of a dull red colour without any brightneſs, and of a fine granulated texture reſembling ſome kinds of earthen ware. It is conſiderably ductile, though leſs ſo than either gold or ſilver; and may be drawn into wire as fine as hair, or beaten into leaves almoſt as thin as thoſe of ſilver. The tenacity of its parts is very conſiderable; for a copper wire of $\frac{1}{10}$ of an inch diameter will ſupport a weight of $299\frac{1}{4}$ pounds without breaking. The ſpecific gravity of this metal, according to Dr Lewis, is to that of water as 8.830 to 1.

1148 How granulated.

Copper continues malleable when heated red; in which reſpect it agrees with iron; but is not, like iron, capable of being welded, or having two pieces joined into one. It requires for its fuſion a ſtronger heat than either gold or ſilver, though leſs than that requiſite to melt iron. When in fuſion, it is remarkably impatient of moiſture; the contact of a little water occaſioning the melted copper to be thrown about with violence, to the great danger of the by-ſtanders. It is, nevertheleſs, ſaid to be granulated in the braſs-works at Briſtol, without exploſion or danger, by letting it fall in little drops, into a large ciſtern of cold water covered with a braſs-plate. In the middle of the plate is an aperture, in which is ſecured with Sturbridge clay a ſmall veſſel, whoſe capacity is not above a ſpoonful, perforated with a number of minute holes, through which the melted copper paſſes. A ſtream of cold water paſſes through the ciſtern. If ſuffered to grow hot, the copper falls liquid to the bottom, and runs into plates.

1149 Calcined.

Copper, in fuſion, appears of a bluiſh green colour, nearly like that of melted gold. Kept in fuſion for a long time, it becomes gradually more and more brittle; but does not ſcorify conſiderably, nor loſe much of its weight. It is much leſs deſtructible than any of the imperfect metals, being very difficultly ſubdued even by lead or biſmuth. If kept in a heat below fuſion, it contracts on the ſurface thin powdery ſcales; which, being rubbed off, are ſucceeded by others, till the whole quantity of the metal is thus changed into a ſcoria or calx, of a dark reddiſh colour. This calx does not melt in the ſtrongeſt furnace fires; but, in the focus of a large burning mirror, runs eaſily into a deep red, and almoſt opaque, glaſs. A flaming fire, and ſtrong draught of air over the ſurface of the metal, greatly promote its calcination. The flame being tinged of a green, bluiſh, or rainbow colour, is a mark that the copper burns.

1150 Solubility.

This metal is very readily ſoluble by almoſt all ſaline ſubſtances; even common water, ſuffered to ſtand long in copper-veſſels, extracts ſo much as to gain a coppery taſte. It is obſervable, that water is much more impregnated with this taſte, on being ſuffered to ſtand in the cold, than if boiled for a longer time in the veſſel. The ſame thing happens in regard to the mild vegetable acids. The confectioners prepare the moſt acid ſyrups, even thoſe of lemons and oranges, by by boiling in clean copper-veſſels, without the preparations receiving any ill taſte from the metal; whereas, either the juices themſelves, or the ſyrups made from them, if kept cold in copper veſſels, ſoon become impregnated with a diſagreeable taſte, and with the pernicious qualities of the copper.

1151 Altered by combination with vegetable acids.

By combination with vegetable acids, copper becomes in ſome reſpects remarkably altered. Verdigris, which is a combination of copper with a kind of acetous or tartareous acid, is partially ſoluble in diſtilled vinegar; the reſiduum, on being melted with borax and linſeed oil, yields a brittle metallic ſubſtance, of a whitiſh colour, not unlike bell-metal. The copper alſo, when revived from the diſtilled verdigris, was found by Dr Lewis to be different from the metal before diſſolution; but neither of theſe changes have yet been ſufficiently examined.

1152 Amalgamation with mercury.

Copper, in its metallic ſtate, is very difficultly amalgamated with mercury; but unites with it more eaſily if divided by certain admixtures. If mercury and verdigris be triturated together with common ſalt, vinegar, and water, the copper in the verdigris will be imbibed by the mercury, and form with it, as Boyle obſerves, a curious amalgam, at firſt ſo ſoft as to receive any impreſſion, and which, on ſtanding, becomes hard like brittle metals. Braſs leaf likewiſe gives out its copper to mercury, the other ingredient of the braſs ſeparating in the form of powder.

1153 Dr Lewis's method.

Eaſier methods of amalgamating copper are publiſhed by Dr Lewis in his notes on Wilſon's Chemiſtry, p. 432. His receipts are,—"Diſſolve ſome fine copper in aquafortis: when the menſtruum will take up no more of the metal, pour it into an iron mortar, and add ſix times the weight of the copper, of mercury, and a little common ſalt: grind the whole well together with an iron peſtle; and, in a little time, the copper will be imbibed by the mercury, and an amalgam formed, which may be rendered bright by waſhing it well with repeated affuſions of water.

"*Another method.* Take the muddy ſubſtance which is procured in the poliſhing of copper plates with a pumice ſtone, and grind it well with a ſuitable portion of mercury, a little common ſalt, and ſome vinegar, in an iron mortar, (a marble one will do, if you make uſe of an iron peſtle), till you perceive the mercury has taken up the copper." The copper recovered from theſe amalgams retains its original colour, without any tendency to yellow. Even when braſs is made uſe of for making the amalgam, the recovered metal is perfect red copper; the ingredient from which the braſs received its yellowneſs being, as above obſerved, ſeparated in the amalgamation.

1154 Braſs, how prepared.

Copper is the baſis of ſeveral metals for mechanic uſes; as braſs, prince's metal, bell-metal, bath-metal, white copper, &c. Braſs is prepared from copper and calamine, with the addition of powdered charcoal, cemented together, and at laſt brought into fuſion. The calamine is to be previouſly prepared by cleanſing it from adhering earth, ſtone, or other matters; by roaſting, or calcining it; and by grinding it into a fine powder. The length of time, and degree of heat, requiſite for the calcination of the calamine, are different according to the qualities of that mineral. The calamine, thus calcined, cleanſed, and ground, is to be mixed with about a third or fourth part of charcoal duſt, or powdered pit-coal, as is done in ſome parts of England. The malleability of the baſis is diminiſhed by the uſe of pit-coal, which is therefore only employed for the preparation of the coarſer kinds. To this compoſition of calamine and coal, ſome manufacturers add common ſalt, by which the proceſs of making braſs is ſaid to be haſtened. In Goſlar, where the cadmia adhering to the inſides of the furnaces is uſed inſtead of the native calamine, a ſmall quantity of alum is added, by which they pretend the colour of the braſs is heightened. With this compoſition, and with thin plates or grains of copper, the crucibles are to be nearly filled. The proportion of the calamine to the copper varies according to the richneſs of the former, but is generally as three to two. The copper muſt be diſperſed through the compoſition of calamine and coal; and the whole muſt be covered with more coal, till the crucibles are full. The crucibles, thus filled, are to be placed in a furnace ſunk in the ground, the form of which is that of the fruſtum of a hollow cone. At the bottom of the furnace, or greater baſis of the fruſtum, is a circular grate, or iron-plate. This plate is covered with a coat of clay and horſe-dung, to defend it from the action of the fire; and pierced with holes, through which the air maintaining the fire paſſes. The crucibles ſtand upon the circular plate, forming a circular row, with one in the middle. The fuel is placed betwixt the crucibles, and is thrown into the furnace at the upper part of it, or the leſſer baſis of the fruſtum. To this upper part or mouth of the furnace is fitted a cover made of bricks or clay, kept together with bars of iron, and pierced with holes. This cover ſerves as a regiſter. When the heat is to be increaſed, the cover muſt be partly or entirely taken off, and a free draught is permitted to the external air, which paſſes along a vault under-ground to the aſh-hole, through the holes in the circular grate or plate, betwixt the crucibles, and through the upper mouth, along with the ſmoke and flame, into an area where the workmen ſtand, which is covered with a large dome or chimney, through which the ſmoke and air aſcend. When the heat is to be diminiſhed, the mouth of the furnace is cloſed with the lid; through the holes of which the air, ſmoke, and flame paſs. The crucibles are to be kept red-hot during eight or ten hours; and in ſome places much longer, even ſeveral days, according to the nature of the calamine. During this time, the zinc riſes in vapour from the calamine, unites with the copper, and renders that metal conſiderably more fuſible than it is by itſelf. To render the metal very fluid, that it may flow into one uniform maſs at the bottom, the fire is to be increaſed a little before the crucibles are taken out, for pouring off the fluid metal into moulds. From 60 pounds of good calamine, and 40 of copper, 60 pounds of braſs may be obtained, notwithſtanding a conſiderable quantity of the zinc is diſſipated in the operation. The quantity of braſs obtained has been conſiderably augmented ſince the introduction of the method now commonly practiſed, of granulating the copper; by which means a larger ſurface of this metal is expoſed to the vapour of zinc, and conſequently leſs of that vapour eſcapes. To make the finer and more malleable kinds of braſs, beſides the choice of pure calamine and pure copper, ſome

ſome manufacturers cement the braſs a ſecond time with calamine and charcoal; and ſometimes add to it old braſs, by which the new is ſaid to be meliorated.

Braſs is brittle when hot; but ſo ductile when cold, that it may be drawn into very fine wire, and beat into very thin leaves. Its beautiful colour, malleability, and its fuſibility, by which it may be eaſily caſt into moulds, together with its being leſs liable to ruſt than copper, render it fit for the fabrication of many utenſils.

Although zinc be fixed to a certain degree in braſs, by the adheſion which it contracts with the copper; yet when braſs is melted, and expoſed to a violent fire, during a certain time, the zinc diſſipates in vapours, and even flames away, if the heat be ſtrong enough; and if the fire is long enough continued, all the zinc will be evaporated and deſtroyed, ſo that what remains is copper.

2d 1154 Princes metal. Prince's metal is made by melting zinc in ſubſtance with copper; and all the yellow compound metals prepared in imitation of gold are no other than mixtures of copper with different proportions of that ſemimetal, taken either in its pure ſtate, or in its natural ore calamine, with an addition ſometimes of iron-filings, *&c.* Zinc itſelf unites moſt eaſily with the copper; but calamine makes the moſt ductile compound, and gives the moſt yellow colour. Dr Lewis obſerves, that a little of the calamine renders the copper pale; that when it has imbibed about $\frac{1}{17}$ its own weight, the colour inclines to yellow; that the yellowneſs increaſes more and more, till the proportion comes to almoſt one half; that on further augmenting the calamine, the compound becomes paler and paler, and at laſt white. The crucibles, in which the fuſion is performed in large works, are commonly tinged by the matter of a deep blue colour.

1155 Bell-metal. Bell-metal is a mixture of copper and tin; and tho' both theſe metals ſingly are malleable, the compound proves extremely brittle. Copper is diſſolved by melted tin eaſily and intimately, far more ſo than by lead. A ſmall portion of tin renders this metal dull-coloured, hard, and brittle. Bell-metal is compoſed of about ten parts of copper to one of tin, with the addition commonly of a little braſs or zinc. A ſmall proportion of copper, on the other hand, improves the colour and conſiſtency of tin, without much injuring its ductility. Pewter is ſometimes made from one part of copper and twenty or more of tin.

1156 Dr Lewis's obſervations on the ſpecific gravity of the metal. It has long been obſerved, that though tin is ſpecifically much lighter than copper, yet the gravity of the compound, bell-metal, is greater than that of the copper itſelf. The ſame augmentation of gravity alſo takes place where the lighter metal is in the greateſt proportion; a mixture even of one part of tin with two of copper, turning out ſpecifically heavier than pure copper. Moſt metallic mixtures anſwer to the mean gravity of the ingredients, or ſuch as would reſult from a bare appoſition of parts. Of thoſe tried by Dr Lewis, ſome exceeded the mean, but the greater number fell ſhort of it; tin and copper were the only ones that formed a compound heavier than the heavieſt of the metals ſeparately.

1157 White copper. White copper is prepared by mixing together equal parts of arſenic and nitre, injecting the mixture into a red-hot crucible, which is to be kept in a moderate fire till they ſubſide, and flow like wax. One part of this mixture is injected upon four parts of melted copper, and the metal, as ſoon as they appear thoroughly united together, immediately poured out. The copper, thus whitened, is commonly melted with a conſiderable proportion of ſilver, by which its colour is both improved and rendered more permanent. The white copper of China and Japan appears to be no other than a mixture of copper and arſenic. Geoffroy relates, that, on repeated fuſions, it exhaled arſenical fumes, and became red copper, loſing with its whiteneſs, one ſeventh of its weight.

§ 4. *Iron.*

Iron is a metal of a greyiſh colour; ſoon tarniſhing in the air into a duſky blackiſh hue; and in a ſhort time contracting a yellowiſh, or reddiſh ruſt. It is the hardeſt of all metals: the moſt elaſtic; and, excepting platina, the moſt difficult to be fuſed. 1158 Tenacity of its parts. Next to gold, iron has the greateſt tenacity of parts; an iron wire, the diameter of which is the tenth part of an inch, being capable of ſuſtaining 450 pounds. Next to tin, it is the lighteſt of all the metals, loſing between a ſeventh and eighth part of its weight when immerſed in water. When very pure, it may be drawn into wire as fine as horſe-hair; but is much leſs capable of being beaten into thin leaves than the other metals, excepting only lead,

Iron grows red-hot much ſooner than any other metal; and this, not only from the application of actual fire, but likewiſe from ſtrong hammering, friction, or other mechanic violence. It nevertheleſs melts the moſt difficultly of all metals except manganeſe and platina; requiring, in its moſt fuſible ſtate, an intenſe, bright, white heat. When perfectly malleable, it is not fuſible at all by the heat of furnaces, without the addition or the immediate contact of burning fuel; and, when melted, loſes its malleability: all the common operations which communicate one of theſe qualities deprive it at the ſame time of the other; as if fuſibility and malleability were in this metal incompatible. When expoſed to the focus of a large burning mirror, however, it quickly fuſed, boiled, and emitted an ardent fume, the lower part of which was a true flame. At length it was changed into a blackiſh vitrified ſcoria.

1159 Iron a combuſtible ſubſtance. From the great waſte occaſioned by expoſing iron to a red but eſpecially to a white heat, this metal appears to be a combuſtible ſubſtance. This combuſtion is maintained, like that of all other combuſtible ſubſtances, by contact of air. Dr Hook, having heated a bar of iron to that degree called *white heat*, he placed it upon an anvil, and blowed air upon it by means of bellows, by which it burnt brighter and hotter. Expoſed to a white heat, it contracts a ſemivitreous coat, which burſts at times, and flies off in ſparkles. No other metallic body exhibits any ſuch appearance. On continuing the fire, it changes by degrees into a dark red calx, which does not melt in the moſt vehement heat procurable by furnaces, and, if brought into fuſion by additions, yields an opaque black glaſs. When ſtrongly heated, it appears covered on the ſurface with a ſoft vitreous matter like varniſh. In this ſtate, pieces of it cohere; and, on being

1160 The only metal capable of being welded.

being hammered together, weld or unite, without diſcovering a juncture. As iron is the only metal which exhibits this appearance in the fire, ſo it is the only one capable of being welded. Thoſe operations which prevent the ſuperficial ſcorification, deprive it likewiſe of this valuable property: which may be reſtored again, by ſuffering the iron to reſume its vitreous aſpect; and, in ſome meaſure, by the interpoſition of foreign vitreſcible matters; whilſt none of the other metals will unite in the ſmalleſt degree, even with its own ſcoria.

1161 Contracts in fuſion.

Iron expands the leaſt of all metals by heat. In the act of fuſion, inſtead of continuing to expand, like the other metals, it ſhrinks; and thus becomes ſo much more denſe, as to throw up ſuch part as is unmelted to the ſurface; whilſt pieces of gold, ſilver, copper, lead, or tin, put into the reſpective metals in fuſion, ſink freely to the bottom. In its return to a conſiſtent ſtate, inſtead of ſhrinking like the other metals, it expands; ſenſibly riſing in the veſſel, and aſſuming a convex ſurface, while the others become concave. This property, firſt obſerved by Raumur, excellently fits it for receiving impreſſions from moulds. By the increaſe of bulk which the metal receives in congelation, it is forced into the minuteſt cavities, ſo as to take the impreſſion far more exactly than the other metals which ſhrink.

1162 Diſſolved by all metals except lead and mercury.

Iron is diſſolved by all the metals made fluid, except lead; though none of them act ſo powerfully upon it as gold: but, as Cramer obſerves, if the iron contains any portion of ſulphur, it can ſcarcely be made to unite at all with gold.

Among the ſemimetallic bodies, it is averſe to an union with mercury; no method of amalgamating theſe two having yet been diſcovered; though quickſilver, in certain circumſtances, ſeems in ſome ſmall degree to act upon it. A plate of tough iron, kept immerſed in mercury for ſome days, becomes brittle; and mercury will often adhere to and coat the ends of iron peſtles uſed in triturating certain amalgams with ſaline liquors. Mr Jones has alſo diſcovered, that by plunging iron, while heated to an intenſe white heat, into mercury, the latter will adhere to the ſurface of the iron, and completely ſilver it over.

Next to mercury, zinc is the moſt difficultly combined with iron; not from any natural indiſpoſition to unite, but from the zinc being difficultly made to ſuſtain the heat requiſite. The mixture is hard, ſomewhat malleable, of a white colour approaching to that of ſilver. Regulus of antimony, as ſoon as it melts, begins to act on iron, and diſſolves a conſiderable quantity. If the regulus be ſtirred with a iron rod, it will melt off a part of it. Arſenic likewiſe eaſily mingles with iron, and has a ſtrong attraction for it; forſaking all the other metals to unite with this. It renders the iron white, very hard, and brittle.

1163 Pruſſian blue.

This metal is the baſis of the fine blue pigment, called, from the place where it was firſt diſcovered, *Berlin* or *Pruſſian* blue. This colour was accidentally diſcovered about the beginning of the preſent century, by a chemiſt of Berlin, who, having ſucceſſively thrown upon the ground ſeveral liquors from his laboratory, was much ſurpriſed to ſee it ſuddenly ſtained with a beautiful blue colour. Recollecting what liquors he had thrown out, and obſerving the ſame effects from a ſimilar mixture, he prepared the blue for the uſe of painters; who found that it might be ſubſtituted to ultramarine, and accordingly have uſed it ever ſince.

1164 Dr Woodward's recept for.

Several chemiſts immediately endeavoured to diſcover the compoſition of this pigment; and in the year 1724 Dr Woodward publiſhed the following proceſs, in the Philoſophical Tranſactions, for making it. "Alkalize together four ounces of nitre, and as much tartar as is directed for charcoal (nº 779). Mix this alkali well with four ounces of dried bullocks blood; and put the whole in a crucible covered with a lid, in which there is a ſmall hole. Calcine with a moderate heat, till the blood be reduced to a perfect coal; that is, till it emits no more ſmoke or flame capable of blackening any white bodies that are expoſed to it. Increaſe the fire towards the end, ſo that the whole matter contained in the crucible ſhall be moderately, but ſenſibly, red.

"Throw into two pints of water the matter contained in the crucible, while yet red, and gave it half an hour's boiling: decant this firſt water; and pour more upon the black charry coal, till it becomes almoſt inſipid. Mix together all theſe waters; and reduce them, by boiling, to about two pints.

"Diſſolve alſo two ounces of martial vitriol, and eight ounces of alum, in two pints of boiling water. Mix this ſolution when hot with the preceding lixivium alſo hot. A great efferveſcence will then be made: the liquors will be rendered turbid; and will become of a green colour, more or leſs blue; and a precipitate will be formed of the ſame colour. Filtrate, in order to ſeparate this precipitate; upon which pour ſpirit of ſalt, and mix them well together; by which means the precipitate will become of a fine blue colour. It is neceſſary to add rather too much of the ſalt than too little, and till it no longer increaſes the beauty of the precipitate. The next day waſh this blue, till the water comes off from it inſipid; and then gently dry it."

1165 Mr Geoffroy's theory.

Mr Geoffroy was the firſt who gave any plauſible theory of this proceſs, or any rational means of improving it. He obſerves, that the Pruſſian blue is no other than the iron of the vitriol revived by the inflammable matter of the alkaline lixivium, and perhaps a little brightened by the earth of alum; that the green colour proceeds from a part of the yellow ferruginous calx, or ochre, unrevived, mixing with the blue; and that the ſpirit of ſalt diſſolves this ochre more readily than the blue part; though it will diſſolve that alſo by long ſtanding, or if uſed in too large quantity. From theſe principles, he was led to increaſe the quantity of inflammable matter; that there might be enough to revive the whole of the ferruginous ochre, and produce a blue colour at once, without the uſe of the acid ſpirit. In this he perfectly ſucceeded; and found, at the ſame time, that the colour might be rendered of any degree of deepneſs, or lightneſs, at pleaſure. If the alkali is calcined with twice its weight of dried blood, and the lixivium obtained from it poured into a ſolution of one part of vitriol to ſix of alum, the liquor acquires a very pale blue colour, and depoſits as pale a precipitate. On adding more and more of a freſh ſolution of vitriol, the colour becomes deeper and deeper, almoſt to blackneſs. He imagines, with great probability, that the blue pigment, thus prepared, will prove more durable in the air, mingle more perfectly with other colours, and be

leſs

leſs apt to injure the luſtre of ſuch as are mixed with or applied in its neighbourhood, than that made in the common manner; the tarniſh to which common Pruſſian blue is ſubject, ſeeming to proceed from the acid, which cannot be ſeparated by any ablution.

1166 Amuſing phenomenon in the preparation.

He takes notice of an amuſing phenomenon which happens upon mixture. When the liquors are well ſtirred together; and the circular motion, as ſoon as poſſible, ſtopped; ſome drops of ſolution of vitriol, (depurated, by long ſettling), let fall on different parts of the ſurface, divide, ſpread, and form curious repreſentations of flowers, trees, ſhrubs, flying inſects, &c. in great regularity and perfection. Theſe continue 10 or 12 minutes: and on ſtirring the liquor again, and dropping in ſome more of the ſolution of vitriol, are ſucceeded by a new picture.

1167 Mr Macquer's theory.

This theory is confirmed by Mr Macquer, in a Memoir printed in the year 1752. He obſerves, that the quantity of phlogiſton communicated to the iron in this proceſs is ſo great, as not only to cauſe the metal reſiſt in a great meaſure the action of acids, and become totally unaffected by the magnet; but by a ſlight calcination it becomes entirely ſimilar to other iron, and is at once deprived of its blue colour. He further obſerves, that fire is not the only means by which Pruſſian blue may be deprived of all the properties which diſtinguiſh it from ordinary iron. A very pure alkali produces the ſame effect. He has alſo diſcovered, that the alkali which has thus deprived the Pruſſian blue of all the properties which diſtinguiſh it from ordinary iron, becomes, by that operation, entirely ſimilar to the phlogiſticated alkali uſed for the preparation of Pruſſian blue.

1168 Phlogiſticated alkali loſes its alkaline properties.

By a more particular examination, he found, that the alkali might become perfectly ſaturated with the colouring matter; ſo that, when boiled on Pruſſian blue, it extracted none of its colour. When the ſalt was thus perfectly ſaturated, it ſeemed no longer to poſſeſs any alkaline qualities. If poured into a ſolution of iron in any acid, a ſingle, homogeneous, and perfect precipitate, was formed; not green, as in Dr Woodward's proceſs, but a perfect Pruſſian blue; which needed no acid to brighten its colour. A pure acid added to the alkali was not in the leaſt neutralized, nor in the leaſt precipitated the colouring matter. From hence Mr Macquer concludes, that, in the making of Pruſſian blue, vitriol is decompoſed; becauſe the iron has a ſtrong attraction for the colouring matter, as well as the acid for the alkali; and the ſum of the attraction of the acid to the alkali, joined to that of the iron for the colouring matter, is greater than the ſingle attraction of the acid to the metal.

1169 Earths do not attract the colouring matter.

Another very important phenomenon is, that earths have not the ſame attraction for this colouring matter that metallic ſubſtances have. Hence, if an alkali ſaturated with this colouring matter be poured into a ſolution of alum, no decompoſition is effected, nor any precipitate formed. The alum continues alum, and the alkali remains unchanged. From this experiment Mr Macquer concludes that alum does not directly contribute to the formation of the Pruſſian blue. The purpoſe he thinks it anſwers is as follows. Fixed alkaline ſalts can never be perfectly ſaturated with phlogiſtic matter by calcination; alkalies, therefore, though calcined with inflammable ſubſtances, ſo as to make a proper lixivium for Pruſſian blue, remain ſtill alkaline. Hence, when mixed with a ſolution of green vitriol, they form, by their purely alkaline part, a yellow precipitate, ſo much more copious, as the alkali is leſs ſaturated with phlogiſton. But nothing is more capable of ſpoiling the fine colour of the Pruſſian blue, than an admixture of this yellow precipitate: it is therefore neceſſary to add a quantity of alum, which will take up the greateſt part of the purely alkaline ſalt, and of conſequence the quantity of yellow ferruginous precipitate is much diminiſhed. But the earth of alum, being of a fine ſhining white, does not in the leaſt alter the purity of the blue colour, but is rather neceſſary to dilute it. From all this it follows, that it is a matter of indifference whether the green precipitate is to be again diſſolved by an acid, or the alkaline part of the lixivium ſaturated with alum or with an acid, before the precipitate is formed. The latter indeed ſeems to be the moſt eligible method.

1170 Blue producible from other alkalies.

Moſt alkalies obtained from the aſhes of vegetables, being combined, by their combuſtion, with a portion of inflammable matter, are capable of furniſhing a quantity of Pruſſian blue, proportionable to the quantity of colouring matter they contain, even without the neceſſity of mixing them with a ſolution of iron; becauſe they always contain a little of this metal diſſolved, ſome of which may be found in almoſt all vegetables; therefore it is ſufficient to ſaturate them with an acid. Henckel obſerved the production of this blue in the ſaturation of the foſſile alkali, and recommended to chemiſts to inquire into its nature.

1171 Mr Scheele diſcovers the colouring matter of Pruſſian blue.

The theories of Geoffroy, Macquer, &c. however, with reſpect to Pruſſian blue, have now given place to that of Mr Scheele; who has examined the ſubſtance with the utmoſt care, and found the colouring matter to conſiſt of an extremely volatile ſubſtance, capable of uniting with and neutralizing alkalies, but eaſily expelled from them by any other acid, even by that of fixed air.

1172 Lixivium ſanguinis loſes its colouring property by expoſure to the air.

He begins his diſſertation on this ſubject by obſerving, that the ſolution of alkali calcined with dried blood, which he calls *lixivium ſanguinis*, by expoſure to the air, loſes its property of precipitating the iron of a blue colour; and that the precipitate thus obtained is entirely ſoluble in the acid. In order to determine whether the air had thus undergone any change, he put ſome newly prepared lixivium into a glaſs veſſel well ſealed with roſin; but after ſome time finding no change on the lixivium, or on the air contained in the veſſel, he began to think that this might be occaſioned by the abſence of fixed air, which always abounds in the open atmoſphere, though not in any confined portion of it, at leaſt in an equal proportion.

1173 Suppoſed to ariſe from the fixed air abſorbed from the atmoſphere.

Having therefore filled a glaſs veſſel with fixed air, he poured into it a little lixivium ſanguinis; and next day found, that it threw down from green vitriol a precipitate entirely ſoluble in acids. With other acids he obtained no precipitate.

1174 The matter fixed by the addition of ſome green vitriol to the lixivium.

On inverting the experiment, and mixing ſome green vitriol with lixivium ſanguinis, the mixture grew yellow; and he found this addition capable of fixing the colouring matter ſo that neither the acid of fixed air nor any other could expel it from the alkali. For having poured the mixture abovementioned into a ſolution of green vitriol, and afterwards ſuperſaturated the

the lixivium with acid, he obtained a conſiderable quantity of blue. To the ſame lixivium ſanguinis, in which a ſmall quantity of green vitriol was diſſolved, he afterwards added of the other acids ſomewhat more than was neceſſary for its ſaturation; and though this was done, a conſiderable quantity of Pruſſian blue was afterwards obtained.

1175 Calx of iron ſoluble in lixivium ſanguinis;

Again, having precipitated a ſolution of green vitriol with alkali, and boiled the precipitate for ſome minutes in lixivium ſanguinis, part of it was diſſolved: the filtered lixivium underwent no change when expoſed to the open air or to the aerial acid, and precipitated the ſolution of vitriol of a blue; and though the lixivium was ſuperſaturated with acid, and ſome green vitriol added, a very beautiful Pruſſian blue was obtained.

1176 But not when highly dephlogiſticated.

This, however, will not hold when a perfectly dephlogiſticated calx of iron is employed, of which none can be diſſolved by the lixivium ſanguinis; nor will any Pruſſian blue be obtained by precipitating with lixivium ſanguinis a perfectly dephlogiſticated ſolution of iron in nitrous acid.

1177 The colouring matter taken up by the air after it has been expelled by acids.

To determine what had become of the colouring matter in thoſe experiments where it ſeemed to have been diſſipated, ſome lixivium ſanguinis was poured into a veſſel filled with aerial acid. It was kept well corked during the night, and next day a piece of paper dipped in a ſolution of green vitriol was fixed to the cork, pencilling it over with two drops of a ſolution of alkali in water. The paper was thus ſoon covered with precipitated iron; and on being taken out two hours afterwards, and dipped in muriatic acid, became covered with moſt beautiful Pruſſian blue. The ſame thing happened when lixivium ſanguinis ſuperſaturated with vitriolic acid was employed; for in this caſe alſo the air was filled with the colouring matter capable of being in like manner abſorbed by the calx of iron. But though from theſe experiments it is plain that acids expel this colouring ſubſtance from the lixivium, a given quantity of air is only capable of receiving a certain quantity of it; for the ſame mixture removed into another veſſel imparts the colouring property to the air it contains according to its quantity. On putting perfectly dephlogiſticated calx of iron upon the papers, no Pruſſian blue was formed; but the muriatic acid diſſolved the calx entirely.

1178 The colouring matter expelled by diſtillation with vitriolic acid.

Our author having now aſſured himſelf that acids really attract the alkali more than the colouring matter, proceeded to try the effects of diſtillation. Having therefore ſuperſaturated ſome lixivium ſanguinis with vitriolic acid, he diſtilled the mixture in a glaſs retort with a gentle fire. When about one-third had paſſed over, he changed the receiver, and continued the operation till one-half was diſtilled. The firſt product had a peculiar taſte and ſmell; the air in the receiver was filled with colouring matter, and the aqueous fluid was alſo ſtrongly impregnated with it, as appeared by its forming a fine Pruſſian blue with phlogiſticated calx of iron. Part of it being expoſed to the open air for ſome hours, entirely loſt its power, and the product of the ſecond operation was no other than water mixed with a little vitriolic acid.

1179 Attemps to procure the colouring matter by itſelf.

The next ſtep was to procure, if poſſible, the colouring matter by itſelf; and this he attempted to obtain from the Pruſſian blue, rather than the lixivium ſanguinis, as he would thus not only avoid the troubleſome calcination of the alkali and blood, but obtain the colouring matter im much larger quantity than could be done from the lixivium. On examining ſeveral kinds of this pigment, he found in them evident marks of ſulphur, volatile alkali, vitriolic acid, and volatile ſulphureous acid; all of which ſubſtances are to be found in the lixivium ſanguinis as well as in that of ſoot, and adhere to the precipitate in the preparation of Pruſſian blue.

1180 Neutral ſalt for diſcovering iron in mineral waters.

Finding, however, that he could not obtain his purpoſe by any kind of analyſis of theſe by fire alone, he had recourſe to a neutral ſalt uſed by chemiſts for diſcovering iron in mineral waters. This is formed by digeſting cauſtic fixed alkali on Pruſſian blue, which effectually extracts the colour from it even in the cold, in a very ſhort time, and being neutralized, may eaſily be reduced into a dry form. But it is not entirely to be depended upon for this purpoſe; for it always contains ſome iron which indeed is the medium of its connection with the alkali. The lixivium ſanguinis is preferable, though even this contains ſome iron, as well as the lixivium of ſoot; our author's experiments, however, were made with the neutral ſalt, for the reaſon already mentioned.

1181 Effects of diſtilling this ſalt with oil of vitriol.

1 An ounce of the ſalt was diſſolved in a glaſs retort in four ounces of water, afterwards adding three drachms of concentrated vitriolic acid; and the mixture was diſtilled with a gentle fire. The maſs grew thick as ſoon as it began to boil; from a great quantity of Pruſſian blue, a quantity of the colouring matter appeared by the ſmell to penetrate the lute: and part of it was abſorbed by the air in the receiver, as in former experiments. The diſtillation was continued till about an ounce had paſſed into the receiver. The blue maſs remaining in the retort was put into a ſtrainer, and a piece of green vitriol put into the liquid which paſſed through; but by this laſt no Pruſſian blue was produced. The blue which remained in the filter was again treated with lixivium tartari: the ſolution freed from its ochre by filtration, and the clear liquor committed a ſecond time to diſtillation with vitriolic acid. Pruſſian blue was again ſeparated, though in ſmaller quantity than before, and the colouring matter came over into the receiver. After one third of the matter had paſſed over, that which had been obtained by the firſt diſtillation was added to it, the Pruſſian blue was ſeparated from the lixivium in the retort, and extracted a third time. Some Pruſſian blue was formed again, though in much ſmaller quantity; whence it is apparent that Pruſſian blue may at laſt be totally decompoſed by means of alkali. Lime, or terra ponderoſa, likewiſe extract the blue colour, and ſhow the ſame phenomena as alkali.

1182 Colouring matter unites with volatile alkali.

With volatile alkali a compound, conſiſting of the alkali, iron, and colouring matter, is formed, which ſhows the ſame phenomena with that formed with fixed alkali. By diſtillation *per ſe* after it has been diſſolved in water, the liquor grows thick in conſequence of a ſeparation of Pruſſian blue, and volatile alkali paſſes over into the receiver. This volatile ſpirit is impregnated with the colouring matter; it is not precipitated by lime water; but green vitriol is precipitated by it; and on adding an acid, Pruſſian blue is formed. If a piece of paper, dipped in a ſolution of green vitriol, be expoſed to the vapour of this alkali, it is ſoon decompoſed; and if the ſame bepencilled over with muriatic acid, it inſtantly becomes blue.

blue. On expoſing the liquor to the open air, it all evaporates, leaving pure water behind.

1183 How to free the colouring matter perfectly from its vitriolic taint.

As in all the operations with vitriolic acid hitherto related, ſome ſmall quantity of it paſſes into the receiver, our author ſhows how to deprive the colouring matter, of that vitriolic taint. For this purpoſe nothing more is neceſſary than to put a little chalk into the matter, and rediſtil it with a very gentle heat; the acid unites with the chalk, and the colouring matter goes over in its greateſt purity.

1184 How to prevent the eſcape of the colouring matter thro' the lute.

In order to hinder, as much as poſſible, the eſcape of the volatile colouring matter through the lute, he makes uſe of a ſmall receiver, putting into it a little diſtilled water, and placing it ſo that the greater part ſhall be immerſed in cold water during the operation. The water impregnated with this colouring matter has a peculiar but not diſagreeable ſmell, a taſte ſomewhat approaching to ſweet, and warm in the mouth, at the ſame time exciting cough.

1185 This matter neither acid nor alkaline.

When rectified as above directed, it appears to be neither acid nor alkaline; for it neither reddens paper dyed with lacmus, nor does it reſtore the colour of ſuch paper after it has been made red; but it renders turbid the ſolutions of ſoap and hepar ſulphuris. The ſame liquor mixed with fixed alkali, though it contains a ſuperabundance of colouring matter, reſtores the blue colour of paper reddened by an acid. By diſtillation to dryneſs, there goes over a part of the colouring matter which diſengages itſelf from the alkali; the reſiduum is ſoluble in water, and has all the properties of the beſt lixivium ſanguinis; but, like the true lixivium, it is decompoſed by all the acids, even by that of fixed air.

1186 Forms a kind of ammoniacal ſalt with volatile alkali.

With cauſtic volatile alkali it forms a kind of ammoniacal ſalt; which, however, always ſmells volatile, though the colouring matter be in ever ſo great proportion. By diſtillation the whole inſtantly riſes, and nothing but pure water is left in the retort.

1187 Diſſolves magneſia alba.

Magneſia precipitated from Epſom ſalt by cauſtic volatile alkali, was diſſolved in the colouring matter by allowing them to ſtand together for ſeveral days in a warm cloſe bottle. On expoſure to the open air, the magneſia ſeparated from it by its ſuperior attraction for aerial acid, and formed on the ſurface of the water a pellicle like that of cream of tartar. This ſolution was likewiſe decompoſed by alkalies and lime-water.

1188 Very little terra ponderoſa.

The colouring matter diſſolves but a very ſmall quantity of terra ponderoſa, which may be afterwards precipitated by vitriolic and even by aerial acid.

1189 Diſſolves lime, but not clay.

Pure clay, or the baſis of alum, is not attacked by it. Lime is diſſolved in a certain quantity. The ſuperabundant portion ſhould be ſeparated by filtration; and as the liquor contains, beſides the combined lime, the portion which water itſelf is able to take up, in order to free it from this, preciſely the ſame quantity of water impregnated with aerial acid is to be added as is requiſite for precipitating an equal quantity of lime-water. The colouring matter, thus ſaturated with lime, is to be filtered again, and then to be preſerved in a well cloſed bottle to prevent the acceſs of fixed air. This ſolution is decompoſed by all the acids, and by the pure or cauſtic alkalies. By diſtillation the colouring matter riſes, and nothing but pure lime is left in the retort.

1190 The ſolution of lime the moſt proper for experiments on metals.

This ſolution of lime appears to our author to be ſo perfectly ſaturated, that he employed it in preference to any other in the experiments he made on metals, and which we are now about to relate.

1191 Silver, quickſilver, and iron precipitated by the colouring matter.

From the trials made by Mr Scheele, it appears that the colouring matter has no effect upon any metal or metallic ſolution, excepting thoſe of ſilver and quickſilver in nitrous acid, and that of iron in fixed air. The firſt is precipitated in a white powder: the ſecond in a black one; and the third aſſumes a ſea-green colour, which afterwards turns to blue.

1192 Its effects on metallic calces;

With metallic calces it produces the following phenomena. 1. Gold precipitated by aerated alkali becomes white. 2. The fixed air is diſengaged from a precipitate of ſilver with a ſlight effervescence. 3. Calx of mercury is diſſolved, and yields cryſtals by gentle evaporation. 4. The calx of copper precipitated by aerated alkali effervеſces, and aſſumes a faint citron colour. 5. Calx of iron precipitated from its ſolution in the vitriolic acid by the ſame alkali, effervеſces, and aſſumes a dark blue colour. 6. Precipitated cobalt ſhows ſome ſigns of effervеſcence, and changes into a yellowiſh brown colour. The other calces are not acted upon.

1193 On metallic ſolutions.

The precipitating liquor abovementioned, poured into metallic ſolutions, produces the following appearances by means of double elective attraction. 1. Gold is precipitated of a white colour, but by adding a ſuperabundant quantity of the precipitating liquor the calx is rediſſolved. The ſecond ſolution is colourleſs as water. 2. Silver is precipitated in form of a white ſubſtance of the conſiſtence of cheeſe; by adding more of the liquor the precipitate is rediſſolved, and the ſolution is not decompoſed either by ſal ammoniac or marine acid. 3. Corroſive ſublimate apparently undergoes no change, though it is in reality decompounded; the calx being diſſolved in the colouring matter. Mercury diſſolved in the nitrous acid without heat, is precipitated in form of a black powder. 4. The ſolutions of tin and biſmuth are precipitated, but the calx is not acted upon by the colouring matter. 5. The ſame effects are produced on the ſolution of butter of antimony, as well as on that of well dephlogiſticated calx of iron. 6. Blue vitriol is precipitated of a yellow citron colour: if more of the precipitating liquor be added, the precipitate is rediſſolved into a colourleſs liquor and a colourleſs ſolution of the ſame calx is likewiſe obtained by volatile alkali. On adding more of the ſolution of blue vitriol, the ſolution likewiſe diſappears, and the liquor aſſumes a green colour. Acids diſſolve a portion of this precipitate, and the remainder is white. The muriatic acid diſſolves the precipitate completely, but lets it fall again on the addition of water. 7. The ſolution of white vitriol yields a white precipitate, which is not rediſſolved by addition of the precipitating liquor, but is ſoluble in acids. Theſe ſolutions ſmell like the colouring matter, which may be ſeparated from them by diſtillation. 8. Green vitriol is precipitated firſt of a yellowiſh brown colour, which ſoon changes to green, and then becomes blue on the ſurface. Some hours afterwards the precipitate ſubſides to the bottom of the veſſels, and then the whole mixture turns blue; but on adding any acid the precipitate becomes inſtantly blue. If a very ſmall quantity of green vitriol be put into the precipitating liquor, the

the precipitate is entirely diſſolved, and the whole aſſumes a yellow colour. 7. Solution of cobalt lets fall a browniſh yellow precipitate, which is not diſſolved by adding more of the precipitating liquor, neither is it ſoluble in acids. By diſtillation the colouring matter goes over into the receiver.

1194
Inveſtigation of the conſtituent part of the colouring matter.

Laſtly, our author undertook an inveſtigation of the conſtituent parts of the colouring matter itſelf; and in this he ſucceeded in ſuch a manner as muſt do honour to his memory, at the ſame time that it promiſes to be a real and laſting improvement to ſcience, by ſhowing a method of preparing this valuable pigment without that nauſeous and horrid ingredient, blood, which is now uſed in great quantities for that purpoſe.—His firſt hint concerning this matter ſeems to have been taken from an obſervation of the air in his receiver accidentally taking fire from the neighbourhood of a candle. It burned without any exploſion, and he was able to inflame it ſeveral times ſucceſſively. Wiſhing to know whether any fixed air was contained in the colouring matter, he filled a retort half full of the liquor containing the colouring matter, and applying a receiver immediately after, gave the retort a briſk heat. As ſoon as the receiver was filled with thick vapours of the colouring matter, he disjoined it, and, inflaming the vapour by a little burning ſulphur introduced into the cavity, found that the air which remained threw down a precipitate from lime-water. "Hence (ſays he) it may be concluded, that the aerial acid (A) and phlogiſton exiſt in this colouring matter."

1195
Inflammability of the colouring matter.

1196
Aerial acid and phlogiſton ſuppoſed to exiſt in it.

1197
Pruſſian blue yields volatile alkali by diſtillation.

It has been aſſerted by ſeveral chemiſts, that Pruſſian blue by diſtillation always yields volatile alkali.—To determine this, Mr Scheele prepared ſome exceedingly pure from the precipitating liquor abovementioned and green vitriol; diſtilling it afterwards in a glaſs retort, to which he adapted a receiver containing a little diſtilled water. The operation was continued till the retort became red-hot. In the receiver was found the colouring matter and volatile alkali, but no oil; the air in the receiver was impregnated with aerial acid, and the ſame colouring matter; the reſiduum was very black, and obeyed the magnet. On ſubſtituting, inſtead of the Pruſſian blue, the precipitates of other metallic ſubſtances precipitated by the Pruſſian alkali, the reſults were: 1. The yellowiſh brown precipitate of cobalt yielded the very ſame products with Pruſſian blue itſelf; the reſiduum in the retort was black. 2. The yellow precipitate of copper took fire, and emitted, from time to time, ſparks during the diſtillation. It produced little colouring matter, but a greater quantity of aerial acid and volatile alkali than had been obtained by the former precipitates. A ſublimate aroſe in the neck of the retort, but in too ſmall a quantity to make any experiment; the reſiduum was reduced copper. 3. The precipitate of zinc yielded the ſame with Pruſſian blue. 4. That of ſilver yielded likewiſe volatile alkali and fixed air, but chiefly colouring matter; a ſublimate containing ſome ſilver aroſe into the neck of the retort; the reſiduum was reduced ſilver. 5. Calx of mercury cryſtallized by means of the colouring matter, yielded ſome of that matter, but ſcarce any mark of volatile alkali. Some mercury, with a portion of the original compound, aroſe in the neck of the retort.

1198
Appearances on diſtilling other precipitates thrown down by Pruſſian alkali.

1199
Ingredients contained in the colouring matter.

From theſe experiments Mr Scheele concluded, that the colouring matter of Pruſſian blue was compoſed of volatile alkali and an oily matter. He was confirmed in his conjecture, by obtaining Pruſſian blue from green vitriol and ſpirit of hartſhorn recently diſtilled on the addition of muriatic acid. The ſame product was obtained by means of the volatile ſpirit drawn from ox's blood; ſo that nothing now remained, but to imitate theſe natural proceſſes by artificially combining the two ingredients together. For this purpoſe he diſtilled a mixture of volatile ſalt and unctuous oil; a mixture of the ſame alkali with animal fat, and with oil of turpentine; a mixture of quick-lime, ſal ammoniac, and axunge, with others of a ſimilar kind; but in vain. He began therefore to conclude, that as long as the volatile alkali contained any water, it could not enter into an union ſufficiently intimate with the other principles to form the colouring matter; and finding alſo that the coal of blood, mixed with ſalt of tartar, yielded very good lixivium ſanguinis, he concluded that no oily matter was neceſſary for the ſucceſs of the experiment.

1200
Unſucceſsful attempts to prepare it artificially.

1201
True method of forming it.

Thus was our author led to make the following deciſive trials, which at once accompliſhed his purpoſe, and ſhowed the truth of the principles he had aſſumed. Three table-ſpoonfuls of charcoal powder were mixed with an equal quantity of alkali of tartar, and the mixture put into a crucible. A ſimilar mixture was put into another crucible, and both put into a fire, and kept red-hot for about a quarter of an hour. One of them was then taken out, and the contents thrown, while perfectly red-hot, into eight ounces of water. At the ſame time he put into the other quantity an ounce of ſal ammoniac in ſmall pieces, agitating the whole briſkly together, and taking care at the ſame time to puſh the ſal ammoniac down towards the bottom of the crucible, which he replaced in the fire. Obſerving in two minutes after, that no ammoniacal vapours aroſe, the whole maſs was thrown, when red-hot, into eight ounces of water. The former lixivium, into which no ſal ammoniac had been put, yielded no Pruſſian blue; but the latter ſhowed the ſame phenomena with the beſt lixivium ſanguinis, and produced a great quantity of blue. By mixing plumbago with the alkali inſtead of charcoal, a tolerable lixivium was obtained.

1202
Volatile alkali capable of uniting with phlogiſton and fixed alkali, ſo as to ſuſtain a great degree of heat.

"From theſe experiments (ſays Mr Scheele), it appears, that the volatile alkali is capable of uniting with the carbonaceous matter, after it has been ſubtilized by a ſtrong heat; that it thus acquires the remarkable property of combining ſo firmly with ſalt of tartar as to be able to ſuſtain the moſt violent degree of heat; and when this lixivium is diſſolved in water, there is obtained lixivium ſanguinis, as it is called.—It is now eaſy to explain what happens in the diſtillation

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(A) This reaſoning ſeems not to be ſufficiently concluſive; for late experiments have ſhown that inflammation is generally attended with the production of fixed air, which could not be proved to have an exiſtence either in the materials or common atmoſphere before.

1203 Appearances on diſtilling Pruſſian blue accounted for.

lation of Pruſſian blue, as well as that of the other abovementioned metallic precipitates.—In the diſtillation of Pruſſian blue, for inſtance, the calx of iron attracts a portion of phlogiſton from the colouring matter. The aerial acid being thus diſengaged, muſt go over into the receiver with the volatile alkali, which is ſet free at the ſame inſtant; but as the calx of iron in the heat of this diſtillation cannot unite with more phlogiſton, a portion of the colouring matter, not decompoſed, muſt likewiſe ariſe. If the calx of iron could combine with the whole of the phlogiſton, there would come nothing over into the reciever but aerial acid and volatile alkali. In order to prove this, I diſtilled a mixture of ſix parts of mangaueſe finely powdered, and one part of pulverized Pruſſian blue, and obtained nothing but aerated volatile alkali, without the leaſt mark of colouring matter."

1204 Colouring matter kept from riſing by mangaueſe.

1205 The colouring matter can ſeparate only mercury and ſilver from their ſolution in nitrous acid.

Mr Scheele further remarks, that this colouring matter may probably be obtained in an aerial form, though he had not been able to do ſo. It is alſo worth notice, that, excepting the ſolutions of ſilver and mercury in nitrous acid, the colouring matter of Pruſſian blue is not able to decompoſe any other by a ſingle elective attraction. Now, as we know that Pruſſian blue is not ſoluble in acids, it naturally follows, that the colouring matter has a greater affinity with iron than acids have, notwithſtanding there is no precipitation perceived when this matter is mixed with the ſolution of vitriol of iron. "It may not be eaſy (ſays Mr Scheele) to give a ſatisfactory explanation of this phenomenon."

1206 Nitre alkalized by iron.

Iron deflagrates with nitre, and renders the ſalt alkaline and cauſtic. A part of the iron is thus rendered ſoluble, along with the alkalized ſalt. A mixture of equal parts of iron filings and nitre, injected into a ſtrongly heated crucible, and, after the detonation, thrown into water, tinges the liquor of a violet or purpliſh blue colour. This ſolution, however, is not permanent. Though the liquor at firſt paſſes through a filter, without any ſeparation of the iron; yet, on ſtanding for a few hours, the metal falls to the bottom, in form of a brick-coloured powder. Volatile alkalies inſtantly precipitate the iron from this fixed alkaline ſolution.

1207 Iron filings and ſulphur take fire ſpontaneouſly.

Iron readily unites with ſulphur; and when combined with it, proves much eaſier of fuſion than by itſelf. A mixture of iron filings and ſulphur, moiſtened with water, and preſſed down cloſe, in a few hours ſwells and grows hot; and, if the quantity is large, burſts into flame.

By cementation with inflammable maters, iron imbibes a larger quantity of phlogiſton; and becomes much harder, leſs malleable, and more fuſible. It is then called *ſteel.* See METALLURGY, and STEEL.

§ 5. *LEAD.*

1208 Has very little tenacity.

LEAD is a pale or livid-white metal, ſoon loſing its brightneſs in the air, and contracting a blackiſh or greyiſh aſh-colour. It is the ſofteſt and moſt flexible of all metallic bodies; but not ductile to any great degree, either in the form of wire or leaf; coming far ſhort, in this reſpect, of all other metals. It has alſo the leaſt tenacity of all metallic bodies; a leaden wire of $\frac{1}{10}$ of an inch diameter being capable of ſupporting only 29$\frac{1}{4}$ pounds. Lead has, however, a conſiderable ſpecific gravity; loſing, when immerſed in water, between $\frac{1}{11}$ and $\frac{1}{12}$ of its weight. It is of all metals the moſt fuſible, excepting only tin and biſmuth. The plumbers caſt thin ſheets of lead upon a table or mould, covered with a woollen, and above this with a linen, cloth, without burning or ſcorching the cloths. The melted lead is received in a wooden caſe without a bottom; which being drawn down the ſloping table by a man on each ſide, leaves a ſheet of its own width, and more or leſs thin according to the greater or leſs celerity of its deſcent. For thick plates, the table is covered over with moiſtened ſand, and the liquid metal conducted evenly over it, by a wooden ſtrike, which bears on a ledge at each ſide.

1209 Sheet-lead.

1210 Advantages of milled lead precarious.

Some have preferred, for mechanic uſes, the milled lead, or flatted ſheets, to the caſt; as being more equal, ſmooth, and ſolid. But whatever advantage of this kind the milled ſort may appear to have at firſt, they are not found to be very durable. When the lead is ſtretched between the rollers, its cavities muſt neceſſarily be enlarged. The particles of metal that may be ſqueezed into them can have no union or adheſion with the contiguous particles; and of conſequence, muſt be liable, from bending, blows, jarrs, &c. to ſtart out again, and leave the maſs ſpongy and porous.

1211 Rendered ſonorous.

Lead yields the dulleſt and weakeſt ſound of all metallic bodies. Reaumer obſerves, that it is rendered ſonorous by caſting a ſmall quantity into a ſpherical or elliptical ſegment, as in the bottom of an iron-laddle; from hence he conjectures, that the ſound of the ſonorous metals might be improved for the bells of clocks, &c. by giving them a ſimilar form.

1212 Calcined.

Though this metal very ſoon loſes its luſtre, and tarniſhes in the air, it reſiſts much longer than iron or copper the combined action of air and water, before it is decompoſed or deſtroyed; and hence it is exceedingly uſeful for many purpoſes to which theſe metals can by no means be applied. When juſt become fluid, lead looks bright like quickſilver; but immediately contracts a variouſly coloured pellicle on the ſurface. If this is taken off, and the fire continued, a freſh pellicle will always be formed, till the metal is by degrees changed into a duſky powder or calx. The injection of a little fat, charcoal-powder, or other inflammable matter, prevents this change, and readily revives the calx into lead again. It is ſaid, that lead, recovered from its calces, proves ſomewhat harder and whiter than at firſt, as well as leſs ſubject to tarniſh in the air.

1213 Minium.

The blackiſh calx or aſhes of lead become of a very different appearance if the calcination is continued with a fire ſo moderate as not to melt them, and particularly if expoſed to flame. By this treatment it is ſaid that they become firſt yellow; then they are called *maſſicot* or *yellow lead.* This colour becomes gradually more and more intenſe, till at laſt the calx is of a deep red; and then is called *minium* or *red lead;* but it is certain, that by proper management this calx never becomes yellow, aſſuming a reddiſh colour from the beginning. Too great a heat makes it irrecoverably yellow. It can be more eaſily prepared without expoſure

expoſure to the flame. The degree of heat neceſſary for converting it into minium is between 600 and 700 of Fahrenheit.

1214 Litharge. If inſtead of keeping this calx in a continued moderate heat, it be ſuddenly fuſed, the matter then puts on a foliated appearance, changing to a dull kind of brick-colour when powdered, and is then called *litharge*. Moſt of this ſubſtance is produced by refining ſilver with lead (ſee Refining): and is of two kinds, white and red. Theſe two are diſtinguiſhed by the names of *litharge of gold*, and *litharge of ſilver*. The moſt perfect is that called *litharge of gold*: the pale ſort contains a conſiderable proportion of lead in its metallic ſtate; and even the higheſt coloured litharge is ſeldom free from a little metallic lead, diſcoverable and ſeparable by melting the maſs in a crucible; when the lead ſubſides to the bottom.

1215 Phenomena with other metals. Lead mingles in fuſion with all the metals except iron, with which it refuſes any degree of union as long as the lead preſerves its metallic form. On continuing the fire, the lead, ſcorifying or calcining, abſorbs the phlogiſtic principle of the iron, and conſequently promotes the calcination of that metal; both being at length reduced to calces. The fuſible calx of lead eaſily unites with the calx of iron, and both melt together into an opaque brown or blackiſh glaſs. Copper does not unite with melted lead till the fire is raiſed ſo high as to make the lead ſmoke and boil, and of a bright red heat. Pieces of copper, now thrown in, ſoon diſſolve and diſappear in the lead: the mixture, when cold, is brittle, and of a granulated texture. The union of theſe two metals is remarkably ſlight. If a mixture of copper and lead is expoſed to a fire no greater than that in which lead melts, the lead almoſt entirely runs off by itſelf; a ſeparation of which no other example is known. What little lead is retained in the pores of the copper, may be ſcorified, and melted out, by a fire conſiderably leſs than is ſufficient to fuſe copper. If any of the copper is carried off by the lead, it ſwims unmelted on the ſurface.

Gold and ſilver are both diſſolved by lead in a ſlight red heat. They are both rendered extremely brittle by the minuteſt quantity of this metal; though lead is rendered more ductile by a ſmall quantity of either of them. In cupellation, a portion of lead is retained by gold, but ſilver parts with it all. On the other hand, in its eliquation from copper, if the copper contains any of the precious metals, the ſilver will totally melt out with the lead, but the gold will not. The attraction of lead to copper, however ſlight, is greater than that of copper to iron: a mixture of copper and iron being boiled in melted lead, the copper is imbibed by the lead, and the iron thrown up to the top. Silver is in like manner imbibed from iron by lead; whilſt tin, on the contrary, is imbibed from lead by iron. If two mixtures, one of lead and tin, and another of iron and ſilver, be melted together, the reſult will be two new combinations, one of the tin with the iron at the top, the other with the lead and ſilver at the bottom: how carefully ſoever the matter be ſtirred and mixed in fuſion, the two compounds, when grown cold, are found diſtinct, ſo as to be parted with a blow.

1216 Soluble in alkalies and in oils. This metal is ſoluble in alkaline lixivia and expreſſed oils. Plates of lead boiled in alkaline lixivia, have a ſmall part diſſolved, and a conſiderable quantity corroded: the ſolution ſtains hair black. Lead, fuſed with fixed alkaline ſalts, is in part corroded into a dark-coloured ſcoria, which partially diſſolves in water. Expreſſed oils diſſolve the calces of lead, by boiling, in ſuch large quantities as to become thick and conſiſtent: hence plaſters, cements for water-works, paint for preſerving nets, &c. Acids have a greater affinity with leads than oils have. If the common plaſter, compoſed of oil and litharge, be boiled in diſtilled vinegar, the litharge will be diſſolved, and the oil thrown up to the top. The oil thus recovered, proves ſoluble like eſſential oils in ſpirit of wine; a phenomenon firſt taken notice of by Mr Geoffroy.

§ 6. *Tin*.

The colour of this metal reſembles ſilver, but is ſomewhat darker. It is ſofter, leſs elaſtic, and ſonorous, than any other metal except lead. When bent backwards and forwards, it occaſions a crackling ſound, as if torn aſunder. It is the lighteſt of all the malleable metals, being little more than ſeven times ſpecifically heavier than water. The tenacity of its parts alſo is not very conſiderable; a tin wire of $\frac{1}{10}$ of an inch diameter being able to ſupport only $49\frac{1}{2}$ pounds.

1217 Capable of being beat into thin leaves. Tin is commonly reckoned the leaſt ductile of all metals except lead; and certainly is ſo, in regard to ductility into wire, but not in regard to extenſibility into leaves. Theſe two properties ſeem not to be ſo much connected with one another as is generally imagined. Iron and ſteel may be drawn into very fine wire, but cannot be beat into leaves. Tin, on the other hand, may be beat into very thin leaves, but cannot be drawn into wire: gold and ſilver poſſeſs both properties in a very eminent degree; whilſt lead, notwithſtanding its flexibility and ſoftneſs, cannot be drawn into fine wire, or beat into thin leaves. It melts the moſt eaſily of all the metals; about the 430th degree of Fahrenheit's thermometer. Heated till almoſt ready to melt, it becomes ſo brittle that large blocks may be eaſily beat to pieces by a blow. The purer ſort, from its facility of breaking into long ſhining pieces, is called *grain-tin*. Melted, and nimbly agitated at the inſtant of its beginning to congeal, it is reduced into ſmall grains or powder.

1218 Calcined. With the heat neceſſary for fuſion, it may alſo be calcined; or at leaſt ſo far deprived of its phlogiſton as to appear in the form of a grey calx, which may be entirely reduced to tin by the addition of inflammable matter. The calcination of tin, like that of lead, begins by the melted metal loſing its brightneſs, and contracting a pellicle on its ſurface. If the fire is raiſed to a cherry-red, the pellicle ſwells and burſts, diſcharging a ſmall bright flame of an arſenical ſmell. By longer continuance in the fire, the metal is converted firſt into a greyiſh, and then into a perfectly white calx, called *putty*, which is uſed for poliſhing glaſs and other hard bodies.

The calx of tin is the moſt refractory of all others. Even in the focus of a large burning mirror, it only ſoftens a little, and forms cryſtalline filaments. With glaſs of biſmuth, and the ſimple and arſenicated glaſſes of lead, it forms opaque milky compounds. By this property it is fitted for making the baſis of the imperfect glaſſes called *enamels*; (ſee GLASS and ENAMEL). The author of the Chemical Dictionary relates, "that having expoſed very pure tin, ſingly, to a fire as ſtrong as that of a glaſs-houſe furnace, during two hours, under a muffle, in an uncovered teſt, and having then examined it, the metal was found covered with an exceedingly white calx, which appeared to have formed a vegetation; under this matter was a reddiſh calx, and an hyacinthine glaſs; and laſtly, at the bottom was a piece of tin unaltered. The experiment was ſeveral times repeated with the ſame ſucceſs."

1219 Affinity of tin with arſenic.

Nitre deflagrates with tin, and haſtens the calcination of this as well as of other imperfect metals. The vapours which riſe from tin, by whatever method it is calcined, have generally an arſenical ſmell. Tin melted with arſenic falls in great part into a whitiſh calx: the part which remains uncalcined proves very brittle, appears of a white colour, and a ſparkling plated texture, greatly reſembling zinc. The arſenic is ſtrongly retained by the tin, ſo as ſcarcely to be ſeparable by any degree of fire; the tin always diſcovering, by its augmentation in weight, that it holds a portion of arſenic, though a very intenſe fire has been uſed. Hence, as the tin ores abound in arſenic, the common tin is found alſo to participate of that mineral.

1220 Arſenic ſeparable from tin.

Henckel diſcovered a method of ſeparating actual arſenic from tin; namely, by ſlowly diſſolving the tin in eight times its quantity of an aqua-regia made with ſal ammoniac, and ſetting the ſolution to evaporate in a gentle warmth: the arſenic begins to concrete whilſt the liquor continues hot, and more plentifully on its growing cold, into white cryſtals. M. Margraaf, in the Berlin Memoirs for 1746, has given a more particular account of this proceſs. He obſerves, that the white ſediment which at firſt ſeparates during the diſſolution, is chiefly arſenical; that Malacca tin, which is accounted one of the pureſt ſorts, yielded no leſs than $\frac{1}{4}$th its weight of arſenical cryſtals; that ſome ſorts yielded more; but that tin extracted from a particular kind of ore, which contained no arſenic, afforded none. That the cryſtals were truly arſenical, and appeared from their being totally volatile; from their ſubliming (a little fixed alkaline ſalt being added to abſorb the acid) into a colourleſs pellucid concrete; from the ſublimate, laid on a heated copper-plate, exhaling in fumes of a garlic ſmell; from its ſtaining the copper white: and from its forming, with ſulphur, a compound ſimilar to the yellow or ſulphurated arſenic. He found that the arſenic was ſeparable alſo by means of mercury; an amalgam of tin being long triturated with water, and the powder which was waſhed off committed to diſtillation, a little mercury came over, and bright arſenical flowers aroſe in the neck of the retort.

1221 Dr Lewis's obſervation.

Dr Lewis obſerves, that the crackling noiſe of tin in bending may poſſibly ariſe from its arſenic; as thoſe operations which are ſaid to ſeparate arſenic from the metal, likewiſe deprive it of this property.

Tin may be allayed, in any proportion, with all metals by fuſion: but it abſolutely deſtroys their ductility, and renders them brittle, as in bell-metal; whence this metal has obtained the name of *diabolus metallorum*.

Mercury or quickſilver.

1222 Injurious to other metals.

Iron is diſſolved by tin in a heat far leſs than that in which iron itſelf melts; the compound is white and brittle. Iron added to a mixture of lead and tin, takes up the tin, leaving the lead at the bottom; and in like manner, if lead, tin, and ſilver, are melted together, the addition of iron will abſorb all the tin, and the tin only. Hence an eaſy method of purifying ſilver from tin.

1223 Not liable to ruſt.

Tin notwithſtanding it is, like lead, ſoon deprived of its luſtre by expoſure to the air, is nevertheleſs much leſs liable to ruſt than either iron, copper, or lead; and hence is advantageouſly uſed for covering over the inſides of other metalline veſſels. The amalgam of mercury and tin is employed to cover one of the ſurfaces of looking-glaſſes; by which they are rendered capable of reflecting the rays of light.

1224 Aurum moſaicum.

The amalgam alſo, mixed with ſulphur and ſal ammoniac, and ſet to ſublime, yields a ſparkling gold-coloured ſubſtance called *aurum moſaicum*; which is ſometimes uſed as a pigment. This preparation is commonly made from quickſilver and tin, of each two parts, amalgamated together; and then thoroughly mixed with ſulphur and ſal ammoniac, of each one part and a half. The mercury and ſulphur unite into a cinnabar, which ſublimes along with the ſal ammoniac; and, after ſublimation, the aurum moſaicum remains at the bottom.

Sulphur may be united with tin by fuſion; and forms with it a brittle maſs, more difficultly fuſible than pure tin. Sulphur has, in this reſpect, the ſame effect upon tin as upon lead. The allay of tin leſſens the fuſibility of theſe very fuſible metals, while it increaſes the fuſibility of other difficultly fuſible metals, as iron and copper.

§ 7. *MERCURY or QUICKSILVER.*

1225 Heavier in winter than in ſummer.

MERCURY is a fluid metallic ſubſtance, of a bright ſilver colour, reſembling lead or tin when melted; entirely void of taſte and ſmell; extremely diviſible; and congealable only in a degree of cold very difficultly produced, in this country, by art (ſee COLD and CONGELATION). It is the moſt ponderous of all fluids, and of all known bodies, gold and platina excepted; its ſpecific gravity being to that of water nearly as 14 to 1. It is found to be ſpecifically heavier in winter than in ſummer by 25 grains in 11 ounces

Neither air nor water, nor the united action of theſe two, ſeem to make any impreſſion upon mercury: nor is it more ſuſceptible of ruſt than the perfect metals. Its ſurface, nevertheleſs, is more quickly tarniſhed than gold or ſilver; becauſe the duſt which floats in the air, quickly ſeizes on its ſurface. The watery vapours alſo, which float in the air, ſeem to be attracted by mercury.

1226 Purification.

From theſe extraneous matters, which only ſlightly adhere to it, mercury may be eaſily cleanſed by paſſing it through a clean new cloth, and afterwards heating it: but if mixed with any other metal, no ſeparation can be effected without diſtillation. In this proceſs, a ſmall portion of ſome of the metals generally ariſes along with the mercury. Thus, quickſilver

1227 Curious mercuries by Boyle.

ver diſtilled from lead, biſmuth, or tin, appears leſs bright than before; ſtains paper black; ſometimes exhibits a ſkin upon the ſurface; and does not run freely, or into round globules. Mr Boyle relates, that he has obſerved the weight of mercury ſenſibly increaſed by diſtillation from lead, and this when even a very moderate fire was made uſe of. By amalgamation with ſtellated regulus of antimony, and then being diſtilled after a few hours digeſtion, mercury is ſaid to become, by a few repetitions of the proceſs, more ponderous, and more active. The animated, or philoſophic mercuries of ſome of the alchemiſts, are ſuppoſed to have been mercury thus prepared. By the ſame, or ſimilar proceſſes, ſeem to have been obtained the curious mercuries which Boyle declared he was poſſeſſed of, and made himſelf; which were "conſiderably heavier in ſpecie than common quickſilver,—diſſolved gold more readily,—grew hot with gold, ſo as to be offenſive to the hand, and elevated gold in diſtillation." When quickſilver is to be diſtilled, it is proper to mingle it with a quantity of iron-filings; which have the property of making it much brighter than it can be otherwiſe obtained, probably by furniſhing phlogiſton.

1228 Mercurius precipitatus per ſe.

1229 Mercury unalterable by a gentle heat;

By digeſtion in a ſtrong heat for ſeveral months, mercury undergoes a conſiderable alteration, changing into a powder, at firſt aſh-coloured, afterwards yellow, at length of a bright red colour, and an acrid taſte; and is then called *mercurius precipitatus per ſe.* In this laſt ſtate it proves ſimilar to the red precipitate, prepared from a ſolution of mercury in nitrous acid. This calx proves leſs volatile in the fire than the mercury in its fluid ſtate. It ſupports for ſome time even a degree of red heat. In the focus of a burning mirror, it is ſaid to melt into glaſs when laid upon a piece of charcoal, and to revive into running mercury before it exhales. Evaporated by common fire, it leaves a ſmall portion of a light brown powder; which, Boerhaave relates, bore a blaſt-heat; ſwelled into a ſpongy maſs; formed with borax a vitreous friable ſubſtance; but vaniſhed in cupellation. By a long continued digeſtion in a gentle heat, mercury ſuffers little change. Boerhaave digeſted it in low degrees of heat, both in open and cloſe veſſels, for 15 years together, without obtaining any other reward for his labour than a ſmall quantity of black powder; which, by trituration, was quickly revived into running mercury. Conſtant triture, or agitation, produce a change ſimilar to this in a ſhort time. Both the black and red powders, by bare expoſure to a fire ſufficient to elevate them, return into fluid mercury. The red powder has been revived by ſimply grinding it in a glaſs mortar.

1230 Or by diſtillation.

1231 Exploſion by the vapours of mercury.

In like manner, quickſilver remains unchanged by diſtillation. Boerhaave had the patience to diſtil 18 ounces of mercury upwards of 500 times over, without obſerving any other change than that its fluidity and ſpecific gravity were a little increaſed, and that ſome grains of a fixed matter remained. The vapours of mercury, like thoſe of all other volatile bodies, cauſe violent exploſions if confined. Mr Hellot gives an account of his being preſent at an experiment of this kind: a perſon pretending to fix mercury, had incloſed it in an iron box cloſely welded. When the mercury was heated, it burſt the box, and diſſipated in inviſible vapours.

1232 Amalgamated with different ſubſtances.

Mercury diſſolves or unites with all metallic bodies, except three, *viz.* iron, arſenic, and nickel: in ſome caſes it will abſorb metals, particularly gold and ſilver, from their ſolutions in acids or alkalies; but does not act upon any metal when combined with ſulphur, nor on precipitates made by alkalies, nor on calces by fire. Whatever metal it is united with, it conſtantly preſerves its own white colour. It unites with any proportion of thoſe metallic ſubſtances with which it is capable of being combined; forming, with different quantities, amalgams of different degrees of conſiſtence. From the fluid ones, greateſt part of the quickſilver may be ſeparated by colature. Biſmuth is ſo far attenuated by mercury, as to paſs through leather with it in conſiderable quantity. It alſo promotes the action of quickſilver upon lead to a great degree; ſo that mercury united with $\frac{1}{4}$, $\frac{1}{8}$, or $\frac{1}{12}$ its weight of biſmuth, diſſolves maſſes of lead in a gentle warmth, without the agitation, triture, comminution, or melting heat neceſſary to unite pure mercury with lead. From theſe properties, this ſolution of biſmuth in mercury becomes a proper ſolvent for pieces of lead lodged in the human body.

1233 Separation of the amalgamated metal.

On triturating or digeſting amalgams for a length of time, a blackiſh or duſky-coloured powder ariſes to the ſurface, and may be readily waſhed off by water. Some of the chemiſts have imagined, that the amalgamated metal was here reduced to its conſtituent parts: but pure mercury is by itſelf reducible to a powder of the ſame kind; and the metallic particles in this proceſs, united with the mercury, are found to be no other than the metal in its entire ſubſtance. Some metals ſeparate more difficultly than others; gold and ſilver the moſt ſo. Boerhaave relates, that if the powder which ſeparates from an amalgam of lead be committed to diſtillation with vinegar in a tall veſſel, the mercury will ariſe before the vinegar boils; that, by a like artifice, quickſilver may be made to diſtil in a leſs degree of heat than that of the human body: but Dr Lewis, though he made many trials, was never able to ſucceed.

1234 Becomes fixed by amalgamation with gold.

By amalgamation with gold, mercury may become exceedingly fixed; ſo as not to be diſſipable by the greateſt heat. Concerning this, Dr Brandt relates the following curious experiment: "Having amalgamated fine gold with a large proportion of quickſilver, and ſtrained off the ſuperfluous mercury, he digeſted the amalgam in a cloſe ſtopped veſſel for two months with ſuch a degree of heat, that a part of the quickſilver ſublimed into the neck of the glaſs. The matter being then ground with twice its weight of ſulphur, and urged with a gradual fire in a crucible, a ſpongy calx remained; which being melted with borax, and afterwards kept in fuſion by itſelf for half an hour, in a very violent fire, ſtill retained ſo much of the quickſilver as to become brittle under the hammer, and appear internally of a leaden colour. The metal being again amalgamated with freſh mercury, the amalgam again ground with ſulphur, and expoſed to an intenſe fire, a ſpongy calx remained as before. This calx being digeſted in two or three freſh parcels of aqua-regia, a ſmall portion of whitiſh matter remained at laſt undiſſolved. The paper which covered the cylindrical glaſs wherein the digeſtion was performed, contracted, from the vapours, a deep-green circular ſpot in the middle, with a ſmaller one at the ſide; whereas the aqua-regia digeſted in the ſame manner by itſelf, or with gold, or with mercury, gave no ſtain. The firſt ſolution, on the addition of oil of tartar *per deliquium*, grew red as blood; on ſtanding, it depoſited, firſt, a little yellow calx, like aurum fulminans; afterwards, a bright matter like fine gold; and at laſt, a paler precipitate, inclining to green; its own deep red colour and tranſparency remaining unchanged. Being now committed to diſtillation, a colourleſs liquor aroſe; and the reſiduum, perfectly exſiccated, yielded, on edulcoration, a yellow calx of gold; which the alakaline lixivium had been unable to precipitate. The ſecond ſolution turned green on the admixture of the alkaline liquor, and let fall a white precipitate, which turned black and brown. The ſeveral precipitates were calcined with twice their weight of ſulphur, and then melted with four times their quantity of flint, and twelve of pot-aſh, in a fire vehemently excited by bellows. The ſcoria appeared of a golden colour, which, on pulverization and edulcoration, vaniſhed. At the bottom was a regulus, which looked bright like the pureſt gold; but was not perfectly malleable. Broken, it appeared internally white; and the white part amounted to at leaſt one-third its bulk Beſides this lump of metal, there were ſeveral others, white like ſilver, and ſoft as lead."

1235 Suppoſed to be convertible into water.

In Wilſon's chemiſtry, we have a proceſs for converting quickſilver into water, by dropping it by little and little into a tall iron veſſel, heated almoſt to a white heat in the bottom. Over the mouth of this veſſel were luted ſeven aludels; and on the top, a glaſs alembic head, with a beak, to which was fitted a receiver. The mercury was put in ſo ſlowly, that it required 16 hours for one pound. Every time that a little quantity of mercury was put in, it made a great noiſe, filling the aludel's head and receiver with white fumes. When the veſſels were cooled, a little water was found in each of the receivers, and in the firſt and ſecond ſome grains of crude mercury. The whole quantity amounted to 13 ounces and 6 drachms; which was expected to prove a powerful ſolvent of gold and ſilver: but, on trial, was found to be in no reſpect different from common water. On this experiment Dr Lewis has the following note.

1236 Dr Lewis's detection of the falſehood of this proceſs.

"The poſſibility of converting mercury into water, or at leaſt of obtaining a great quantity of water from mercury, has not only been believed by ſeveral great men in the chemical art, but ſome have even ventured to aſſert that they have actually made this change. Yet, neverthleſs, they have delivered the hiſtory of this affair with ſuch marks, as ſeem to make the reality of the change extremely doubtful. Mr Boyle (in his tract *of the producibleneſs of Chemical Principles*, annexed to *Scept. Chemiſt.* p. 235) ſays, "that he once obtained water from mercury without additament, without being able to make the like experiment ſucceed afterwards." M. Le Febure, who is generally looked upon as an honeſt practitioner, directs a proceſs ſimilar to that above (Wilſon's), for obtaining of this mercurial water. But it is to be ſuſpected, as Mr Hales very well obſerves (in his *Statical Experiments*, p. 200.), that Mr Boyle and others were deceived by ſome unheeded circumſtance, when they thought they obtained a water from mercury, which ſhould ſeem rather to have ariſen from the lute and earthen veſſels made uſe of in the diſtillation: for Mr Hales could not find the leaſt ſign of any moiſture upon diſtilling mercury in a retort made of an iron gun-barrel, with an intenſe degree of heat; although he frequently cohobated the mercury which came over into the recipient. "In a courſe of chemical experiments, I repeated Mr Hales's proceſs, and urged the mercury, which was let fall by little and little, through an aperture made in the gun-barrel, with a moſt intenſe degree of heat, without obtaining any water; but it being ſuſpected by a byſtander, that the mercury in this experiment came over before it had been ſufficiently acted upon by the fire, by reaſon of the lowneſs of the neck of the diſtilling inſtrument, the experiment was varied in the following manner. Sixteen ounces of mercury were heated in a crucible, in order to evaporate any moiſture that might have been accidentally mixed with it; and an iron gun-barrel of four feet in length, being placed perpendicularly in a good furnace, and a glaſs-head and recipient fitted to its upper part, the mercury was let fall by little and little into the barrel, and the fire urged with bellows. After each injection, the mercury made a conſiderable noiſe and ebullition, and aroſe into the head; where it ſoon condenſed and trickled down, in the common form of running mercury, into the recipient, without the leaſt perceptible appearance of any aqueous humidity."

1237 How to amalgate with regulus of antimony.

Mercury is difficultly amalgamated with regulus of antimony and copper; for which ſome particular manœuvres are required. Two of Dr Lewis's receipts for uniting quickſilver with copper, we have already given (n° 1153.): with regulus of antimony, mercury, he ſays, may be perfectly united, by pouring a ſmall ſtream of melted regulus into a conſiderable portion of mercury, made almoſt boiling hot. Another method directed by Henckel, is to put mercury into an iron mortar along with ſome water, and ſet the whole over the fire. When the water boils, a third or fourth part of melted regulus is to be poured in, and the maſs ground with a peſtle, till the amalgam is completed. The uſe of the water, as Dr Lewis obſerves, is to hinder the mercury from flying off by the heat of the regulus: but as the two are by this means not put together in ſo hot a ſtate, the union is more difficult, and leſs perfect. The loſs of the mercury, in the firſt proceſs, may be prevented by uſing a large veſſel, and covering it with a perforated iron-plate, through the hole in which the regulus is to be poured. This method is likewiſe applicable to the amalgamation of copper.

With ſulphur, mercury unites very readily, forming by trituration, or ſimple fuſion, a black powder or maſs, called *Ethiops mineral*; which, by careful ſublimation, becomes the beautiful red pigment called *vermillion*. (See SULPHUR, ſect. iv.).

1238 Preparations of mercurius dulcis in the moiſt way.

The extenſive uſe of mercurius dulcis in medicine has rendered it an object to chemiſts to find out ſome method of preparing it with leſs expence and trouble, and with more certainty of its effects, than it can be by the methods hitherto mentioned. This is now accompliſhed

pliſhed through the induſtry of Mr Scheele, to whom chemiſtry in general has been ſo much obliged. His method is as follows:

"Take half a pound of quickſilver, and as much pure common aquafortis. Pour it into a ſmall cucurbit with a pretty long neck, ſtop the mouth with a little paper, and put it into warm ſand. Some hours afterwards, when the acid appears no longer to act upon the quickſilver, the fire is to be augmented ſo as to make the ſolution nearly boil. This heat is to be continued for three or four hours, and the veſſel now and then to be ſhaken. Towards the end, regulate the heat in ſuch a manner that the ſolution ſhall gently boil for a quarter of an hour. In the mean time, diſſolve $4\frac{1}{2}$ ounces of pure common ſalt in ſix or eight pounds of water; pour this ſolution, ſtill boiling, into a glaſs veſſel, and immediately afterwards mix with it the abovementioned ſolution of quickſilver, which alſo muſt be boiling, in ſmall quantities at a time, with conſtant agitation. When the precipitate has ſettled, decant off the clear liquor, and pour hot water again on the precipitate, with which it is to be edulcorated till the water ſtanding upon it ſhall be entirely taſteleſs. Put the whole, obtained by theſe means, together, filter and dry it in a mild heat."

1239 How to obtain a perfectly ſaturated ſolution of quickſilver.

On this proceſs it is remarked, that when the quickſilver no longer effervesces with the acid, one would imagine that a ſaturation had taken place. But this is far from being the caſe. By increaſing the heat the ſolution is ſtill able to diſſolve a great quantity; with this difference, however, that, whereas the quickſilver in the beginning is calcined, a great deal of it afterwards, in a metallic form, is diſſolved, as appears from this, that not only no more elaſtic vapours aſcend; but alſo, that with fixed and volatile cauſtic alkalies, a black precipitate is obtained; otherwiſe, when the ſolution contains only calcined quickſilver, the precipitate is yellow. If the black precipitate be gently diſtilled, quickſilver ariſes, and there remains a yellow powder, which is that part of the metal that was calcined by the nitrous acid. The fire muſt at any rate be augmented, in order to keep the mercurial calx diſſolved, the compound of this metal and nitrous acid being extremely apt to cryſtallize even in the heat. There commonly remains ſome undiſſolved quickſilver; but it is always better to take too much than too little; for the more metal the mercurial ſolution contains, the more mercurius dulcis is obtained at laſt. The quantity here mentioned uſually produces $8\frac{1}{2}$ ounces of mercurius dulcis. The mercurial ſolution muſt be cautiouſly poured into that of ſea-ſalt, that no mercury may follow. Two ounces of ſalt would be ſufficient for the precipitation of all the quickſilver; but when ſo ſmall a quantity is uſed, it may eaſily happen, that ſome ſuperabundant corroſive ſublimate may adhere to the precipitate, which water alone is incapable of entirely ſeparating. Among other advantages this method of making mercurius dulcis poſſeſſes, it is none of the leaſt, that the powder is much finer than any to which it can be reduced in the common way by trituration, however long continued.

§ 8. *Zinc.*

This is a ſemimetal of a bluiſh white colour. It is the leaſt brittle of any of the ſemimetals; and when amply ſupplied with phlogiſton, which may be done by treating it in cloſe veſſels with inflammable matters, it poſſeſſes a ſemiductility, by which it may be flattened into thin plates. When broken, it appears formed of many flat ſhining plates or facets, which are larger when ſlowly than when haſtily cooled. When heated, it is very brittle; and crackles like tin, only londer, when bent. Expoſed to the air, it contracts in length of time a yellowiſh ruſt. 1240 Deflagration. Its ſpecific gravity, according to Dr Lewis, is to that of water as $7\frac{1}{10}$ to 1. It begins to melt as ſoon as red-hot; but does not flow thin till the fire is raiſed to a white heat. Then the zinc immediately begins to burn with an exceedingly bright and beautiful flame. Kept juſt in fuſion, it calcines ſlowly; not only on the upper ſurface, but likewiſe round the ſides, and at the bottom of the crucible. If ſeveral pieces are juſt melted together, the maſs, when grown cold, may be broken into the ſame number; their union being prevented by a yellowiſh calx, with which each piece is covered over. M. Malouin relates, in the French Memoirs for 1742, that a quantity of zinc being melted ſix times, and the fuſion continued fifteen hours each time, it proved, on every repetition, harder, more brittle, leſs fuſible, and leſs calcinable; that after the two firſt fuſions, its colour was grey; after the third, brown; and after the fourth, black; that the fifth rendered it of a ſlate-blue; and the ſixth of a clear violet.

1241 Flowers of zinc.

So violent is the deflagration of zinc, that the whole of its calx is ſublimed by it, in the form of light flocks of wool; which, however, are eaſily reduced to a fine powder. Theſe are uſed in medicine, and reckoned an excellent remedy in epileptic caſes. When once ſublimed, they are by no means capable of being elevated again by the moſt violent heat. In a heat far greater than that in which they firſt aroſe, they ſuffer no alteration; in a very vehement one, they melt, according to Henckel, into a ſemiopaque green glaſs. Vitrified with borax, they give a grey, or browniſh, glaſs. From the brightneſs of the flame of burning zinc, and the garlic ſmell which it is ſaid to emit, ſome have concluded that zinc contained the phoſphorine acid; which, from ſome other circumſtances, is not altogether improbable.

1242 Dr Lewis's method of reducing them.

The flowers of zinc have been thought very difficultly, or not at all, reducible to their metallic form by an addition of phlogiſton. But Dr Lewis obſerves, that this difficulty proceeds not from their unfitneſs to be reſtored into the form of zinc, but from the volatility of the ſemimetal, which occaſions its being diſſipated in fumes, if the common methods are made uſe of. All calces, theſe of iron excepted, require a greater heat for their fuſion than that in which the metal itſelf melts; and as a full melting heat is the greateſt that zinc can ſuſtain, it burns and calcines the inſtant of its revival, if the air is admitted; and in cloſe veſſels eſcapes, in part at leaſt, through their pores. On mixing flowers of zinc with powdered charcoal, and urging them with a ſtrong fire in a crucible, a deflagration and freſh ſublimation enſue: ſufficient marks that the zinc has been reduced to its metallic form; for as long as it remains in the ſtate of calx, neither of theſe effects can happen. If the veſſel is ſo contrived

trived as to exclude the air, and at the ſame time to allow the reviving ſemimetal to run off from the vehemence of the heat, into a receiver kept cool, the zinc will there concrete, and be preſerved in its metallic ſtate. It is ſtill more effectually detained by certain metallic bodies, as copper, or iron; with which the zinc, when thus applied, unites more readily and perfectly than it can be made to do by any other means.

1243 Oil from flowers of zinc by Mr Homberg.

Homberg pretended to obtain an oil from the flowers of zinc, by diſſolving them in diſtilled vinegar, and then diſtilling the ſolution in a glaſs retort. At firſt a quantity of phlegm aroſe; then the ſuperfluous acid; and at laſt an empyreumatic oil. This laſt, which Homberg imagined to proceed from the flowers of zinc, Newmann very juſtly attributes to the diſtilled vinegar.

1244 Another by Mr Hellot.

An oil of another kind was obtained by Mr Hellot from the above ſolution, by digeſting the aſh-coloured reſiduum, which remained after the diſtillation, with the acidulous phlegm which came over, for eight or ten days; diſtilling the tincture to dryneſs; and repeating the extraction with the diſtilled liquor, till the quantity of dry extract thus obtained was very conſiderable. This reſin-like matter, diſtilled in a retort with a ſtronger fire, yielded a yellowiſh liquor, and a white ſublimate. The liquor diſcovered no mark of oil; but, upon being paſſed upon the ſublimate, immediately diſſolved it, and then exhibited on the ſurface ſeveral drops of a reddiſh oil. Some of this oil was taken up on the point of a pencil, and applied to gold and ſilver-leaf. In twenty-four hours the parts touched appeared, in both, equally diſſolved.

1245 Zinc with other metals.

Zinc does not unite in fuſion with biſmuth, or the ſemimetal called *nickel*. It unites difficultly with iron; leſs ſo with copper; eaſier with the other metals. It renders iron or copper more eaſily fuſible; and, like itſelf, brittle whilſt hot, though conſiderably malleable when cold. 1246 Materials for ſpecula. It brightens the colour of iron almoſt into a ſilver hue, and changes that of copper into a yellow or gold colour. It greatly debaſes the colour of gold; and renders near an hundredth part of that moſt ductile metal brittle and untractable. A mixture of equal parts of each is very hard, white, and bears a fine poliſh; hence it is propoſed by Mr Hellot for making ſpecula. It is not ſubject to ruſt or tarniſh in the air, like thoſe metals whoſe baſis is copper. It improves the colour and luſtre of lead and tin, renders them firmer, and conſequently fitter for ſeveral mechanic uſes. Tin, with a ſmall proportion of zinc, forms a kind of pewter. Lead will bear an equal weight, without loſing too much of its malleability. Maoluin obſerves, that arſenic, which whitens all other metals, renders zinc black and friable; that when the mixture is performed in cloſe veſſels, an agreeable aromatic odour is perceived on opening them; that zinc amalgamated with mercury, and afterwards recovered, proves whiter, harder and more brittle than before, and no longer crackles on being bent.

1247 Deflagration of zinc with other metals.

Mixtures of zinc with other metals, expoſed to a ſtrong fire, boil and deflagrate more violently than zinc by itſelf. Some globules of the mixture are uſually thrown off during the ebullition, and ſome part of the metal calcined and volatilized by the burning zinc: hence this ſubſtance has been called *metallic nitre*. Gold itſelf does not entirely reſiſt its action. It very difficultly volatilizes copper; and hence the ſublimates obtained in the furnaces where braſs is made, or mixtures of copper and zinc melted, are rarely found to participate of that metal. 1248 Cannot be united with ſulphur. On melting copper and zinc ſeparately, and then pouring them together, a violent detonation immediately enſues, and above half the mixture is thrown about in globules.

Zinc does not unite in the leaſt with ſulphur, or with crude antimony, which ſcorify all other ſubſtances except gold and platina; nor with compoſitions of ſulphur and fixed alkaline ſalts, which diſſolve gold itſelf. With nitre it deflagrates violently. Its flowers do not ſenſibly deflagrate; yet alkalize double their weight of the ſalt more readily than the zinc itſelf. 1249 Nitre alkalized by flowers of zinc. The alkaline maſs appears externally greeniſh, internally of a purple colour. It communicates a fine purple to water, and a red to vinegar. The acetous tincture inſpiſſated, leaves a tenacious ſubſtance which ſoon runs in the air into a dark red cauſtic liquor, the alkaheſt of ſome of the pretended adepts.

§ 9. *BISMUTH.*

THIS ſemimetal, called alſo *tin-glaſs*, and by ſome naturaliſts *marcaſita officinarum*, is ſomewhat ſimilar to the regulus of antimony. It appears to be compoſed of cubes formed by the application of plates upon each other. Its colour is leſs white than that of regulus of antimony; and has a reddiſh tinge, particularly when it is expoſed to the air. In ſpecific gravity it approaches to ſilver; being nearly ten times heavier than water. It has no degree of malleability; breaking under the hammer, and being reducible by trituration to fine powder. It melts a little later than tin, and ſeems to flow the thinneſt of all metallic ſubſtances. Biſmuth is ſemivolatile, like all other ſemimetals. 1250 Convertible into litharge and glaſs. When expoſed to the fire, flowers riſe from it; it is calcined; and converted into a litharge and glaſs nearly as lead is; (See GLASS). It may even be employed, like that metal, in the purification of gold and ſilver by cupellation. (See REFINING). When in fuſion, it occupies leſs volume than in its ſolid ſtate: a property peculiar to iron among the metals, and biſmuth among the ſemimetals. It emits fumes in the fire as long as it preſerves its metallic form; when calcined or vitrified, it proves perfectly fixed.

1251 Promotes the fuſion of all the metals,

Biſmuth mingles in fuſion with all the metalline ſubſtances, except regulus of cobalt and zinc. The addition of nickel or regulus of antimony, renders it miſcible with the former, though not with the latter. It greatly promotes the tenuity as well as facility of the fuſion of all thoſe metals with which it unites. It whitens copper and gold, and improves the colour of ſome of the white metals: mixed in conſiderable quantity; it renders them all brittle, and of a flaky ſtructure like its own. If mixed with gold or ſilver, a heat that is but juſt ſufficient to melt the mixture, will preſently vitrify a part of the biſmuth; which, having then no action on thoſe perfect metals, ſeparates, and glazes the crucible all round.

§ 10. Regulus of Antimony.

1252 Appearance of a ſtar on its ſurface.

This ſemimetal, when pure, and well fuſed, is of a white ſhining colour, and conſiſts of laminæ applied to each other. When it has been well melted, and not too haſtily cooled, and its ſurface is not touched by any hard body during the cooling, it exhibits the perfect figure of a ſtar, conſiſting of many radii iſſuing from a centre. This proceeds from the diſpoſition that the parts of this ſemimetal have to arrange themſelves in a regular manner, and is ſimilar to the cryſtallization of ſalts.

1253 Sublimable.

Regulus of antimony is moderately hard; but, like other ſemimetals, it has no ductility, and breaks in ſmall pieces under a hammer. It loſes $\frac{1}{7}$ of its weight in water. The action of air and water deſtroys its luſtre, but does not ruſt it ſo effectually as iron or copper. It is fuſible with a heat ſufficient to make it red hot; but when heated to a certain degree, it fumes continually, and is diſſipated in vapours. Theſe fumes form what are called the *argentine flowers* of regulus of antimony, and are nothing but the earth of this ſemimetal deprived of part of its inflammable principle, and capable of being reduced to its reguline ſtate by an union with this principle.

1254 Separation of the ſulphur from antimony.

There are different methods of preparing the regulus of antimony; but all of them conſiſt merely in ſeparating the ſulphur which this mineral contains, and which is united with the regulus. It is plain, therefore, that regulus of antimony may be made by an addition of any ſubſtance to crude antimony in fuſion, which has a greater attraction for ſulphur than the regulus itſelf has. For this purpoſe, alkaline ſalts have been employed, either previouſly prepared, or extemporaneouſly produced in the proceſs, by a deflagration of tartar and nitre. By this means, the ſulphur was indeed abſorbed; but the hepar ſulphuris, formed by the union of the ſulphur and alkali, immediately diſſolved the regulus, ſo that very little, ſometimes none at all, was to be obtained diſtinct from the ſcoria. Metals are found to anſwer better than alkaline ſalts, but the regulus is ſeldom or never free from a mixture of the metal employed. The way of obtaining a very pure regulus, and in great quantity, is to calcine the antimony in order to diſſipate its ſulphur; then to mix the calx with inflammable matters, ſuch as oil, ſoft ſoap, &c. which are capable of reſtoring the principle of inflammability to it. This method was invented by Kunckel. Another, but more expenſive way of procuring a large yield of very pure regulus, is, by digeſting antimony in aqua-regis, which diſſolves the reguline part, leaving the ſulphur untouched, precipitating the ſolution, and afterwards reviving the precipitate by melting it with inflammable matters.

1255 Regulus eaſily miſcible with mercury.

There are conſiderable differences obſerved in the regulus of antimony, according to the different ſubſtances made uſe of to abſorb the ſulphur. When prepared by the common methods, it is found to be very difficultly amalgamated with mercury; but Mr Pott has diſcovered, that a regulus prepared with two or five parts of iron, four of antimony, and one of chalk, readily unites with mercury into an hard amalgam, by bare trituration with water. Marble and quicklime ſucceed equally well with chalk; but clay, gypſum, or other earths, have no effect.

1256 Extemporaneous regulus with cawk.

One earthy ſubſtance, found in lead-mines, and commonly called *cawk*, has a very remarkable effect upon antimony. This is found in whitiſh, moderately compact and ponderous maſſes; it is commonly ſuppoſed a ſpar; but differs from bodies of this kind, in not being acted upon by acids, (ſee nº 1068). If a lump of cawk, of an ounce or two, be thrown red hot into 16 ounces of melted antimony, the fuſion continued about two minutes, and the fluid matter poured off, "you will have 15 ounces like poliſhed ſteel, and as the moſt refined quickſilver." *Phil. Tranſ.* nº 110. Dr Lewis mentions his having repeated this experiment ſeveral times with ſucceſs: but having once varied it by mixing the cawk and antimony together at the firſt, a part of the antimony was converted into a very dark black vitreous matter, and part ſeemed to have ſuffered little change; on the ſurface of the maſs ſome yellow flowers appeared.

1257 Glaſs of antimony.

Regulus of antimony enters into the compoſitions for metallic ſpeculums for teleſcopes, and for printing-types. It is alſo the baſis of a number of medicinal preparations; but many of theſe, which were formerly much eſteemed, are found to be either inert, uncertain, or dangerous in their operations. When taken in ſubſtance, it is emetic and purgative, but uncertain in its operation; becauſe it only acts in proportion to the quantity of ſolvent matter it meets with in the ſtomach; and if it meets with nothing capable of acting upon it there, the regulus will be quite inactive. For theſe reaſons, the only two preparations of antimony now retained, at leaſt by ſkilful practitioners, are the infuſion of glaſs of antimony in wine and emetic tartar. For making the glaſs of antimony we have the following proceſs. "Take a pound of antimony; reduce it to fine powder, and ſet it over a gentle fire; calcine it in an unglazed earthen pan, till it comes to be of an aſh colour, and ceaſes to fume: you muſt keep it continually ſtirring; and if it ſhould run into lumps, you muſt powder them again, and then proceed to finiſh the calcination. When that is done, put the calcined antimony into a crucible; ſet it upon a tile in a wind-furnace; put a thin tile on the top; and cover it all over with coals. When it is brought into fuſion, keep it ſo in a ſtrong fire for an hour: then put into it an iron rod; and when the melted antimony, which adheres to it, is tranſparent, pour it upon a ſmooth, hot, marble; and when it is cold, put it up for uſe. This is *vitrum antimonii*, or *ſtibium*."

1258 Difference of ſtrength in emetic tartars.

This preparation is more violent in its effects than the pure regulus itſelf; becauſe it contains leſs phlogiſton, conſequenly is ſimilar to a regulus partially calcined, and ſo more ſoluble. Hence it is the moſt proper for infuſion in wine, or for making the tartar emetic. It is obviouſly, however, liable to great uncertainties in point of ſtrength; for as the antimony is more or leſs ſtrongly calcined, the glaſs will turn out ſtronger or weaker in its operation, and conſequently all the preparations of it muſt be liable to much uncertainty. This uncertainty is very apparent in the ſtrength of different parcels of emetic tartar: accordingly Mr Geoffroy found by examination of different emetic tartars, that an ounce of the weakeſt contain-

Rugulus of antimony.

ed from 30 to 90 grains of regulus; an ounce of moderate ſtrength contained about 108 grains; and an ounce of the ſtrongeſt kind contained 154 grains. For theſe reaſons, the author of the Chemical Dictionary recommends the pulvis algaroth as the moſt proper material for making emetic tartar; being perfectly ſoluble, and always of an equal degree of ſtrength. Emetic tartar, as he juſtly obſerves, ought to be a metallic ſalt compoſed of cream of tartar ſaturated with the regulus of antimony; and M. Beaumé has ſhown ſuch a ſaturation to be poſſible, and that the neutral ſalt cryſtallizes in the form of pyramids. They are tranſparent while moiſt; but by expoſure to a dry air, they loſe the water of their cryſtallization and become opaque. The preparation of this ſalt, according to M. Baumé, conſiſts in mixing together equal parts of cream of tartar, and levigated glaſs of antimony: theſe are to be thrown gradually into boiling water; and the boiling continued till there is no longer any efferveſcence, and the acid is entirely ſaturated. The liquor is to be filtered; and upon the filter is obſerved a certain quantity of ſulphureous matter along with ſome undiſſolved parts of the glaſs of antimony. When the filtered liquor is cooled, fine cryſtals will be formed in it, which are a ſoluble tartar perfectly ſaturated with glaſs of antimony. He obſerves, that the diſſolution is ſoon over if the glaſs is well levigated, but requires a long time if it is only groſsly pounded.

1259 Pulvis algaroth the moſt proper material for emetic tartar.

1260 Objection to its uſe.

The trouble of levigating glaſs of antimony, as well as the uncertainty of diſſolving it, would render *pulvis algaroth* much preferable, were it not on account of its price; which would be a temptation to thoſe in uſe to prepare medicines, to ſubſtitute a cheaper antimonial preparation in its place. This objection, however, is now in a great meaſure removed by Mr Scheele; who demonſtrated that the pulvis algaroth is no other than regulus of antimony half calcined by the dephlogiſticated marine acid in the corroſive ſublimate made uſe of for preparing the antimonial cauſtic. If therefore we can fall upon any other method of dephlogiſticating the regulus, we ſhall then be able to combine the marine acid with it; and by ſeparating them afterwards, may have the powder of algaroth as good as from the butter of antimony itſelf. One of the methods of dephlogiſticating the regulus is by nitre. Our author therefore gives the following receipt for the powder in queſtion.

1261 Scheele's theory of the nature of pulvis algaroth.

1262 His receipt for making it cheap.

"Take of powdered crude antimony one pound; powdered nitre, one pound and a half; which, after being well dried and mixed, are to be detonated in an iron mortar. The hepar obtained in this manner is to be powdered, and a pound of it to be put into a glaſs veſſel, on which firſt a mixture of three pounds of water and 15 ounces of vitriolic acid is to be poured, and afterwards 15 ounces of powdered common ſalt are to be added; the glaſs veſſel is then to be put in a ſand-bath, and kept in digeſtion for 12 hours, during which period the maſs is to be conſtantly ſtirred. The ſolution, when cool, is to be ſtrained through linen. On the reſiduum one third of the above menſtruum is to be poured, and the mixture digeſted and ſtrained. From this ſolution, when it is diluted with boiling water, the pulvis algarothi precipitates, which is to be well edulcorated and dried."

As regulus of antimony, like other metallic ſubſtances, is ſoluble in liver of ſulphur, it happens, that, on boiling antimony in an alkaline ley, the ſalt, uniting with the ſulphur contained in that mineral, forms an hepar ſulphuris, which diſſolves ſome of the reguline part. If the liquor is filtered, and ſaturated with an acid, the regulus and ſulphur will fall together in form of a yellowiſh or reddiſh powder, called *golden ſulphur of antimony*. If the ley is ſuffered to cool, a like precipitation of a red powder happens. This laſt is called *kermes mineral*.

Arſenic.

1263 Golden ſulphur of antimony and kermes mineral.

1263 Diaphoretic antimony.

Nitre deflagrates violently with antimony, conſuming not only its ſulphureous part, but alſo the phlogiſton of the regulus: and thus reduces the whole to an inert calx, called *antimonium diaphoreticum*. If equal parts of nitre and antimony are deflagrated together, the ſulphureous part is conſumed, as well as part of the inflammable principle of the regulus. The metalline part melts, and forms a ſemivitreous maſs of reddiſh colour, called *crocus metallorum*, or *liver of antimony*. It is a violent emetic, and was formerly uſed for making infuſions in wine ſimilar to thoſe of glaſs of antimony; but is now diſuſed on account of its uncertainty in ſtrength. It is ſtill uſed by the farriers: but the ſubſtance ſold for it is prepared with a far leſs proportion of nitre; and ſometimes even without any alkaline ſalt being added to abſorb part of the antimonial ſulphur. This crocus is of a dull red colour; and, when powdered, aſſumes a dark purple.

1265 Crocus metallorum.

§ II. *ARSENIC.*

This ſubſtance, in its natural ſtate, has no appearance of a metal, but much more reſembles a ſalt, which, as has been already obſerved, it really is when deprived of its phlogiſton. When united to a certain quantity of phlogiſton, it aſſumes a metallic appearance; and in this ſtate it is found, as Mr Bergman informs us, in Bohemia, Hungary, Saxony, Hercynia, and other parts; particularly at Alſatia in the mines called *St Marieux*. The maſſes in which it is found are frequently ſhapeleſs, friable, and powdery; but ſometimes compact, and divided into thick convex lamellæ, with a needle-formed or micaceous ſurface: it takes a poliſh, but ſoon loſes it again in the air. When freſh broken, it appears compoſed of ſmall needle-like grains of a leaden colour, ſoon becoming yellow, and by degrees blackiſh; exceeding copper in hardneſs, though as brittle as antimony.

1266 Arſenic found naturally in a metallic form.

1267 Regulus of arſenic eaſily converted into the common white kind.

Reguline arſenic, whether found naturally or prepared by art, very readily parts with as much of its phlogiſton as is ſufficient to make it fly off in a white ſmoke; but this ſtill retains a very conſiderable quantity of phlogiſtic matter, as is evident from its producing nitrous air by the affuſion of nitrous acid, and from the experiments already related of the preparation of the acid of arſenic. This calx indeed is the form in which arſenic is moſt commonly met with. It is leſs volatile than the regulus; and by ſublimation in a glaſs veſſel aſſumes an opaque cryſtalline appearance from becoming white on the ſurface; but that which cryſtallizes in the bowels of the earth does not appear to be ſubject to any ſuch change.

1268 White arſenic may be mixed with other metals.

White arſenic, though a true metalline calx, may be mixed in fuſion with the ſame metals which will unite with the regulus. This ſeems contrary to the general rule of other calces, which cannot be united with any metal in its metalline ſtate; but it muſt be remembered, that by this operation the arſenical calx is reduced to a regulus by the phlogiſton of the metal: whence, in all fuſions of this kind, ſome ſcoriæ riſe to the top, conſiſting of the calcined metal and part of the white arſenic.

1269 Solution of arſenic in water. Eight parts of diſtilled water diſſolve, by means of moderate heat, one part of calcined arſenic, and by boiling may be made to take up 15. The ſolution changes ſyrup of violet green, but the tincture of turnſole red. It is not changed by neutral ſalts, but ſlowly precipitates the ſolutions of metals, the arſenic united to the metallic calx falling to the bottom.—"It may be aſked (ſays Mr Bergman), whether the whole of the arſenic, or only the arſenical acid, unites with the metallic calx, yielding the phlogiſton to the menſtruum of the other metal?" Certainly ſuch a mutual commutation of principles does not appear improbable, if we conſider only thoſe caſes in which the menſtruum is vitriolic or nitrous acid: but as iron, for example, united with marine acid (which does not attract the phlogiſton of white arſenic), as well as when it is joined to the nitrous acid, is precipitated, it would appear that the whole of the arſenic is united, at leaſt in certain caſes, to the metallic calces.

1270 And in ſpirit of wine. One part of arſenic is diſſolved by 70 or 80 of boiling ſpirit of wine.

1271 In vitriolic acid. Arſenic diſſolves partially in concentrated vitriolic acid, but concretes in the form of cryſtalline grains on cooling. Theſe diſſolve in water with much greater difficulty than the arſenic itſelf. On the blow-pipe they emit a white ſmoke, but form into a globule by fuſion, which at firſt bubbles, but ſoon grows quiet, and is but ſlowly conſumed even in a white heat. This fixity is occaſioned by the acid carrying off the phlogiſton of the arſenic, and thus leaving a greater proportion of its peculiar acid than what it naturally contains; and therefore the more frequently the operation is repeated, the more fixed the arſenic becomes, though it is ſcarce poſſible to diſſipate the arſenical phlogiſton as perfectly with this acid as with the nitrous; the effects of which have been already particularly mentioned.

1272 In marine acid. The marine acid, which naturally contains phlogiſton, diſſolves about one-third of its weight of arſenic, a great part of which ſeparates ſpontaneouſly on cooling in a ſtate of ſaturation with the acid. This ſalt, which may be had in a cryſtalline form, is much more volatile than the former, readily ſubliming in a cloſe veſſel with a moderate heat; but is ſoluble with difficulty in boiling water. It is of a fine yellow colour, and ſcarcely differs from butter of arſenic, except in its degree of concentration. The nature of marine acid prevents it from diſengaging the arſenical acid from the phlogiſton of the ſemimetal, as will eaſily appear from what has been ſaid concerning that acid. The arſenical acid, however, is eaſily made to appear by the addition of that of nitre, as will be underſtood from the directions given by Mr Scheele for the preparation of the acid of arſenic.

1273 Phlogiſticated alkali cannot precipitate arſenic except from marine acid. Arſenic is not precipitated from its ſolution in vitriolic and nitrous acids by the phlogiſticated alkali, which yet very readily precipitates all other metals. From the marine acid, however, it is precipitated by its means of a white colour; but unleſs the ſolution be very acid, the addition of mere water will throw down a precipitate of the ſame colour.

1274 Decompoſed by dephlogiſticated marine acid. Dephlogiſticated marine acid deprives arſenic of its inflammable principle; ſo that in the diſtilling veſſel we find water, acid of arſenic, and marine acid, regenerated.

1275 Phenomena with other acids. Arſenic is diſſolved by its own acid, and forms cryſtalline grains with it as well as with that of fluor and borax. Saccharine acid diſſolves it likewiſe, and forms priſmatic cryſtals; and a ſimilar ſalt is alſo formed by the acid of tartar. Vinegar, and the acids of vinegar and phoſphorus, form with it cryſtalline grains, which are ſcarcely ſoluble in water.

1276 Liver of arſenic. Solutions of fixed alkali diſſolve arſenic; and, when loaded with it, form a brown tenacious maſs, called *liver of arſenic.* The arſenic is partly precipitated by mineral acids, though part of it gradually loſes its phlogiſton, and adheres more tenaciouſly. Solution made with volatile alkali ſeems to effect this decompoſition more readily, as no precipitation is made by acids. Limpid ſolution of ſaline hepar, dropped into a ſolution of white arſenic, floats upon the ſurface in form of a grey ſtratum, which at length diſturbs the whole liquor.

1277 Effects on metals. By the aſſiſtance of heat ſolutions of arſenic attack ſome of the metals, particularly copper, iron, and zinc; the ſolutions of the two laſt yielding cryſtals by evaporation. No alteration is made on theſe compounds by alkaline ſalts or by acids: volatile alkali does not diſcover the copper by changing the colour of the ſolution blue; nor does the phlogiſticated alkali throw down any blue precipitate from the ſolution of iron. The reaſon of this is the ſuperabundance of phlogiſton in the ſolutions; for the arſenical acid takes up all metals: when united with copper, it ſhows a blue colour with volatile alkali; and when united with iron, it lets fall a Pruſſian blue in the uſual way; but the quantity of phlogiſton which converts the acid into white arſenic, prevents the appearance of theſe phenomena when the latter is made uſe of.

1278 Unites eaſily with ſulphur. Arſenic, either in its calcined or reguline ſtate, may be united with ſulphur; in which caſe it appears either of a red or yellow colour, according to the quantity of ſulphur with which it is united. Theſe compounds are ſpontaneouſly produced by nature; both of them ſometimes pellucid and cryſtalline; with this difference, however, that the yellow ſeems to affect a lamellated, and the red a cryſtalline, form. 1279 Realgar and orpiment. Theſe are called *red and yellow orpiment*, or realgar and orpiment; the ſpecific gravity of realgar being about 3.225; of orpiment, 5.315. Both of theſe ſublime totally with a moderate heat, unleſs when they happen to be mixed with other ſubſtances. They readily unite with thoſe metals which form an union with the arſenic and ſulphur of which they are compoſed. Silver mineralized by fuſion with orpiment, forms a ſubſtance ſimilar to what is called the red ore of that metal. Iron, in conjunction with orpiment, aſſumes a white, poliſhed, and metallic appearance, ſimilar to that of the white or arſenical pyrites; and by various combinations of theſe ſubſtances with metals of different kinds, many of the natural metalline ores may be produced.

1280 Phenomena with nitrous acid. Nitre, when treated with mineralized arſenic, detonates

tonates partly with the ſulphur, and partly with the phlogiſton of the arſenic; the alkaline baſis of the ſalt either forming ſal polychreſt with the acid of the ſulphur, or uniting with the alkali, and forming the neutral arſenical ſalt. By the addition of fixed alkali in proper quantity, either to orpiment or realgar, and then expoſing the mixture to a ſubliming heat, nitre retains the ſulphur, but lets go the greateſt part of the arſenic; the hepatic maſs, however, retains a ſmall quantity of the latter; and if there is much alkali, ſcarce any of the arſenic ariſes.

1281 Butter of arſenic.

On diſtilling orpiment with twice or thrice it quantity of corroſive ſublimate, two liquids ariſe which refuſe to unite; and at length, on augmenting the heat, a cinnabar ariſes. A butter of arſenic is found at the bottom of the receiver, of a ferruginous brown colour, but pellucid: in the open air it firſt ſends forth a copious fume of a white colour, and then gradually attracts the moiſture of the atmoſphere, by which it is precipitated.

1282 Can ſcarce be made to unite with marine acid.

It is remarkable that it unites ſo ſlowly with marine acid, that they ſeem to repel one another; nor can they be made to unite beyond a certain degree. By the affuſion of diſtilled water, a white powder will be precipitated, which, though ever ſo well waſhed, retains ſome acidity; for a portion of butter of antimony is produced by diſtillation, as is likewiſe true of the pulvis algaroth. The ſmoke has a peculiar penetrating ſmell, ſomewhat ſimilar to that of phlogiſticated vitriolic acid, and lets fall white flowers.

1283 Oil of arſenic.

The liquor which ſwims above, and which, by chemical authors, has been compared to oil, is yellowiſh and pellucid, ſeparating a white arſenical powder by the addition of water and ſpirit of wine. It is not affected by the ſtronger acids; but effervesces, and lets fall a precipitate, with alkalies. On keeping it with a cucurbit with a long neck unſtopped, white flowers gradually concrete round the orifice, which are lax, and ſometimes approaching to a cryſtalline form. And laſtly, by ſpontaneous evaporation, pellucid cryſtals appear at the bottom of the liquor, which are ſoluble in water with great difficulty; but when diſſolved, precipitate ſilver from nitrous acid, and let fall ſome arſenic on the addition of an alkali. When put into lime-water, a cloud ſlowly ſurrounds them: on being expoſed to the fire, they totally ſublime without any arſenical ſmell, without decrepitation, or loſing their tranſparency; but if ignited phlogiſtic matter comes in contact with them, the arſenical ſmell inſtantly appears. No traces of mercury are to be found in this liquor by treating it either with alkali or copper; not the ſlighteſt precipitation is made by it on being dropped into a ſolution of terra ponderoſa in the marine acid: from all which it appears, that this liquor is only a very dilute butter of arſenic, containing leſs of the mercury on account of the quantity of water it has. The butter contains the acid in its moſt concentrated ſtate, and is therefore loaded with a larger quantity of arſenic: the former liquor will therefore be obtained in much larger quantity, by ſetting the mixture of corroſive ſublimate and arſenic to ſtand a night in a cellar, or moiſtened with water, before it be ſubjected to diſtillation. As the common marine acid can diſſolve only a determined quantity of the butter, it naturally follows, that what remains after complete ſaturation ſhould totally refuſe to mix. The acid, however, when too much diluted, precipitates the butter; but in proportion to its ſtrength it diſſolves a greater quantity.

1284 Arſenic mineralized by ſulphur.

Arſenic mineralized by ſulphur is not diſſolved by water, but is affected by the different acids, according to the particular circuſtances of each. Nitrous acid and aqua-regia act moſt powerfully; the former ſoon deſtroys the red colour of the realgar, and converts it into yellow orpiment; its primary action being to calcine the arſenic, without affecting the yellowneſs of the ſulphur. It makes no change on the colour of orpiment. Aqua-regia, by long digeſtion, takes up the arſenic, and leaves the ſulphur at the bottom; and hence we may find out the proportions of the two ingredients. Some dexterity, however, is neceſſary in performing this operation with accuracy; for if, on the one hand, the menſtruum be too weak, part of the arſenic will remain undiſſolved; and if, on the other, it be too ſtrong, part of the ſulphur will be decompoſed; for ſtrong nitrous acid is capable of decompoſing ſulphur by long digeſtion, having a greater attraction for phlogiſton than the vitriolic acid itſelf. The colour of the reſiduum ought to be grey; for as long as any yellow particles remain, it is a ſign that ſome of the arſenic alſo remains. If any iron be preſent in the compound, it is all diſſolved, by reaſon of the ſuperior attraction of the acid for it, before any of the arſenic is taken up, unleſs it ſhall have been calcined either by the acceſs of air and heat employed in the operation, or by the too great power of the menſtruum.

1285 Pure regulus of arſenic, how prepared.

The pure regulus of arſenic may be obtained artificially from white arſenic, either by ſublimation with oil, black flux, or other phlogiſtic materials; or by melting it with double its weight of ſoap and potaſhes; or laſtly, by precipitation by means of ſome other metal, from orpiment or ſandarack melted with ſulphur and fixed alkali. By the firſt of theſe methods it is obtained in a cryſtalline form, octohedral, pyramidal, or even priſmatic.

1286 Miſpickel, a natural regulus of arſenic.

Mr Bergman mentions a natural regulus of arſenic, named *miſpickel*, which along with ſome ſulphur contains a large quantity of iron united with the regulus into a metallic compound; but tho' the iron ſometimes amounts to $\frac{2}{2}$ or even $\frac{2}{3}$ of the whole, it nevertheleſs remains untouched by the magnet. When ignited, it ſends forth an arſenical ſmell, and ſoon becomes obedient to the magnet, even though the operation be performed on a tile without any additional phlogiſton; it melts eaſily in an open fire, and in cloſe veſſels the greater part of the regulus ſublimes, leaving the iron at the bottom.

1287 Great volatility of this ſemimetal.

The pure regulus of arſenic is vaſtly more volatile than any other metal, and therefore cannot be melted. It begins to ſend forth a viſible ſmoke in 180° of the Swediſh thermometer, and is capable of inflammation; but in order to inflame it, it muſt be thrown into a veſſel previouſly heated to a ſufficient degree, otherwiſe it will be ſublimed. The flame is of an obſcure whitiſh blue, diffuſing a white ſmoke and garlic ſmell. In cloſe veſſels it retains its metallic form, and may be ſublimed of any figure we pleaſe.

1288 Effects of regulus of arſenic on other metals.

Regulus of arſenic unites with many of the metals, but deſtroys the malleability of thoſe with which it enters into fuſion. It renders thoſe more eaſy of fuſion which are melted with difficulty by themſelves; but tin, the moſt eaſily fuſible of all the metals, becomes

comes more refractory by being united with arſenic. This metal acquires a permanent and ſhining whiteneſs by its union with regulus of arſenic, and is able to retain half its own weight of the arſenical metal. The other white metals become grey by fuſion with this ſemimetal, platina only excepted. Gold fuſed in a cloſe veſſel with regulus of arſenic, ſcarcely takes up $\frac{1}{60}$ of its weight; ſilver $\frac{1}{4}$; lead $\frac{1}{6}$; copper $\frac{5}{6}$; and iron more than its own weight. The magnetic property of this laſt metal is deſtroyed by a large quantity of regulus, though the exact proportion which deſtroys it can ſcarcely be determined, as ſome of the iron is always taken up by the ſcoria; but according to Mr Bergman, leſs than an equal quantity is certainly ſufficient. Biſmuth retains $\frac{1}{15}$ of its weight; zinc $\frac{1}{5}$; regulus of antimony $\frac{1}{8}$; and manganeſe an equal quantity. Nickel and regulus of cobalt take up a large quantity; but how much cannot be determined, as it is next to impoſſible to procure any of thoſe metals in a ſtate of perfect purity. In a ſufficient degree of heat, and by a triture of ſeveral hours, regulus of arſenic takes up about $\frac{1}{6}$ of its own weight of mercury, forming an amalgam of a grey colour.

1289 May be expelled by heat from all the metals with which it is united.

Regulus of arſenic, by reaſon of its volatility, may be expelled from all the metals with which it is united; but, in flying off, it generally carries along with it ſome of the metals with which it is united, gold and ſilver not excepted, if the degree of heat be great and very ſuddenly applied. Platina, however, perfectly reſiſts the volatilization; and by reaſon of its refractory nature, even retains a portion of the arſenic.

1290 Effects of it upon alkaline ſalts and nitre.

This ſemimetal cannot be united by fuſion with alkaline ſalts until the phlogiſton is conſiderably diminiſhed, and the regulus approaches to the nature of pure arſenical acid. By adding regulus therefore to nitre in fuſion, a detonation enſues, the phlogiſton of the former is totally deſtroyed, and the acid uniting with the alkali of the nitre forms a neutral arſenical ſalt, ſimilar to that made with white arſenic and nitre. By diſtillation with dry acid of arſenic, the regulus ſublimes before it can be acted upon by the acid; but when thrown into the acid in fuſion, ſoon takes fire, and ſends forth a white ſmoke: for the acid, being in this inſtance deprived of its phlogiſton, ſeparates that principle from the regulus, and unites with it in ſuch quantity as to regenerate white arſenic; while on the other hand, the regulus, by this operation, is ſo far deprived of its phlogiſton as to appear in the form of a calx. 1291 Decompoſes corroſive ſublimate. By diſtillation with corroſive ſublimate, a ſmoking butter, and ſmall quantity of mercurius dulcis and running mercury, are procured; which happens in conſequence of a double elective attraction; the regulus of arſenic yielding its phlogiſton to the baſe of the corroſive ſublimate, which being thus really calcined, reduces the former to perfect mercury, while the marine acid takes up the calx of arſenic. The regulus of arſenic readily unites with ſulphur, and forms the ſame red and yellow compounds that have already been mentioned when ſpeaking of white arſenic; it is ſoluble in hepar ſulphuris, but may be precipitated by every other metal which can unite with the hepar.

1292 Converted into white arſenic by the vitriolic acid.

Regulus of arſenic is not affected by the vitriolic acid, unleſs when concentrated and aſſiſted by heat. The inflammable part of the regulus which phlogiſticates the acid flies off, ſo that the remainder aſſumes the nature of white arſenic, and exhibits the ſame properties with menſtrua as any other metallic calx: the ſame holds good with nitrous acid, except that it attracts the phlogiſton more vehemently. Marine acid has little or no effect except when boiling.

1293 Effects of it on metallic ſolution.

Regulus of arſenic precipitates certain metals diſſolved in acids, ſuch as gold and platina, diſſolved in aqua-regia, as well as ſilver and mercury in vitriolic and nitrous acids. Silver generally appears in beautiful poliſhed ſpiculæ, like the arbor Dianæ; but if the arſenic be ſuffered to ſtand long in the nitrous ſolution but little diluted, the ſilver ſpiculæ are again diſſolved, the arſenic in the mean time being dephlogiſticated. Solutions of biſmuth and antimony are ſcarcely rendered turbid. Iron may be ſeparated from regulus of arſenic by digeſtion with marine acid, or with aqua-regia; neither of which will touch the arſenic, as long as any iron remains; but in order to ſucceed in this operation, ſubtile pulveriſation is neceſſary as well as a juſt quantity and ſtrength of the menſtruum. Heat muſt alſo be carefully avoided. The regulus is alſo diſſolved by hepar ſulphuris and by fat oils, the latter forming with it a black maſs like plaſter.

§ 12. *Cobalt.*

Regulus of cobalt, or more properly pure cobalt itſelf (what we have under the name of *cobalt* being only a calx of the regulus), is a ſemimetal of a reddiſh white colour, cloſe-grained, ſo as to be eaſily reducible to powder, about 7.7 of ſpecific gravity, and forming itſelf into maſſes of a needle-like texture, placed upon one another. It is ſeldom or never found native, but almoſt always calcined and united with arſenic, the arſenical acid, ſulphur, iron, &c. 1294 Zaffre, a calx of cobalt. The zaffre uſed in commerce is an impure and grey calx of cobalt. When mixed with three times its weight of pulveriſed flints, and expoſed to a ſtrong fire, it melts into glaſs of a dark blue colour, called *ſmalt*, uſed in tinging other glaſſes, and in painting. 1295 Smalt, how produced. With three times its weight of black flux, a ſmall quantity of tallow and marine ſalt, it affords the ſemimetal known by the improper name of *regulus of cobalt*; but the reduction is very difficult. 1296 Regulus of cobalt difficult to reduce. For this purpoſe a large quantity of flux muſt be made uſe of, and the crucible kept a conſiderable time in a white-red heat, that the matter may become very fluid, and that the ſcoria may be completely fuſed into a blue glaſs, at which period the cobalt ſinks in the form of a button to the bottom.

1297 Properties of cobalt when expoſed to heat.

Cobalt melts in a ſtrong red heat, is very fixed in the fire, and it is uncertain whether it can be volatilized in cloſe veſſels. When ſuffered to cool ſlowly, it cryſtallizes in needle-ſhaped priſms, placed one upon the other, and united in bundles, having a conſiderable reſemblance to maſſes of baſaltes ſeparated from each other: in order to ſucceed in this cryſtallization, however, the cobalt muſt be melted in a crucible till it begins to boil, and, when the ſurface of the metal becomes fixed on being withdrawn from the fire, the veſſel is then to be inclined; that which ſtill remains fluid runs out, and the portion adhering to the lumps formed by the cooling of the ſurface is found covered with cryſtals.

1298 Calcines ſpontaneouſly in the air.

This ſemimetal, expoſed to the atmoſphere, becomes covered with a dull pellicle, and undergoes a ſpontaneous calcination; but it may eaſily be calcined

1299 Its calx forms a beautiful blue glaſs.

in any quantity by expoſing it in powder in a ſhallow veſſel, under the muffle of a cupelling furnace, and ſtirring it now and then to expoſe freſh ſurfaces to the air. After being kept red hot for ſome time, this powder loſes its ſplendor, increaſes in weight, and becomes black, the calx being convertible, by a moſt violent heat, into a blue glaſs. By fuſion it combines with vitrifiable earths, forming with them a beautiful bule glaſs extremely fixed in the fire; whence it is of the greateſt uſe in enamel-painting, porcelain-painting, &c. The action of terra ponderoſa, magneſia, and lime, on cobalt, is not known. Alkalies manifeſtly alter it; but in what reſpect is not known.

1300 Phenomena with vitriolic acid.

Cobalt diſſolves in concentrated vitriolic acid, when aſſiſted by a boiling heat; the acid evaporating almoſt entirely in the form of ſulphureous gas. The reſiduum is then to be waſhed; a portion of it diſſolves in the water, and communicates a greeniſh colour to it when warm, which changes to a roſe colour when cold. M. Beaumé affirms, that by ſufficiently evaporating the vitriolic ſolution of cobalt, two ſorts of cryſtals are obtained; one white, ſmall, and cubical; the other greeniſh, quadrangular, ſix lines in length, and four in breadth. Theſe laſt he only conſiders as the true vitriol of cobalt; the former being produced by certain foreign matters united to it. The cryſtals moſt commonly obtained have the form of ſmall needles, and may be decompoſed by fire, leaving a calx of cobalt not reducible by itſelf. They may likewiſe be decompoſed by all the alkalies, by terra ponderoſa, magneſia, and lime. According to Fourcroy, 100 grains of cobalt, diſſolved in the vitriolic acid, afford, by precipitation with pure mineral alkali, 140 grains of precipitate; by the ſame alkali aërated, 160 grains. Diluted vitriolic acid acts on zaffre, and diſſolves a part, with which it forms the ſalt already deſcribed.

1301 With nitrous acid.

Nitrous acid acts upon the ſemimetal with that violence which is its general characteriſtic; and the ſolution, when nearly ſaturated, appears either of a roſy brown or bright green colour. By ſtrong evaporation it yields a ſalt in ſmall needles joined together; which is very deliqueſcent, boils upon hot coals without detonation, and leaves a calx of a deep red colour. It is decompoſed by the ſame ſubſtances as the former, and by exceſs of alkali the precipitate diſappears.

1302 With marine acid.

Muriatic acid, aſſiſted by heat, diſſolves cobalt in part, but has no effect upon it in the cold. It acts more ſtrongly on zaffre, forming a ſolution of a reddiſh brown, which becomes green by being heated. By evaporation it yields a very deliqueſcent ſalt in ſmall needles, which becomes green when heated, and is ſoon after decompoſed. Aqua-regia diſſolves the metal more eaſily than the marine acid, but leſs ſo than the nitrous. The ſolution has been long known as a *ſympathetic Ink*.

1303 With the acid of borax.

Cobalt is not diſſolved directly by the acid of borax; but when a ſolution of this ſalt is mixed with a ſolution of cobalt in any of the mineral acids, a double decompoſition takes place; the alkaline baſis of the borax uniting with the acid which held the cobalt in ſolution; and the calx, combining with the ſedative ſalt, falls to the bottom in form of an inſoluble precipitate.

1304 With ſal ammoniac.

1305 With ſulphur.

This ſemimetal is calcined by being heated to ignition with nitre. One part of cobalt, and two or three of dry nitre, well powdered and mixed, when thrown into a red-hot crucible; produce ſmall ſcintillations; a portion of the cobalt being converted into a calx of a red colour, more or leſs deep, and ſometimes of a green. Sal ammoniac is not decompoſed, by reaſon of the little attraction there is between the metal and muriatic acid. M. Bucquet, who made the experiment with great care, could not obtain a particle of volatile alkali. Sulphur does not unite with it but very difficultly, and the combination is promoted by liver of ſulphur. Thus a kind of artificial one may be produced, the grain of which will be finer or cloſer, and its colour whiter or yellower, in proportion to the quantity of ſulphur in the mixture. M. Beaumé obſerves, that this compound cannot be decompoſed by acids, and that fire cannot deſtroy all the ſulphur.

§ 13. *Nickel.*

1306 Diſcovered by Mr Cronſtedt.

This was firſt diſcovered to be a ſemimetal of a peculiar kind by Cronſtedt, in the years 1751 and 1754, who procured it in the form of regulus from its ore, but without being able to reduce it to a ſufficient degree of purity; which indeed has not yet been done by any chemiſt. M. Bergman has laboured moſt in this way, though even he has not reduced it to the purity of other metallic ſubſtances. His experiments were made with ſome regulus made by M. Cronſtedt, and whoſe ſpecific gravity was to that of water exactly as 7.421 to 1. His attempts to purify it were made,

I. By Calcination and Scorification.

1307 Effects of calcination with a violent heat.

Nine ounces of powdered nickel were expoſed for ſix hours, in ſeveral portions, to a moſt violent heat, under the dome of an aſſay furnace. Thus the arſenic was firſt diſſipated with a fetid ſmell, after which the odour of ſulphur became perceptible; after this a white ſmoke aroſe without any ſmell of garlic, and which, according to our author, aroſe probably from the more dephlogiſticated part of the arſenic which now began to ſublime. The heaps (we ſuppoſe after the matter had been poured out of the diſhes, and yet retaining a great deal of heat), when hot, began to ſwell, and green vegetations aroſe from all the ſurface, reſembling ſome kinds of moſs, or the filiform lichen; a ferruginous aſh-coloured powder remained at bottom; and 0.13 of the whole were diſſipated during the operation. Half an ounce of this calx fuſed in a forge for four minutes, along with three times its weight of black flux, yielded a regulus reticulated on the ſurface; the areola of a hexangular figure, with very ſlender ſtriæ, diverging from a centre, full of little tubercles; it weighed 0.73 of half an ounce; was obedient to the magnet; and, when ſcorified with borax, left a blackiſh glaſs.

By a ſecond roaſting the regulus again emitted a garlic ſmell; afterwards a viſible fume without any ſmell, with vegetations as before. The roaſted powder, reduced with black flux as before, ſtill emitted a ſmell of arſenic; but on repeating the fuſion with the calx and borax, nothing but ſome obſcure ſigns of cobalt appeared. A third calcination ſeemed to have much diſſipated the arſenic, as it now emitted but little of that kind of ſmell; the vegetations were alſo gone; and the matter had rather a ferruginous than a green

green colour. Nearly the ſame phenomenon appeared after reduction in a fourth operation.

On performing the reduction with lime and borax, the regulus, when firſt melted, loſt much of its ferruginous matter, which adhered to the black ſcoriæ; it ſoon acquired an hyacinthine colour, without any remarkable mixture of cobalt, was little obedient to the magnet, and its ſpecific gravity was ſomewhat diminiſhed, being now only 7.0828.

By a fifth calcination, gradually adding a quantity of powdered charcoal while the matter continued red hot, a prodigious quantity of arſenic, imperceptible before, flew off in the form of vapour; the arſenical acid being thus furniſhed with as much phlogiſton as was neceſſary to make it riſe in fume. The regulus was treated in this manner until no more arſenical ſmoke could be perceived; it was now of a lamellated and tenacious texture when reduced, but ſtill diffuſed the arſenical odour on being removed from the fire. The roaſting was therefore repeated a ſixth time, and continued for ten hours; the addition of powdered charcoal continued to diſſipate the arſenic in inviſible vapours which yet were perceptible by the ſmell; the colour of the metallic calx was obſcurely ferruginous, with a mixture of green ſcarcely viſible. On reducing the regulus with equal parts of white flux, lime and borax, a ſemiductile regulus was obtained, highly magnetic, and ſoluble in nitrous acid, to which it communicates a deep green colour; a blackiſh maſs remained, which afterwards become white, and when laid on a burning coal, flies off without any remarkable arſenical ſmell. The regulus being then ſix times fuſed with lime and borax, the ſcoriæ reſembled the hyacinth in colour, and the metallic part was ſurrounded with a green calx. The regulus, as before, was magnetic and ſemi-malleable. Laſtly, it was expoſed for 14 hours to a very ſtrong heat; when the powdered charcoal was added by degrees without any diſſipation of arſenic or loſs of weight; the colour of the roaſted powder was ferruginous, with a very ſlight tinge of green. On reduction, a very ſmall globe, ſtill magnetic, was found among the ſcoriæ.

II. By Sulphur.

1308
Effects of ſulphur and borax.

Eight hundred parts of Cronſtedt's regulus of nickel, fuſed with ſulphur and a ſmall quantity of borax, yielded a mineralized maſs of a reddiſh yellow, whoſe weight amounted to 1700. On expoſing one half of this to the fire, it began to grow black; on which the heat was augmented until vegetations appeared; the remaining calx weighed 652. Melting this part with borax, and the other which had not been expoſed to the fire, a ſulphurated regulus of a whitiſh yellow colour was obtained, weighing 1102. The ſame regulus, calcined for four hours, was firſt covered with vegetations, and then, on the addition of powdered charcoal, diffuſed an arſenical odour; the metallic calx was green, and weighed 1038. A whitiſh yellow regulus was obtained ſemiductile, highly magnetic, and extremely refractory, weighing 594. By fuſion with ſulphur a ſecond time, it weighed 816; one half of which roaſted to greenneſs, united by means of fire to the other half ſtill ſulphurated, weighed 509, and was almoſt deprived of its magnetic quality. A calcination of four hours, during which phlogiſton was added, diſſipated a conſiderable quantity of arſenic; the powder put on an aſh-colour, ſomewhat greeniſh, was in weight 569; and by reduction yielded a regulus whoſe ſurface was red, and which, on breaking, appeared of a white aſh-colour, very friable, and weighing 432; the ſpecific gravity 7.173.

On mineralizing the regulus a third time with ſulphur, adding charcoal as long as any veſtige of arſenic remained, which required a violent calcination of 12 hours, the remaining powder was of an aſh-green colour, and weighed 364; but the regulus obtained by means of a reduction effected by the moſt violent heat in a forge for three quarters of an hour, was ſo refractory that it only adhered imperfectly to the ſcoria, which were of a diſtinct hyacinthine colour; nor could it be reduced to a globule by means of borax, though urged by the ſame vehemence of fire. The abſolute gravity of this regulus was 180; its ſpecific gravity 8.666. Its magnetic virtue was very remarkable; for it not only adhered ſtrongly to the magnet, but to any other piece of iron; and the ſmall pieces of it attracted one another. It had a conſiderable ductility, was of a whitiſh colour, mixed with a kind of glittering red; diſſolved in volatile alkali, yielding a blue ſolution, and a green one in nitrous acid.

An hundred parts of the ſame regulus, beaten out into thin plates, were covered by a calcination of four hours, with a cruſt apparently martial, having under it a green powder, and within it a nucleus conſiſting of reguline particles ſtill unchanged; the weight being increaſed by 5. The friable matter, reduced to powder, put on a browniſh-green colour; and after a calcination of four hours more, concreted at the bottom in form of a friable black cruſt, ſtrongly magnetic, and weighing 100: No veſtiges of arſenic were diſcovered by a ſucceeding operation, in which charcoal was added; nor was the magnetic powder deſtroyed, but the weight was increaſed to 105, and the colour ſomewhat changed. By fuſion for an hour with lime and borax, this powder yielded a regulus of an angular ſtructure, red, ſemiductile, and altogether magnetic; the ſpecific gravity being 8.875. The ſame globule diſſolved in aqua-regia, was precipitated by green vitriol, as if it had been loaded with gold; but the precipitate was readily ſoluble in nitrous acid. Moſt of the reguli ſhowed no ſigns of precipitation with green vitriol.

III. With Hepar Sulphuris.

1309
Effect of hepar ſulphuris.

Fifty-eight parts of regulus of nickel, which had been ſulphurated before, being fuſed with 1800 parts of ſaline hepar ſulphuris, then diſſolved in warm water, filtered through paper, and precipitated by an acid, yielded a powder, which, by calcination till the ſulphur was driven off, appeared of an aſh-colour, and weighed 35. The inſoluble reſiduum, deprived of its ſulphur by means of fire, was likewiſe of an aſh-colour, and weighed 334. On reducing this regulus by means of the black flux, a friable regulus was obtained, which had a very weak magnetic property; but, on fuſion with borax, this quality was augmented. On mixing and melting together equal parts of calx of nickel, gypſum, colophony, and white flux, a powdery, ſquamous, and reguline maſs was produced; which, by fuſion with borax, afforded a regulus poſſeſſing the properties

perties of nickel, but not entirely deſtitute of cobalt, which obeyed the magnet, and did not part with its iron even after two ſolutions in the nitrous acid, and various reductions by fuſion with borax; the ſulphur was alſo retained with great obſtinacy.

On diſſolving regulus of nickel by fuſion, in hepar ſulphuris made with fixed alkali, adding a quantity of nitre ſufficient only to deſtroy a ſmall part of the hepar, the regulus which had been ſuſpended by it was ſeparated, and fell to the bottom. On examining this regulus, it appeared more pure, and generally deprived of cobalt, but ſtill containing iron. In like manner nickel is always very diſtinctly precipitated by regulus of cobalt, as this latter is attracted more powerfully by the hepar ſulphuris. When diſſolved by fuſion with hepar ſulphuris, this ſemimetal may be precipitated by adding iron, copper, tin, or lead, and even by cobalt: the regulus obtained is indeed ſcarcely ever attracted by the magnet; but we are not from thence to conclude that it does not contain any iron; for when the heterogenous matters, which impede its action, are properly removed, it then acknowledges the power of the magnet very plainly.

IV. By Nitre.

1310
Of nitre.

One part of Cronſtedt's regulus was added to twelve of nitre ignited in a crucible, and kept red-hot for about an hour. Some weak flaſhes appeared firſt; then a large quantity of arſenic was emitted; and, laſtly, the ſides were covered with a blue cruſt occaſioned by the cobalt, a green matter remaining at bottom. This, fuſed again for an hour, with twelve parts of nitre, tinged the internal ſides of the veſſel of a green colour; and, laſtly, a browniſh green maſs, much leſs in quantity than in the former operation, was left at the bottom. This green matter, treated in the ſame way for two hours a third time, left a grey ſcoria at the bottom, which yielded no regulus with black flux.

Another portion of the ſame regulus, treated in the ſame way with nitre, was diſſolved, and became green; yet on being freed by ablution from the alkaline ſalt, it yielded no regulus with black flux, but only ſcoria of an hyacinthine colour mixed with blue, tinging nitrous acid of a green colour, concreting into a jelly, and on evaporation leaving a greeniſh calx behind.

Another portion of Cronſtedt's regulus was kept ſome hours in the crucible with 16 parts of nitre; by which means all the arſenic was firſt ſeparated; then the phlogiſticated nitrous acid; and, laſtly, the ſides of the veſſel were penetrated by a kind of green efflo-reſcences. The maſs, after being waſhed with water, was of a dilute green colour, and tinged borax of a greeniſh brown. A green powder was ſtill yielded, after treating this in the ſame manner with 12 parts of nitre; and on reducing it with one-half black flux, one-eighth borax, and as much lime, a yellowiſh white regulus, both magnetic and malleable, was obtained, poſſeſſing all the properties of nickel. Its ſpecific gravity was 9.000; the phlogiſtic ingredient was uſed in ſmall quantity, that the iron might, if poſſible, enter the ſcoria.

1311
Nitre capable of ſeparating all the cobalt from nickel.

It having appeared from this and ſome other experiments, that nitre was capable of diſcovering the ſmalleſt quantity of cobalt contained in nickel the products of the former operations were now ſubjected to its action. The regulus produced by repeated ſcorification thus became a little blue; that diſſolved in volatile alkali (to be afterwards particularly mentioned) diſcovered a conſiderable quantity of cobalt; nor was there any one which did not thus diſcover more or leſs of that ingredient by this trial.

V. By Sal Ammoniac.

1312
Effect of ſal ammoniac

A calx of nickel, ſo much freed from cobalt that it did not tinge borax in the leaſt, mixed with twice its weight of ſal ammoniac, yielded by ſublimation with a ſtrong red heat, two kinds of flowers; one, which roſe higher than the other, was of an aſh colour; the other white. The bottom of the glaſs was ſtained of a deep hyacinthine colour; the reſiduum was divided into two ſtrata; the upper one yellow, ſcaly, and ſhining like moſaic gold. With borax it afforded an hyacinthine glaſs, but not regulus; and in a few days liquefied in the air, acquiring a green colour and the conſiſtence of butter. The reſiduum ſhowed the ſame properties with calx of nickel; and the green ſolution ſhowed no veſtiges of iron with galls, but became blue with volatile alkali; which was alſo the caſe with the flowers. The lower ſtratum contained a calx, blackiſh on the upper part, but of a ferruginous brown in the under, with a friable and ſcarcely magnetic regulus, of a reddiſh white. The blackiſh calx yielded an hyacinthine glaſs with borax. Part of this ſtratum ſublimed with twice its quantity of ſal ammoniac; and with the ſame degree of heat as before, yielded flowers of a very fine white, with a reſiduum of ferruginous brown, greeniſh on the upper part towards the ſides of the veſſel, the bottom being ſtained of an hyacinthine colour as before. Twenty parts of ſal ammoniac being added to a part of the inferior ſtratum reduced, the whole was ſublimed in a retort; a blackiſh powder remained, which became green by calcination, and of an hyacinthine colour by ſcorification, as did alſo the bottom of the containing veſſel. The ſublimation being twice repeated, uſing a double quantity of ſal ammoniac each time, the calx became at length very green, diſſolving with the ſame colour in the nitrous acid, and yielding by reduction a white, brittle, and very little magnetic regulus. In all theſe ſublimations, it was obſerved, that the volatile alkali roſe firſt; then ſal ammoniac; and, laſtly, a part of the marine acid was forced over by the violence of the heat.

VI. With Nitrous acid.

1313
Effects of antimony.

Having obtained a ſalt by cryſtallization from nickel diſſolved in nitrous acid, part of this was calcined with charcoal duſt in a proper veſſel, and during the operation a large quantity of arſenic was diſſipated; a grey, ſemiductile, and magnetic regulus being obtained after reduction. A brittle regulus was obtained after a ſecond ſolution, precipitation, and reduction; but by a third operation it became again ſemiductile and magnetic. By repeating this proceſs a fourth and fifth time, the quantity became ſo much diminiſhed that it could no longer be tried. In all theſe ſolutions a blackiſh reſiduum appeared; which, when ſuffered to remain in the acid, grew white by degrees; but when edulcorated and laid on a burning coal, exhaled a ſulphureous ſmoke, and left a black powder ſoluble in the nitrous acid.

VII. By volatile Alkali.

1314 Volatile alkali.

Four hundred and eighty-ſeven parts of a calx of nickel, produced by diſſolving Cronſtedt's regulus in nitrous acid, and precipitating the ſolution by a fixed alkali, being immerſed for 24 hours in a quantity of volatile alkali, yielded a reſiduum of fifty, having a blackiſh green colour. The ſolution, which was blue, by filtration and inſpiſſation yielded a powder of a light blue colour, weighing 282; which, reduced with black flux, produced a white, ſemiductile, and highly magnetic regulus, weighing 35, whoſe ſpecific gravity was 7.000. The ſcoriæ were of a light red: but when mixed with borax, put on an hyacinthine colour, and yielded a regulus weighing 30. The two reguli united together proved very refractory; ſo that the maſs could not be melted by the blow-pipe, even with the addition of borax. It ſent forth neither an arſenical nor ſulphureous ſmell on the addition of charcoal-duſt; but, on a ſucceeding reduction, yielded hyacinthine ſcoriæ; and the remaining flocculi, diſſolved in nitrous acid, affording a very green ſolution, which, on the addition of volatile alkali, yielded a powder of the ſame colour.

From 50 parts of the blackiſh green reſiduum, 13 of a clear white, brittle, ſquamous, and little magnetic regulus, were obtained, the ſpecific gravity of which was 9.333. At the bottom of the veſſel was found a ſcoria of an obſcurely blue colour, with the upper part hyacinthine. It was eaſily fuſed; and tinged borax, firſt blue, then of a hyacinth colour, upon which it became more ſtrongly magnetic. By the aſſiſtance of heat it diſſolved in nitrous acid, forming a ſolution of a beautiful blue colour. A black powder at firſt floated in the liquor, but became white, and fell to the bottom. After edulcoration it was for the moſt part diſſipated, with a ſulphureous ſmell, on being expoſed to the fire; a little brown-coloured maſs, ſoluble in volatile alkali, remaining at bottom. This ſolution was precipitated by phlogiſticated alkali, and a powder thrown down of the colour of calx of nickel, which ſoon grew blue with volatile alkali.

1315 Nickel cannot be obtained in a ſtate of purity.

From all theſe experiments it appears, that nickel cannot be obtained in a ſtate of purity by any means hitherto known. From every other ſubſtance, indeed, it may be ſeparated, except iron; but this reſiſts all the operations hitherto deſcribed, and cannot be diminiſhed beyond certain limits. The magnet not only readily diſcovers its preſence, but ſome portions of the regulus itſelf becomes magnetic; but the tenacity and difficulty of fuſion, which increaſe the more in proportion to the number of operations, plainly ſhow that there is no hope of ſeparating the whole quantity, unleſs we ſuppoſe the regulus of nickel itſelf to be attracted by the magnet; and there is certainly a poſſibility that one other ſubſtance beſides iron may be attracted by the magnet. The great difficulty, or rather impoſſibility, of obtaining it in a ſtate of purity, naturally raiſes a ſuſpicion of its not being a diſtinct ſemimetal, but a mixture of others blended together; and on this ſubject our author agrees in opinion with thoſe who ſuppoſe it to be a compound of other metals. Indeed, Mr Bergman is of opinion, that "nickel, cobalt, and manganeſe, are perhaps no other than modifications of iron." And in order to aſcertain this, he made the following experiments.

1316 Bergman's opinion of the compoſition of nickel.

1317 Experiments to compoſe nickel artificially.

1. Equal parts of copper, of the gravity of 9.3243, and iron of 8.3678, united by fuſion with black flux, yielded a red maſs, whoſe ſpecific gravity was 8.5441; and which tinged nitrous acid firſt blue, then green, afterwards yellow, and at laſt of an opaque brown. 2. Two parts of copper and one of iron had a ſpecific gravity of 8.4634; the mixture yielding firſt a blue, and then a green ſolution. 3. Equal parts of copper and iron, of the ſpecific gravities already mentioned, with another part of cobalt whoſe gravity was 8.1500, yielded a metal of the gravity of 8.0300, imparting a brown colour to the ſolution. 4. Two parts of arſenic of 4.000, added to one of copper and another of iron, gave a brittle metal of 8.0468, which formed a blue ſolution. 5. One part of copper, one of iron, two of cobalt, and two of white arſenic, gave a brittle regulus of 8.4186; the ſolution of which was browniſh, and ſeparated in part ſpontaneouſly. 6. One part of copper, one of iron, four of cobalt, and two of white arſenic, formed a maſs of 8.5714. The ſolution was ſomewhat more red than the former; and a ſimilar effect took place on repeating the experiment, only that the ſpecific gravity of the metal was now 8.2941. 8. One part of iron and four of white arſenic formed a metal which diſſolved with a yellow colour; and, on the addition of Pruſſian alkali, immediately let fall a blue ſediment. 9. One part of copper, eight of iron, ſixteen of white arſenic, and four of ſulphur, united by fire, on the addition of black flux, yielded a maſs which, though frequently calcined and reduced, produced nothing but brown or ferruginous calces. It acquired a greenneſs with nitrous acid; but on the addition of phlogiſticated alkali depoſited a Pruſſian blue. 10. One part of iron was diſſolved in ſix of the nitrous acid, and likewiſe ſeparated by one part of copper and one of the calcined ore of cobalt, in the ſame quantity of the ſame acid. The whole of the ſolution of iron was then mixed with five parts of the ſolution of copper, whence a green and ſaturated nickel colour was produced; which, however, on the addition of three parts of the ſolution of cobalt, became evidently obſcured. The alkaline lixivium dropped into this threw down at firſt a ferruginous brown ſediment, the ſolution ſtill remaining green: afterwards all the blue was precipitated; by which at firſt all colour was deſtroyed, but afterwards a red appeared, occaſioned by the cobalt diſſolved in the alkaline ſalt. The ſediment, when reduced, yielded a regulus ſimilar to copper, and at the ſame time ductile, which tinged both glaſs and nitrous acid of a blue colour. If a ſaturated ſolution of nickel be mixed with half its quantity of ſolution of cobalt, the green colour is much obſcured; but four parts of the former, on the addition of three of the latter, put off all appearances of nickel. See the article NICKEL.

§ 14. *Of* PLATINA.

1318 The heavieſt of all metals.

THE properties of this metal have not as yet been thoroughly inveſtigated by chemiſts, and there is therefore ſome diſagreement concerning them. Formerly it was ſuppoſed to be inferior in ſpecific gravity to gold;

gold; but now is generally allowed to be ſuperior in that reſpect by little leſs than a fourth part; being to water in the proportion of 23 to 1 when perfectly freed from all heterogeneous matters. Mr Bergman ſays that its colour is that of the pureſt ſilver. The very ſmall globules of it are extremely malleable; but when many of theſe are collected together, they can ſcarcely be ſo perfectly fuſed as to preſerve the ſame degree of malleability. They are not affected by the magnet in the leaſt, nor can they be diſſolved in any ſimple menſtruum excepting dephlogiſticated marine acid. As it is commonly met with, however, platina has the form of ſmall grains, its plates of a bluiſh black, whoſe colour is intermediate betwixt thoſe of ſilver and iron. Theſe grains are mixed with many foreign ſubſtances, as particles of gold, mercury, and blackiſh ferruginous, ſandy grains, which by the magnifier appear ſcorified. The grains themſelves, when examined by a magnifying glaſs, appear ſometimes regular, ſometimes round and flat, like a kind of button. When beat on the anvil, moſt of them are flattened and appear ductile; ſome break in pieces, and on being narrowly examined appear to be hollow, and particles of iron and a white powder have been found within them: and to theſe we muſt attribute the attraction of platina by the magnet; ſince, as we have already obſerved, pure platina is not attracted by it.

1319
Inſoluble except by dephlogiſticated marine acid.

1320
Found in ſmall grains intermixed with foreign ſubſtances.

1321
Mr Bergman's experiments on this metal.

Mr Bergman, who carefully examined this metal, diſſolved it firſt in aqua-regia compoſed of the nitrous and marine acid. The ſolution at firſt exhibits a yellow colour, but on approaching to ſaturation became red, and the redneſs increaſes as the liquor becomes more loaded with metal. Cryſtals are produced by evaporation of a deep red colour, generally in ſmall angular and irregular grains, whoſe true ſhape cannot be diſcovered. Their appearance is ſometimes oqaque and ſometimes pellucid. After theſe are once formed, they are extremely difficult of ſolution, requiring much more water than even gypſum itſelf for this purpoſe.—The ſolution is not precipitated by vegetable fixed alkali, nor does the latter affect the cryſtals, except very faintly by digeſtion with them in a cauſtic ſtate. Aerated mineral alkali takes them up and grows yellow, but without depoſiting any thing, though it decompoſes them at laſt by evaporating to dryneſs.

1322
Cryſtals of platina may be decompoſed by mineral but not vegetable fixed alkali.

On the addition of a ſmall quantity of vegetable fixed alkali, either mild or cauſtic, ſmall red cryſtals ſoluble in water, and ſometimes of an octohedral figure, are depoſited. They are decompoſed with difficulty by the mineral alkali, but not at all by the vegetable. If a larger quantity of ſalt is added at firſt, an inſoluble ſpongy matter of a yellow colour is precipitated. Cryſtalline particles of the ſame kind are thrown down by an alkali ſaturated either with the vitriolic, nitrous, marine, or acetous acids, though all the platina cannot thus be ſeparated from the menſtruum.

1323
Solution in aqua-regia made with nitrous acid and that of ſea-ſalt.

Aqua-regia, compoſed of nitrous acid and common ſalt, diſſolved the metal with equal facility as the former; only the ſolution was more dilute, and a yellow powder floated on the ſurface, a larger quantity being found at the bottom. On adding vegetable fixed alkali to the clear ſolution, a copious yellow powder, ſoluble in a large quantity of water, was depoſited. A powder, of a ſimilar kind, was precipitated, tho' more ſlowly, and more of a cryſtalline nature; but mineral alkali, though uſed in much larger quantity, did not make any alteration. The collected powder was yellow, and agreed in property with that ſeparated ſpontaneouſly in a former experiment.

1324
In a liquor compoſed of nitre and ſpirit of ſalt.

On repeating the experiment with nitre and depurated ſpirit of ſalt, inſtead of nitrous acid and ſea-ſalt, the platina was diſſolved into gold-coloured liquor, a greeniſh coloured granulated matter falling to the bottom, and the finer part of the ſame riſing to the top. After ſaturating the ſuperfluous acid, a metallic calx, inſoluble in water, was thrown down by the vegetable alkali. The green powder is ſoluble in water, and is of the ſame nature with the precipitate thrown down by the vegetable alkali.

1325
Cryſtalline powder precipitated by vegetable alkali from ſolution of the calx in marine acid;

Platina precipitated from aqua-regia by a ſufficient quantity of mineral alkali, the precipitate waſhed and diſſolved in marine acid, on the addition of vegetable alkali immediately lets fall a cryſtalline powder, as it does alſo with nitre and other ſalts, having the vegetable alkali for their baſis. The caſe is the ſame with calx of platina, diſſolved in vitriolic acid. Nitrous acid alſo diſſolves the calx of platina, but does not yield any diſtinct ſaline precipitate without the aſſiſtance of marine acid.—The above phenomena are likewiſe produced by the precipitate thrown down by the vegetable alkali after the ſaline powder has been depoſited.

1326
But not from the ſolution in nitrous acid.

1327
This precipitate a kind of triple ſalt.

From theſe experiments our author concludes, 1. That the precipitate which is firſt thrown down, on the addition of vegetable alkali to ſolutions of platina, is a ſaline ſubſtance, and different from the calx of the metal. 2. That this ſaline precipitate is compoſed of calcined platina, marine acid, and vegetable alkali. 3. By means of vitriolic acid, a precipitate analogous to this may be obtained, compoſed of calcined platina, vegetable alkali, and vitriolic acid. 4. The whole ſolution of platina cannot be precipitated by vegetable alkali in form of a triple ſalt; but after paſſing a certain limit, a metallic calx in the uſual way is produced.

1328
Whether mineral alkali can ſeparate platina from its ſolvent.

As it has been denied by Margraaf and Lewis that mineral alkali is capable of ſeparating platina from its acid, our author was induced to attend particularly to this circumſtance. Having therefore tried the common ſolution with mineral alkali, he found that each drop excited a violent effervescence, and at laſt that a yellow ſpongy matter, affording a genuine calx of platina, was precipitated: this was more ſpeedily effected by uſing the dry mineral alkali, which had fallen to powder of itſelf. To determine, however, the difference betwixt the two alkalies in a more accurate manner, he divided a very acid ſolution of platina into two equal parts. To one of theſe, he added ſmall portions of the vegetable, and to the other an equal weight of pieces of mineral alkali, waiting five minutes after every addition, till the effervescence ſhould fully ceaſe. After the firſt addition, ſmall cryſtals appeared; in the former partly on the ſurface, and partly in the bottom; but in the latter no precipitate could be obſerved until 56 times the quantity of vegetable alkali had been added. The difference, however, was even greater than what appears from this experiment; for the vegetable alkali was cryſtallized, and therefore charged with the water neceſſary to its cryſtalline form;

1329
Fifty-ſix times as much mineral alkali required to precipitate platina as of vegetable alkali.

form; whereas the mineral alkali was ſpontaneouſly calcined: and though, in equal quantities of theſe two alkalies, the purely alkaline parts are as 3 to 2, yet three parts of vegetable alkali ſaturated only 1.71 of this aqua-regia, while two of the mineral alkali took up about 2.6.

1330
Effects of the volatile alkali.

The volatile alkali firſt throws down this metal in a ſaline form; the grains ſometimes diſtinctly octohedral. Their colour is red when that of the ſolution is ſo, but yellow when the ſolution is more dilute. After ſaturating the ſuperabundant acid, the ſame alkali precipitates the platina truly calcined. This precipitate is diſſolved in water, though with difficulty, and may be reduced to more regular cryſtals by evaporation. Theſe are diſſolved by the mineral alkali; but hardly any ſigns of decompoſition are to be obſerved, unleſs the yellow ſolution, evaporated to dryneſs, be again diſſolved in water; for then the metallic calx reſts at the bottom, and the ſolution is deprived of its yellow colour. The vegetable alkali has ſcare any effect in this way; for, after repeated exſiccation, the ſolution remains clear and yellow: but here probably the fixed alkali takes the place of the volatile; for in larger quantities, and eſpecially when the cauſtic vegetable alkali is made uſe of, the mixture ſmells of volatile alkali.

1331
Platina partly precipitated by neutral ſalts.

The volatile alkali, ſaturated with any acid, precipitates the platina in the ſame manner as the vegetable alkali in combination with acids: but theſe neutral ſalts precipitate only a determined quantity of platina; for after their effect has ceaſed, the liquor lets fall a pure calx of platina on the addition of vegetable or volatile alkali.

1332
Triple ſalts formed by this metal.

The calx of platina precipitated by mineral alkali, and then diſſolved in any ſimple acid, ſhows nearly the ſame phenomena with volatile alkali as with the vegetable alkali. "Whence (ſays Mr Bergman) we may conclude, that platina diſſolved in acids forms at firſt, both with the volatile and fixed vegetable alkali, a triple ſalt, difficult of ſolution, and which therefore almoſt always falls to the bottom unleſs the quantity of water be very large." Calcareous earth, whether aerated or cauſtic, produces the ſame phenomena as the mineral alkali, without any cryſtalline appearance.

1333
Platina the moſt infuſible ſubſtance in the world.

Platina has been remarkable ever ſince its firſt diſcovery for being the moſt infuſible ſubſtance in the world. Meſſrs Macquer and Beaumé kept it in the moſt violent heat of a glaſs-houſe furnace for ſeveral days without perceiving any other alteration than that its grains adhered ſlightly to each other; but the adheſion was ſo ſlight that they ſeparated even by touching. In theſe experiments the colour of the platina became brilliant by a white heat, but acquired a dull grey colour after it had been heated for a long time. They obſerved alſo, that its weight was conſtantly increaſed; which undoubtedly aroſe from the calcination of the iron it contained. Dr. Lewis, after various attempts to fuſe platina, found himſelf unable to ſucceed even in a fire which vitrified bits of glaſs-houſe pots and Heſſian crucibles.

1334
Firſt melted by a burning mirror.

Meſſrs Macquer and Beaumé firſt melted this refractory metal with a large burning-glaſs, 22 inches diameter and 28 inches focus. The power of this ſpeculum was almoſt incredible, and far exceeded what is related of the lens of Tſchirnhauſen or the mirror of Villette. Its general effects are related under the articl *Burning-Glaſs*. And as platina reſiſted this intenſe heat more than ſix times as long as the moſt unfuſible ſubſtances formerly known, it appears to require a fire as many times ſtronger to melt it.

1335
May be vitrified by electric fire.

It has been found, however, capable not only of fuſion but of vitrification by the electric fire; and that it may alſo be melted by fire excited by dephlogiſticated air:

1336
Its precipitate fuſible in a common forge.

but M. de Liſle was the firſt who was able to melt it with the heat of a common forge when expoſed to the blaſt of a double bellows in a double crucible. Thus its real ſpecific gravity began firſt to be known. It muſt be obſerved, however, that this fuſion was not performed on common platina, but on ſuch as had been diſſolved in aqua-regia and precipitated by means of ſal ammoniac. M. Morveau repeated the experiment, and from 72 grains of platina obtained a regulus weighing 50½; which ſeemed to have undergone a very imperfect fuſion; for it did not adhere to the crucible or take its form, but ſeemed to be merely platina revived. Its ſpecific gravity was alſo found to be no more than 10.045; but it was nearly as malleable as ſilver; and when it had been ſufficiently hammered, its ſpecific gravity was augmented to no leſs than 20.170, which is more than that of gold itſelf.

1337
This precipitate, or even crude platina, fuſible by the aſſiſtance of fluxes.

M. Morveau found that he could melt the precipitate with different fluxes, ſuch as a mixture of white glaſs, borax, and charcoal, and a mixture of white glaſs and neutral arſenical ſalt: and that the regulus thus obtained was more completely fuſed, but was not malleable, and obeyed the magnet; but the regulus obtained without addition did not ſhow this mark of containing iron. He alſo found, that by means of the abovementioned flux of white glaſs, borax, and charcoal, he could melt crude platina. Since that time the fuſion of platina has been accompliſhed by various chemiſts, and with different fluxes; and in proportion to the degree of purity to which the metal has been reduced, its ſpecific gravity has alſo increaſed; ſo that it is now ſettled at 23, that of fine gold being 19.

1338
Alloyed by Dr Lewis with other metals.

Though Dr Lewis could not accompliſh the fuſion of platina by the methods he attempted, he was nevertheleſs able to alloy it with other metals. Equal parts of gold and platina may be melted together by a violent fire, and the mixed metal formed into an ingot by pouring it into a mould. It is whitiſh, hard, and may be broken by a violent blow; but when carefully annealed, is capable of conſiderable extenſion under the hammer.

1339
With gold.

Four parts of gold with one of platina form a compound much more fuſible than the former, and likewiſe more malleable; ſo that it may be extended into very thin plates without being broken or even ſplit at the edges. Dr Lewis remarks alſo, that though in this caſe it be alloyed with ſuch a quantity of white metal, it nevertheleſs appears no paler than guineas uſually are, which contain only one-twelfth of ſilver.

1340
With ſilver.

Equal parts of ſilver and platina melted together with a violent fire, form a much harder and darker-coloured maſs than ſilver, which has alſo a large grain, though it preſerves ſome ductility. Seven parts of ſilver with one of platina form a compound much more reſembling ſilver than the other; but ſtill coarſer-grained and leſs white. From the experiments made on ſilver, however, it appears that no perfect union is formed betwixt the two; for after the mixture has been kept in fuſion for a conſiderable time, moſt of the platina ſeparates and falls to the bottom. Lewis obſerved that ſilver melted with platina was thrown up with an exploſion againſt the ſides of the crucible.

1341 Copper conſiderably improved by union with platina.

Silver did not appear to be in any degree meliorated by its union with this metal, excepting by the ſuperior hardneſs communicated to it; but copper ſeemed to be conſiderably improved. A large proportion of platina, indeed, as two-thirds or equal parts, produced an hard, brittle, and coarſe-grained compound; but when a ſmaller quantity of platina is added, as from $\frac{1}{6}$ to $\frac{1}{25}$, or even leſs, a golden-coloured copper is produced, very malleable, harder, ſuſceptible of a finer poliſh, ſmoother-grained, and much leſs ſubject to calcination and ruſt than pure copper.

1342 Unites moſt readily with zinc;

Of all metallic matters, however, zinc moſt readily unites with platina, and is moſt effectually diſſolved by fuſion. When the proportion of platina is conſiderable, the metal is of a bluiſh colour, the grain cloſer, without tarniſhing or changing colour in the air, and they have not even the malleability of the ſemimetal.

1343 And with the compound metals.

Platina unites readily with the compound metals, braſs formed of copper and zinc, and bronze made of copper and tin. In the latter it was remarkable, that the compound metal took up more platina than both its ingredients ſeparately can do. This compound was hard and capable of receiving a fine poliſh, but is ſubject to tarniſh.

1344 The compound of braſs and platina a proper material for ſpeculums.

Equal parts of braſs and platina formed a compound very hard, brittle, capable of receiving a fine poliſh, and not ſubject to tarniſh. It is poſſible therefore that it might be uſed to advantage as a material for ſpeculums; all materials for which, hitherto diſcovered, have the great inconvenience of tarniſhing in the air, and that very quickly.

1345 Can ſcarce be united with mercury.

Platina amalgamates with mercury, but with much greater difficulty than gold, which will alſo ſeparate the quickſilver after it has been united with the platina. The amalgamation of platina does not ſucceed but by very long trituration of the metals with water, as for inſtance a week; but if the trituration be performed with a mixed metal compoſed of gold and platina, the mercury ſeizes the gold, and leaves the platina untouched. Dr Lewis propoſes this as a method of ſeparating gold from platina; and it is that uſed in Peru, where gold and platina are ſometimes naturally mixed in the ore; but we do not know whether this ſeparation be quite complete.

1346 Mercury leaves platina to unite with gold.

1347 May be united with forged and caſt iron;

Mr Morveau ſucceeded in uniting iron with platina, though Dr Lewis could not accompliſh this. The latter ſucceeded, however, in uniting it with caſt iron. The compound was much harder and leſs ſubject to ruſt than pure iron. It was alſo ſuſceptible of a much finer poliſh.

1348 And with tin, lead, or biſmuth:

Platina may be alloyed with tin, lead, or biſmuth, but without any advantage. To lead and tin it gives the property of aſſuming blue, violet, or purple colours, by being expoſed to the atmoſphere.

Dr Lewis could not ſucceed in uniting platina with arſenic; but M. Scheffer affirms, that if only one twentieth of arſenic be added to platina when red hot in a crucible, the two ſubſtances will be perfectly fuſed and united into a brittle grey maſs. This experiment did not ſucceed with Mr Margraaf; for he, having expoſed to a violent fire during an hour a mixture of an ounce of platina with a fuſible glaſs, compoſed of eight ounces of minium, two ounces of flints, and one ounce of white arſenic, obtained a regulus of platina well united and fuſed, weighing an ounce and 32 grains; the ſurface of which was ſmooth, white, and ſhining, and the internal parts grey; but which nevertheleſs appeared ſufficiently white when filed. The experiment ſucceeded imperfectly alſo in the hands of Dr Lewis; but M. Fourcroy informs us, that "it has ſince been repeated, and that platina is in fact very fuſible with arſenic, but that it remains brittle. In proportion as the arſenic is driven off by the continuance of the heat, the metal becomes more ductile; and by this proceſs it is that M. Achard and M. de Morveau ſucceeded in making crucibles of platina by melting it a ſecond time in moulds." (A)

1349 May be melted by means of arſenic.

1350 Fourcroy denies that platina can be united with mercury.

M. Fourcroy ſeems to deny that platina can be united with mercury, contrary to what is mentioned above. "Platina (ſays he) does not unite with mercury, though triturated for ſeveral hours with that metallic fluid. It is likewiſe known, that platina reſiſts the mercury uſed in America to ſeparate the gold. Many intermediums, ſuch as water, uſed by Lewis and Beaumé, and aqua-regia by Scheffer, have not been found to facilitate the union of theſe two metals. In this reſpect platina ſeems to reſemble iron, to whoſe colour and hardneſs it likewiſe in ſome meaſure approaches." This laſt ſentence, however, ſeems very little to agree with what he himſelf had before told us of M. Macquer's experiment of melting platina. "The melted portions (ſays he) were of a white brilliant colour, in the form of a button; they could be *cut to pieces* with a knife." This ſurely was a very ſmall approach to the hardneſs of iron; and gives us an idea rather of the conſiſtence of tin or lead. "One of theſe maſſes was flattened on the anvil, and converted into a thin plate without cracking or breaking, but it became hard under the hammer." In another experiment indeed the button of platina was brittle, and ſufficiently hard to make deep traces in gold, copper, and even iron; but this was obtained from precipitated platina urged for 35 minutes by a ſtrong blaſt furnace. In an experiment of this kind M. Beaumé even ſucceeded in melting the precipitate along with certain fluxes, into a vitriform ſubſtance by two different proceſſes. The precipitate of platina, mixed with calcined borax, and a very fuſible white glaſs, was expoſed, for 36 hours, in the hotteſt part of a potter's furnace; and afforded a greeniſh glaſs, inclining to yellow, without globules of reduced metal. This glaſs, treated a ſecond time with cream of tartar, gypſum, and vegetable alkali, was completely melted, and exhibited globules of platina diſperſed through its ſubſtance. M. Beaumé ſeparated them by waſhing, and found them ductile. The ſame chemiſt afterwards, together

1351 Inconſiſtent in his account of its hardneſs.

1352 Precipitated platina vitrified by M. Beaumé

(A) For a particular account of this proceſs ſee before n° 587.

gether with M. Macquer, expoſed precipitate of platina to the ſame burning mirror with which they had fuſed the metal: the precipitate exhaled a very thick and luminous fume, with a ſtrong ſmell of aqua-regia: it loſt its red colour, reſumed that of platina, and melted into a perfect brilliant button, which was found to be an opaque vitreous ſubſtance, of an hyacinthine colour at its ſurface, and blackiſh within; and may be conſidered as a true glaſs of platina. It may however be obſerved, that the ſaline matters with which it was impregnated contributed doubtleſs to its vitrification.

1353 Precipitate by ſal ammoniac fuſible in a ſtrong forge heat.

1354 This fuſion ſuppoſed by Macquer not to be perfect.

“ The orange-coloured precipitate obtained by pouring a ſolution of ſal ammoniac into a ſolution of platina, appears to be a ſaline ſubſtance entirely ſoluble in water. This precipitate has a valuable property, diſcovered by M. de l'Iſle, viz. that it is fuſible without addition in a good furnace or common forge-heat. The platina melted by this proceſs is a brilliant, denſe, and cloſe-grained button; but it is not malleable unleſs it has been expoſed to a very ſtrong heat. Macquer thinks that this fuſion, like that of the grains of platina alone, expoſed to the action of a violent fire, conſiſts only in the agglutination of the ſoftened particles; which being exceedingly more divided and minute than the grains of platina, adhere to and touch each other in a greater number of points than the grains; and in that manner render the texture of the metal much more denſe, though no true fuſion may have taken place. It ſeems, however, that if platina in grains be capable of fuſion by the burning-glaſs, and of becoming conſiderably ductile, the precipitate of this metal, formed by ſal ammoniac may likewiſe be fuſed on account of its extreme diviſion; and that its not being as ductile as the button of platina fuſed by the ſolar heat, may perhaps depend on its retaining a part of the matter it carried down with it in precipitation, of which it may be poſſible to deprive it by fire.”

1355 Attempts to purify platina by cupellation

It being ſo extremely difficult to bring platina itſelf into fuſion, one of the firſt attempts to purify it was by cupellation with lead. Thus the baſer metals would be ſcorified; and, running through the crucible along with the lead, leave the platina in as great purity as though it had been melted by itſelf. This operation, however, was found almoſt equally difficult with the fuſion of the metal by itſelf. Lewis failed in the experiment, though he applied the moſt violent heat of the ordinary cupelling furnaces. The vitrification and abſorption of the lead indeed took place as uſual; but in a ſhort time the platina became fixed, and could not by any means be rendered fluid. Meſſrs Macquer and Beaumé ſucceeded by expoſing an ounce of platina with two ounces of lead in the hotteſt part of a porcelain furnace, where the fire is continued for 50 hours without intermiſſion. At the end of the operation the platina was flattened in the cupel; its upper ſurface was dull and rough, and eaſily ſeparated; but its under ſurface was brilliant, and it was found eaſily to extend under the hammer; and on every chemical trial was found to be perfectly pure without any mixture of lead. M. de Morveau likewiſe ſucceeded in cupelling a mixture of one drachm of platina and two drachms of lead in M. Macquer's wind-furnace. The operation laſted eleven or twelve hours, and a button of platina was obtained which did not adhere to the cupel, was uniform, though rather rough, and of a colour reſembling tin. It weighed exactly one drachm, and was not at all acted upon by the magnet. Thus it appears that platina may be obtained in plates or laminæ, which may be forged, and conſequently may be employed in making very valuable utenſils; and this the more eſpecially as Mr Beaumé has obſerved that different pieces of it may be welded and forged like iron. After having heated two pieces of pure cupelled platina to whiteneſs, he placed them one upon the other, and ſtriking them briſkly with a hammer, found that they united together as quickly and firmly as two pieces of iron would have done.

1356 Of the poſſibility of adulterating gold with platina.

1357 Methods of detecting this fraud if it ſhould be practiſed.

The great ſpecific gravity of platina has rendered it a very deſirable matter for ſuch as wiſh to adulterate the precious metal, and can procure the platina eaſily. This, however, can only be done in South America, where platina is met with in plenty. In Europe the ſcarcity of platina renders it a more valuable object than even the gold itſelf. Fears of this fraud, however, have undoubtedly given occaſion to the prohibition of exporting it. There are great differences among chemiſts concerning the quantity of platina that can be mixed with gold without deſtroying the colour of the latter. Dr Lewis, as has already been obſerved, informs us, that four parts of platina may be mixed with one of gold, and yet the mixture be no paler than that for guineas; while Fourcroy aſſerts, that “it greatly alters the colour of the metal, unleſs its quantity be very ſmall: thus, for example, a 47th part of platina, and all the proportions below that, do not greatly affect the colour of the gold.” But whether this be the caſe or not, chemiſtry has afforded various ways of ſeparating even the ſmalleſt proportion of platina from gold; ſo that there is now no reaſon to prohibit the importation of it to Europe, more than that of any other metal with which gold can be alloyed. The following are the methods by which the platina may be moſt readily diſcovered: 1. By amalgamating the ſuſpected metal with mercury, and grinding the mixture for a conſiderable time with water; by which the platina will be left, and the gold remain united with the quickſilver. 2. By diſſolving a little of it in aqua-regia, and precipitating with alkaline ſalt; the remaining liquor, in caſe the metal has been adulterated with platina, will be ſo yellow, that it is ſuppoſed a mixture of one thouſandth part would thus be found out. 3. By precipitation with ſal ammoniac, which throws down the platina but not the gold. If mineral alkali be uſed, the gold will be precipitated, but not the platina, unleſs the precipitant is in very large quantity. 4. By precipitation with green vitriol, which throws down the gold, and leaves the platina united with the menſtruum.

1358 Platina moſt eaſily diſcoverable by its great ſpecific gravity.

All theſe methods, however, are not only attended with a conſiderable deal of trouble, but in ſome caſes, for inſtance in ſuſpected coin, it might not be eligible to uſe them. The hydroſtatic balance alone affords a certain method of diſcovering mixtures of metals without hurting the texture of their parts. The great ſpecific gravity of platina would very readily diſcover it if mixed with gold in any moderate quantity; and even in the ſmalleſt, the gravity of the maſs could never be leſs than that of the pureſt gold: which circumſtance

cumſtance alone, as gold is never worked without alloy, would be ſufficient to create a juſt ſuſpicion; after which ſome of the methods already mentioned might be tried. It is poſſible, however, that the hardneſs and ductility of platina might render it more proper for alloying gold than even copper or ſilver, uſually made uſe of for this purpoſe.

§ 15. *Of Manganese.*

1359 New ſemi-metal afforded by manganeſe.

This ſubſtance is now diſcovered to afford a ſemi-metal different from all others, and likewiſe to poſſeſs ſome other properties of a very ſingular kind. Mr Scheele has inveſtigated its nature with the utmoſt care; and the reſult of his inquiries are as follows:

1360 Properties of the common manganeſe treated with vitriolic acid.

1. Two drachms of levigated manganeſe, digeſted for ſeveral days in a diluted vitriolic acid, did not appear to be diſſolved or diminiſhed in quantity; nevertheleſs a yellowiſh white precipitate was procured by ſaturating the acid with fixed alkali. The remaining manganeſe was not acted upon by more of the ſame acid, but the addition of another half ounce nearly deſtroyed the acidity of the menſtruum when boiled upon it.

2. With concentrated vitriolic acid an ounce of manganeſe was reduced to a maſs like honey, and then expoſed to the fire in a retort till it became red-hot. Some vitriolic acid came over into the receiver; and after breaking the retort, a maſs was found in it weighing 12½ drachms, hard and white in the inſide, but red on the outſide. A great part of it diſſolved in diſtilled water, on the affuſion of which at firſt it became very hot. The reſiduum after edulcoration weighed a drachm and an half, and was of a grey colour. Being calcined in a crucible with concentrated vitriolic acid till no more vapours aroſe, it was all diſſolved by water excepting one drachm; which being again calcined with the ſame acid, an inſoluble reſiduum of a white colour, and weighing only half a drachm, remained. This white reſiduum efferveſced with borax, and melted into a tranſparent brown glaſs; it likewiſe efferveſced with fixed alkali, changing into a brown maſs, which yielded an hepatic ſmell with acids, and became at the ſame time gelatinous. The ſolution obtained by calcination was evaporated and ſet to cryſtallize. A few ſmall cryſtals of ſelenite were firſt depoſited, and afterwards ſome very fine large cryſtals of an oblique parallelopiped form, whoſe number increaſed as long as there was any liquid left. They taſted like Epſom ſalt, and Mr Weſtfeld ſuppoſes them to be alum; but according to Mr Scheele, they have no other reſemblance to alum than that they contain the vitriolic acid.

1361 Entirely diſſolved by phlogiſticated vitriolic acid.

3. By phlogiſticated vitriolic acid the manganeſe was entirely diſſolved. To procure this acid in purity, Mr Scheele dipped ſome rags in a ſolution of alkali of tartar, and after ſaturating them with the fumes of burning brimſtone, put them into a retort, pouring on them ſome diſſolved acid of tartar, luting on a receiver which contained levigated manganeſe and water. After a warm digeſtion of only one day, the liquid of the receiver had become as clear as water, and a little fine powder, conſiſting principally of ſiliceous earth, fell to the bottom.

4. Two drachms of levigated manganeſe, digeſted for ſeveral days with an ounce of pure colourleſs acid of nitre, did not appear to have deprived the menſtruum of its acidity, or to have been affected by it in any degree. The liquor being diſtilled off, and the product of the diſtillation poured back on the reſiduum, a ſmall quantity of it was diſſolved. By a third diſtillation, and pouring back the liquor on the reſiduum, a complete ſolution was effected; and this quantity of acid appeared capable of diſſolving nine drachms of the powder.

1362 Precipitate and cryſtals obtained from the ſolution.

5. The ſolution of manganeſe thus ſaturated, was filtered and divided into two equal portions. Into one of theſe ſome drops of vitriolic acid were poured, by which a fine white powder was thrown down, which, however, did not ſettle to the bottom for ſome hours. It was ſoluble neither in boiling water nor in acids. The limpid ſolution, by evaporation, yielded ſome ſmall cryſtals of ſelenite or gypſum.

6. From the other half of this ſolution, after evaporation by a gentle heat, about ten grains of ſmall ſhining cryſtals of a bitter taſte were obtained. On pouring ſome drops of vitriolic acid into the ſolution inſpiſſated by gentle heat, no precipitation, excepting of a little ſelenite, enſued; but as ſoon as it was inſpiſſated to the conſiſtence of honey, ſome fine acicular cryſtals, verging towards the ſame centre, began to form, but grew ſoft, and deliqueſced in a few days after.

1363 Manganeſe diſſolved by phlogiſticated nitrous acid.

7. Phlogiſticated nitrous acid diſſolves manganeſe as readily as the phlogiſticated vitriolic. A little levigated manganeſe mixed with ſome water was put into a large receiver, to which a tubulated retort was luted. Some ounces of common nitrous acid were put into the retort, to which ſome iron-filings were added, taking care always to cloſe the orifice with a glaſs ſtopple. The phlogiſticated nitrous acid thus paſſed over into the receiver, and diſſolved the manganeſe in a few hours: the ſolution was as limpid as water, excepting only a little fine ſiliceous earth. Another white precipitate, ſimilar to that produced by adding vitriolic acid to the ſolution in pure nitrous acid now began to fall; but in other reſpects this ſolution agreed with the former.

1364 Effects of it on ſpirit of ſalt.

8. An ounce of purified muriatic acid was poured upon half an ounce of levigated manganeſe; which, after ſtanding about an hour, aſſumed a dark brown colour. A portion of it was digeſted with heat in an open glaſs veſſel, and ſmelled like warm aqua-regia. In a quarter of an hour the ſmell was gone, and the ſolution became clear and colourleſs. The reſt of the brown ſolution being digeſted, to ſee whether the muriatic acid would be ſaturated with manganeſe, an efferveſcence enſued, with a ſtrong ſmell of aqua-regia, which laſted till next day, when the ſolution was found to be ſaturated. Another ounce of acid was poured upon the reſiduum, which was followed by the ſame phenomenon, and the manganeſe was entirely diſſolved, a ſmall quantity of ſiliceous earth only remaining.

1365 Entirely diſſolved by this acid.

The ſolution, which was yellow, being now divided into two portions, ſome drops of vitriolic acid were poured into the one, by which it inſtantly became white, and a fine powder, inſoluble in water, was precipitated. Some ſmall cryſtals of ſelenite were formed by evaporation, and the reſiduum exhibited the ſame phenomenon with thoſe abovementioned with nitrous

trous acid, by evaporating the other half, ſome ſmall ſhining angular cryſtals were obtained, ſimilar to thoſe procured by means of the nitrous acid.

1366
Scarce ſoluble in fluor acid,

9. Very little manganeſe was diſſolved by fluor acid, even after ſeveral days digeſtion. A great quantity was required to form a ſaturated ſolution. It had very little taſte, and gave a ſmall quantity of precipitate with fixed alkali. But if a neutral ſalt, compoſed of fluor acid and ſal ammoniac, be added, a double decompoſition takes place, and the manganeſe is precipitated along with the fluor acid.

1367
Or in phoſphoric acid.

10. A drachm of phoſphoric acid, digeſted with as much powdered manganeſe, diſſolved but litle of it; and, though evaporated to dryneſs, the reſiduum taſted very acid; but by adding more manganeſe the acid was at laſt ſaturated. On adding microcoſmic ſalt to a ſolution of manganeſe, a decompoſition takes place ſimilar to that effected by the combination of fluor acid and volatile alkali.

1368
Partly ſoluble in acid of tartar.

11. Pure acid of tartar diſſolved manganeſe partly in the cold, and more effectually by means of heat. The whole, however, could not be diſſolved, though the acid was at laſt ſaturated by adding a great quantity of the mineral. On adding a ſolution of ſoluble tartar, a double decompoſition took place.

1369
With difficulty in the acetous.

12. Little was diſſolved by diſtilled vinegar, though boiled on manganeſe; but after diſtilling ſpirit of verdigris ſeveral times upon it, the acid at laſt became ſaturated. The ſolution, evaporated to dryneſs, left a deliqueſcent maſs. Little or none of the remaining manganeſe was diſſolved by concentrated vinegar, though repeatedly diſtilled upon it.

1370
Entirely diſſolved by acid of lemons;

13. With acid of lemons the whole was diſſolved with efferveſcence, excepting only ſome white earth.

1371
And by water impregnated with fixed air.

14. Water impregnated with fixed air likewiſe diſſolved manganeſe, but parted with it on the addition of alkali, or ſpontaneouſly by expoſure to the air.

1372
Has a ſtrong attraction for phlogiſton.

1373
Becomes white by ſaturation with phlogiſton.

From theſe experiments Mr Scheele concludes, that manganeſe has a ſtrong elective attraction for all phlogiſtic ſubſtances; and that this attraction becomes ſtronger, if there be preſent a menſtruum which can unite with the phlogiſticated manganeſe. Thus it attracts phlogiſton more powerfully than even the nitrous acid itſelf in the moiſt way. By ſaturation with phlogiſton, manganeſe has the property of loſing its black colour, and aſſuming a white one, which is unuſual, the phlogiſton generally communicating a black or dark colour to the ſubſtances with which it was united.

1374
Contains ſome phlogiſton naturally.

That manganeſe naturally contains ſome phlogiſton, though but in ſmall quantity, appears from evaporating a ſolution of it in vitriolic acid to dryneſs, and then diſtilling the maſs in a glaſs retort in an open fire. When the retort begins to melt, the acid parts fly off from the manganeſe in a ſulphureous ſtate, leaving the former of its natural black colour. By diſtilling the maſs remaining after evaporation of the nitrous ſolution, a green volatile nitrous acid remains, and the black calx of manganeſe remains as before. A ſolution of this mineral in vitriolic or nitrous acid, precipitated by fixed alkali, retains its colour; but when calcined in the open fire, again becomes black.

1375
Becomes inſoluble in pure acids by loſing its phlogiſton.

By loſing its phlogiſton, manganeſe becomes inſoluble in pure acids; and therefore the reſiduum of the abovementioned diſtillations cannot be diſſolved by adding more of the vitriolic or nitrous acids: but if that which has come over into the receiver be poured back into the retort, a ſolution will again take place by reaſon of the manganeſe reaſſuming the phlogiſton it had parted with to the acid.

1376
Partial ſolutions of manganeſe explained on this principle.

On this principle our author explains the reaſon of the partial ſolutions of this mineral abovementioned. Part of it is diſſolved, for inſtance, in the vitriolic acid, while the remainder is found inſoluble. This happens (ſays he), "becauſe the undiſſolved portion has parted with the little phlogiſton it naturally poſſeſſed to that portion of manganeſe which is taken up by the vitriolic acid during the firſt digeſtion; for without that principle it is inſoluble."

Manganeſe attracts phlogiſton more ſtrongly when combined with ſome acid than by itſelf, as appears from the following experiments.

1377
Strong attraction of manganeſe when combined with acids for phlogiſton.

1378
Why the concentrated acid of vitriol diſſolves manganeſe without addition.

1. Levigated manganeſe, digeſted or boiled with a ſolution of ſugar, honey, gum arabic, hartſhorn, jelly, &c. remains unchanged; but on mixing the pounded mineral with diluted vitriolic, or pure nitrous acid, and then adding ſome of theſe ſubſtances, the whole is diſſolved, the black colour vaniſhes by degrees, and the ſolution becomes as limpid as water. So ſtrong is the attraction of manganeſe for phlogiſton in theſe circumſtances, that metals, the noble ones not excepted, render it ſoluble in theſe acids in a limpid form. Concentrated vitriolic acid, indeed, diſſolves manganeſe entirely without any phlogiſton. "It would be difficult (ſays Mr Scheele) to comprehend whence the phlogiſton in this caſe ſhould come, if we were not certain that ſeveral ſubſtances, which have a great attraction for phlogiſton, can attract it in a red heat. Quickſilver and ſilver, when diſſolved in the pureſt nitrous acid, really loſe their phlogiſton, which is a conſtituent part of theſe metals. This appears from the red vapours in which the acid ariſes; and the diſſolved metallic earth cannot be again reduced to its metallic form, till it has acquired the loſt phlogiſton, which is effected either by precipitation with complete metals or by heat alone. Thus manganeſe can attract the quantity of phlogiſton neceſſary for its ſolution by means of concentrated vitriolic acid from heat. It is not probable that the concentrated acid undergoes a decompoſition in this degree of fire; for if you ſaturate half an ounce of this acid with alkali of tartar, and afterwards calcine in a retort, with a receiver applied, an ounce and a half of powdered manganeſe, with an equal quantity of the ſame vitriolic acid, then diſſolve the calcined maſs in diſtilled water, and likewiſe waſh well the receiver, which contains ſome drops of vitriolic acid, which are alſo to be added to the ſolution, and laſtly, add the ſame quantity of alkali, there will be no mark of ſuperabundant acid or alkali. Thence it may be concluded, that the phlogiſton in the vitriolic acid, if there really exiſts any in it, contributes nothing to the ſolution. But the manganeſe precipitated by alkali, contains a conſiderable quantity of it; in conſequence of which it is afterwards entirely ſoluble in acids without any addition.

1379
Why the volatile ſulphureous acid diſſolves it.

"The effects of volatile ſulphureous acid on manganeſe, clearly prove what has been aſſerted. The manganeſe attracts the phlogiſton contained in this acid, which is the cauſe of its great volatility, and which renders the former ſoluble in the new pure vitriolic acid. If this ſolution be mixed with concentrated vitriolic acid and diſtilled, no volatile ſulphureous acid is obtained; and if it be precipitated by means of fixed vegetable alkali, vitriolated tartar is obtained; which proves that manganeſe has a ſtronger attraction than vitriolic acid for phlogiſton in the moiſt way.

1380
Effects of nitrous acid on mangeneſe explained.

"The effects of nitrous acid on this ſubſtance are ſimilar to thoſe of vitriolic acid. Could ſpirit of nitre ſuſtain as great a degree of heat as the concentrated vitriolic acid, it would alſo entirely diſſolve the manganeſe by means of the phlogiſton attracted by heat; but as this is not the caſe, it is neceſſary to add phlogiſton in the manner abovementioned. The manganeſe decompoſes phlogiſticated nitrous acid, for the ſame reaſon that it does the volatile ſulphureous acid; and that the phlogiſton of this acid really combines with manganeſe, is manifeſt from this, that the affuſion of vegetable acid produces no ſmell of aquafortis by diſplacing the phlogiſticated acid of nitre. By diſtillation with pure vitriolic acid alſo, the nitrous acid is expelled, not in a ſmoking ſtate, and of a yellow colour, but pure and colourleſs.

"In the ſolution of manganeſe by means of gum arabic or ſugar, a very conſiderable effervеſcence takes place, owing to the extrication, or probably rather the production, of fixed air from the mixture; but with phlogiſticated acid of nitre no ſuch phenomenon takes place, becauſe the manganeſe is combined with pure phlogiſton; and if this ſhould be again ſeparated, there is no cauſe for the production of fixed air. This mineral is alſo diſſolved without effervеſcence, by uniting it with nitrous acid and metals, arſenic or oil of turpentine."

1381
Exiſtence of phlogiſton in the muriatic acid proved

As muriatic acid diſſolves manganeſe without addition, Mr Scheele is of opinion that this proves the exiſtence of phlogiſton in that acid, as has already been taken notice of. The manganeſe digeſted in the cold with ſpirit of ſalt aſſumes a dark brown colour; for it is a property of this ſubſtance that it cannot be diſſolved into a colourleſs liquor without phlogiſton, but has always a red or blue colour; but with ſpirit of ſalt the ſolution is more brown than red, on account of the fine particles of the manganeſe floating in the liquid. Here the mineral adheres but looſely to the acid, ſo that it may be precipitated by water.

1382
Explanation of the action of acid of tartar and acid of lemons.

The effects of acid of tartar and acid of lemons upon manganeſe are likewiſe explained on the principle already laid down, *viz.* the extreme attraction this ſubſtance has for phlogiſton. Thus it attracts part of that naturally contained in theſe acids, decompoſing one part of them, and being diſſolved by the other. This deſtruction of the acid is ſimilar to that of the ſugar, gum arabic, &c. which render it ſoluble in nitrous acid; for if a proper quantity of theſe are added, the manganeſe will be diſſolved, without a poſſibility of recovering the ſmalleſt particle of the vegetable ſubſtance employed; and if the ſolution be ſlowly evaporated and calcined, there will not remain the ſmalleſt mark of burned ſugar or gum. During this decompoſition, a pungent vapour ariſes, which, being collected, appears to be true vinegar. It is obtained in its pureſt ſtate from diluted vitriolic acid, ſugar, and manganeſe.

1383
Of fluor acid.

Fluor acid diſſolves but very little manganeſe, owing to its precipitating ſalt which envelopes the particles of manganeſe, and prevents the further action of the menſtruum. In all precipitations of manganeſe, however, by means of mild fixed alkalies, the full quantity is not procured; becauſe the fixed air, detached from the mineral, diſſolves part of it.

1384
Effects of manganeſe on nitre.

Though manganeſe decompounds nitre, yet this does not happen till the mixture becomes red hot. If phlogiſticated manganeſe be mixed with an equal quantity of nitre, and diſtilled in a glaſs retort, the mixture begins to grow black before the retort becomes red-hot, but no nitrous acid goes over. By lixiviation, no mark of uncombined alkali is met with; but phlogiſticated nitrous acid is extricated by the application of tamarinds, or any vegetable acid. Three parts of phlogiſticated manganeſe, mixed with one part of finely pounded nitre, yields no nitrous acid, though the nitre is alkalized as ſoon as the mixture becomes black in the retort.

1385
Experiments on manganeſe united with phlogiſton.

Mr Scheele proceeds now to another ſet of experiments upon manganeſe united with phlogiſton. In order to procure it in this ſtate, the beſt method is to diſſove in diſtilled water, and cryſtallize the ſalt obtained by ſolution of manganeſe in vitriolic acid, and then precipitate it with vegetable fixed alkali. In this ſtate it is white like chalk; but by calcination in an open fire, the ſuperfluous phlogiſton flies off, and the calx regains its uſual black colour. This change of colour likewiſe happens when the precipitation is made with cauſtic alkalies, whether fixed or volatile. The precipitate, indeed, in this caſe, is white when kept cloſe from the air, but aſſumes a brown colour when expoſed to it for any time: But when the precipitation is made by mild alkali, the white colour is preſerved by the fixed air, which in this caſe it alſo contains. By diluting the ſolution with a conſiderable quantity of water, and precipitating with cauſtic alkali, the precipitate is brown from the very beginning, owing to the air in the liquid attracting the phlogiſton from the manganeſe. The precipitate formed by lime-water is alſo brown; but on adding more of a ſtrong ſolution of manganeſe, and afterwards precipitating with cauſtic alkali, the powder falls of a white colour; becauſe the air, being already ſaturated with phlogiſton, cannot take up any more. The reſults of Mr Scheele's experiments on this phlogiſticated manganeſe are,

1386
By diſtillation *per ſe.*

1. An ounce of this ſubſtance diſtilled by itſelf in a glaſs retort, with a ſtrong fire, yielded a great quantity of fixed air with ſome drops of water. The reſiduum poured warm out of the retort grew red-hot, and ſet the paper on fire.

2. On repeating the experiment with only a drachm of phlogiſticated manganeſe, and tying a bladder to the neck of a retort, three ounce-meaſures of air came over: the reſiduum was of a light grey colour; diſſolved in acids without addition of any more phlogiſton; and took fire in that degree of heat in which ſulphur ſmokes, but does not burn. From theſe experiments, ſays Mr Scheele, it is evident, that phlogiſton does not ſeparate from manganeſe if the acceſs of air be prevented.

1387
Boiled with oil olive.

3. One part of finely powdered manganeſe boiled in four of oil-olive, effervеſced violently, and diſſolved into a kind of ſalve.

1388
By diſtillation with charcoal.

4. On diſtilling a mixture of finely powdered manganeſe and charcoal, with an empty bladder tied to the mouth of the retort, a quantity of fixed air was extri-

cated when the retort began to melt and diſtended the bladder. The reſiduum was moſtly ſoluble in diluted vitriolic acid.

1389 With ſulphur.

5. On diſtilling half an ounce of powdered manganeſe with two drachms of ſulphur, the latter partly roſe into the neck of the retort, and ſome volatile acid vapours penetrated through the lute. The diſtillation was continued till the retort began to melt; and, on cooling, the reſiduum was found to weigh $5\frac{1}{2}$ drachms. It was of a yellowiſh-grey colour; and diſſolved in ſpirit of vitriol with effervefcence, yielded an hepatic ſmell, ſome ſulphur being alſo precipitated at the ſame time. By calcination in the open air, the ſulphur was diſſipated; but great part of the maſs was rendered ſoluble on account of its having been penetrated by the acid vapour, and ſhot into cryſtals as though it had been formally diſſolved in volatile ſulphureous acid; and by repeating the calcination with more ſulphur, the whole became at laſt entirely ſoluble, and was reduced to cryſtals.

1390 By calcination with nitre.

Finely powdered mangaueſe, triturated with nitre and ſtrongly calcined in a crucible, unites with the alkali of the nitre, while the acid is diſſipated in the air. The maſs formed by the union of the manganeſe and alkali is of a dark green colour, and ſoluble in water, communicating alſo a green colour to the liquid; but in a ſhort time a fine yellow powder (an ochre of iron) falls to the bottom, leaving the liquor of a blue colour. By the addition of water, this ſolution firſt aſſumes a violet colour, grows afterwards red, and a precipitation of the manganeſe takes place, which reſumes its natural colour as ſoon as it has fallen. The ſame precipitation takes place on the addition of a few drops of acid, or by expoſure for ſome days to the open air. As for the dark red colour aſſumed by the ſolution when the precipitate is about to fall, Mr Scheele conjectures that the particles of manganeſe may naturally have a red colour, which becomes viſible when the ſubſtance is diſperſed through a menſtruum without being perfectly diſſolved.

1391 With the addition of arſenic.

7. By the addition of finely powdered white arſenic to the alkaline maſs of nitre and manganeſe, the green colour diſappears, and the whole becomes white; phlogiſticated manganeſe being alſo precipitated on the addition of water. This ariſes from the more powerful attraction of manganeſe for the phlogiſton of the arſenic than that of the arſenical acid itſelf; and for the ſame reaſon, if the maſs be calcined with charcoal, or any other phlogiſtic ſubſtance, a colourleſs ſolution will be obtained.

1392 By diſtillation with ſal ammoniac.

8. Half an ounce of phlogiſticated manganeſe, diſtilled in a retort with an equal quantity of powdered ſal ammoniac, yielded firſt a concrete volatile ſalt, after which ſome ſal ammoniac undecompoſed aroſe in the neck of the retort. Half an ounce of pure dephlogiſticated manganeſe, mixed with two drachms of powdered ſal ammoniac, yielded alkali in its cauſtic ſtate. Both reſiduums were ſoluble in water; which ſhows that manganeſe attracts phlogiſton from the volatile alkali.

1393 By diſtillation with pure nitrous acid.

9. On digeſting finely powdered manganeſe for ſome weeks with pure nitrous acid and ſome volatile alkali, a great number of air-bubbles riſe to the top, and the volatile alkali is entirely decompoſed: for though the mixture be afterwards diſtilled in a retort with the addition of quicklime, not the leaſt urinous ſmell can be perceived. This decompoſition is effected by the manganeſe attracting the phlogiſton of the volatile alkali; for that the nitrous acid has no ſhare in this, is proved by the following experiment.

1394 Volatile alkali deſtroyed by manganeſe attracting its phlogiſton.

10. An ounce of well triturated manganeſe was diſtilled with half an ounce of ſal ammoniac; and a liquid alkali, ſuch as that obtained from ſal ammoniac and quicklime, was procured. On repeating this experiment, with the variation only of a bladder inſtead of a receiver, the ſame kind of air was obtained as that which riſes to the top of the nitrous mixture. Though the emiſſion of this air indicated a deſtruction of the volatile alkali, our author explains the reaſon of its being ſtill obtained in a cauſtic ſtate by the phlogiſton taken from the alkali being more than ſufficient to render the alkali ſoluble in muriatic acid; in conſequence of which, the ſuperfluous quantity combines with the manganeſe, and enables it to decompoſe the ſal ammoniac in the ordinary way. It muſt be owned, however, that his reaſoning on this ſubject is not entirely ſatisfactory, nor does the account he gives of his experiments ſeem entirely conſiſtent with itſelf. See *Scheele's Chem. Eſſays*, Eſſay V. § xxxix.

1395 By diſtillation with arſenic.

11. Powdered manganeſe, diſtilled with an equal quantity of white arſenic, underwent no change, the arſenic flying off in its proper form; but with an equal quantity of yellow orpiment, ſome volatile ſulphureous acid came over firſt, then a yellow ſublimate, and at laſt a little red ſublimate aroſe. On augmenting the fire by degrees, the orpiment remained obſtinately attached to it. Similar effects enſued on treating manganeſe with an equal quantity of antimony; which likewiſe yielded a pungent ſulphureous acid, but no ſublimate. By calcination in the open air theſe compounds are decompoſed; and the manganeſe, united with vitriolic acid, becomes ſoluble in water.

1396 With cinnabar.

12. On diſtilling manganeſe with an equal quantity of finely pounded cinnabar, a volatile ſulphureous acid came over firſt; then a little cinnabar was ſublimed into the neck of the retort; and at laſt the quickſilver, which had been the baſis of the cinnabar, began to diſtil: the reſiduum, being a combination of manganeſe and ſulphur, was ſimilar to the compounds already deſcribed.

1397 With corroſive ſublimate.

13. With an equal quantity of corroſive ſublimate, manganeſe underwent no change; but when ſublimed with an equal quantity of mercurius dulcis, a corroſive ſublimate, and then mercurius dulcis, aroſe into the neck of the retort. The reaſon of this is, that the mercurius dulcis contains a portion of phlogiſton; by being deprived of which it ceaſes to be mercurius dulcis, and becomes corroſive ſublimate: but by reaſon of the ſtrong attraction of manganeſe for phlogiſton, the mercurius dulcis parts with that portion which is neceſſary to keep it in its mild ſtate, and thus is converted into corroſive mercury.

SECT. IV. *Inflammable Subſtances.*

1398 General diviſion.

THESE may be divided into the following claſſes: 1. Sulphurs. 2. Ardent ſpirits. 3. Oils and fats. 4. Reſins. 6. Bitumens; and, 6. Charcoal.

§ 1. SULPHURS.

1399 Sulphur.

1. *Common ſulphur.* For the extraction of this ſubſtance from its ores, ſee Sulphur. The artificial compoſition of it we have already related, n° 715; and have now only to take notice of a very few of its properties, which come more properly under this ſection.

Sulphur, as commonly uſed in commerce and the arts, is of a pale yellow colour, of a diſagreeable and peculiar ſmell, which is rendered more ſenſible when it is heated or rubbed. By rubbing, it receives very curious electrical qualities: (See Electricity.) Its ſpecific gravity is conſiderably greater than that of water, though leſs than earths or ſtones. In cloſe veſſels, ſulphur is incapable of receiving any alteration. It melts with a very gentle heat; and then is ſublimed, adhering to the capital in ſmall, very fine, needle-like cryſtals, called *flowers of ſulphur*. It may thus be ſublimed many times without alteration. 1400 Cryſtallization. If ſulphur is expoſed to a heat barely ſufficient to melt it, and very ſlowly cooled, it cryſtallizes in form of many needles croſſing one another. Some of theſe pointed cryſtals may alſo be obſerved in the interior parts of the lumps of ſulphur which have been melted, and caſt into cylyndrical moulds, as they are commonly ſold; becauſe the centre of theſe cylindrical rolls is more ſlowly cooled than the ſurface. Sulphur alſo gives this needle-like form to cinnabar, antimony, and many other minerals containing it. Sulphur may be decompoſed in ſeveral ways. The moſt ſimple is by burning; which we have already taken notice of, n° 623. It may alſo be very effectually decompoſed by mixing it with iron filings and water. In this caſe the phlogiſton is diſſipated, and the acid uniting with the iron forms a green vitriol.

1401 Decompoſed by a ſuperabundance of phlogiſton.

It is very remarkable, that though ſulphur is compoſed of vitriolic acid and phlogiſton, yet the addition of more inflammable matter, ſo far from making the union ſtronger, weakens it to a great degree: and hence we have another method of decompoſing this ſubſtance; namely, by combining it with a large quantity of oil, and diſtilling the compound.

Sulphur is capable of being eaſily diſſolved in expreſſed oils, but very difficultly in eſſential ones. Theſe compoſitions are called *balſams of ſulphur;* and are ſometimes employed in medicine, but are found to be of a very heating nature. They are much uſed by farriers. According to Mr Beaumé, ſulphur cannot be diſſolved in oil, without a heat ſufficient to melt it. A larger quantity is kept diſſolved when the mixture is hot, than when cold; and conſequently the ſulphur, eſpecially if it has been diſſolved in a thin eſſential oil, cryſtallizes on cooling the mixture. The ſulphur, thus ſeparated from the oil, is found not to be altered in any reſpect from what it formerly was; but if the mixture is expoſed to a degree of heat capable of entirely decompoſing the oil, the ſulphur is decompoſed along with it, and the ſame products are obtained by diſtilling this mixture to dryneſs, as if a mixture of pure oil of vitriol and oil were diſtilled. Theſe products are, firſt a portion of oil, when an eſſential oil was made uſe of in the compoſition of the balſam; then ſome volatile ſulphureous acid, which is at firſt watery, and afterwards becomes ſtronger; along with this acid more oil ariſes, which becomes more and more thick towards the end of the diſtillation; and laſtly, when the retort has been made red hot, nothing remains but a fixed coal.

In this proceſs we find, that both the ſulphur and oil are decompoſed. The acid of the ſulphur ſeems to attack the watery principle of the oil, while its phlogiſton remains confounded with that of the oil, or is diſſipated in vapours. Hence, though the vitriolic acid in ſulphur is concentrated to the utmoſt degree, and perfectly free from water, what riſes in this diſtillation is very aqueous, by reaſon of the water which it attracts from the oil.

1402 How ſoluble in ſpirit of wine.

Spirit of wine does not ſenſibly act upon ſulphur in its liquid ſtate; but if both the ſpirit of wine and ſulphur meet in the ſtate of vapour, they will then unite, and a perfect ſolution will take place. By methods of this kind, many combinations might be effected, which have been hitherto thought impoſſible.

1403 Its union with metals.

Pure ſulphur unites eaſily with all metals; gold, platina, and zinc, excepted. The compounds, except that with mercury, poſſeſs a metallic luſtre without any ductility. The ſulphur may be ſeparated by expoſing the mixture to a ſtrong fire. (See Metallurgy,) or by diſſolving the metalline part in acids. The ſulphur, however, defends ſeveral of the metals from the action of acids; ſo that this diſſolution ſucceeds but imperfectly. The reguline part of antimony is more eaſily ſeparated from ſulphur by means of acids than by any other metalline ſubſtance. Alkaline ſalts will ſeparate the ſulphur from all metals in fuſion, but they unite with it themſelves, and form a compound equally capable of diſſolving the metal.

1404 Vermilion

Sulphur united with quickſilver forms the beautiful pigment called *cinnabar*, or *vermilion;* which is ſo much uſed in painting, that the making of it is become a diſtinct trade. Neumann relates, that in the making of cinnabar by the Dutch method, ſix or eight parts of quickſilver are made uſe of to one of ſulphur. The ſulphur is firſt melted, and then the quickſilver is ſtirred into it; upon which they unite into a black maſs. In this part of the proceſs the mixture is very apt to take fire; of which it gives notice by ſwelling up to a great degree. The veſſel muſt then be immediately covered. The maſs being beaten to powder, is afterwards to be ſublimed in large earthen jars almoſt of an equal wideneſs from end to end; theſe are hung in a furnace by a ſtrong rim of iron. When the matter is put in, the mouth of the veſſel is covered, the fire increaſed by degrees, and continued for ſeveral hours, till all the cinnabar has ſublimed; care being taken to introduce at times an iron rod to keep the middle clear; otherwiſe the cinnabar concreting there, and ſtopping up the paſſage would infallibly burſt the veſſels.

The quantity of ſulphur directed in the common receipts for making cinnabar is greatly larger than the above; being no leſs than one-third of the quantity of quickſilver employed: accordingly it has been found, that the ſublimate, with ſuch a large quantity of ſulphur, turned out of a blackiſh colour, and required to be ſeveral times ſublimed before it became perfectly red; but we cannot help thinking, that by one gentle

ſublimation

ſublimation the ſuperfluous ſulphur might be ſeparated, and the cinnabar become perfectly pure the ſecond time. Hoffman gives a curious method of making cinnabar without ſublimation: by ſhaking or digeſting a little mercury with volatile tincture of ſulphur, the mercury readily imbibes the ſulphur from the volatile ſpirit, and forms with it a deep red powder, not inferior in colour to the cinnabar prepared in the common manner. Dr Lewis has found the common ſolutions of ſulphur by alkalies, or quicklime, to have a ſimilar effect. This cinnabar will likewiſe be of a darker or lighter colour, according as the ſolution contains more or leſs ſulphur.

1405 Pulvis fulminans. Sulphur is a principal ingredient in gun-powder, (ſee GUN-POWDER.) It alſo enters the compoſition of the *pulvis fulminans*. This conſiſts of three parts of nitre, two of the dry alkali of tartar, and one part of ſulphur, well ground together. If a little quantity of this powder is laid on an iron-ſpoon or ſhovel, and ſlowly heated, it will explode, when it arrives at a certain degree of heat, with aſtoniſhing violence and noiſe. The moſt probable opinion concerning this is, that the fixed air contained in the alkali is, by the acid vapours acting upon and endeavouring to expel it all at once, driven off with ſuch force, that a loud exploſion is produced.

1406 Phoſphorus of urine. 2. *Phoſphorus of Urine*. This is a very inflammable ſubſtance, compoſed of phlogiſton united with a certain acid, the properties of which we have already taken notice of, n° 904 *et ſeq*. The preparation of it was long a ſecret, and only perfectly diſcovered by Mr Margraaf, who publiſhed it in the Berlin Memoirs in 1743. This proceſs being by far the beſt and moſt practicable, we ſhall content ourſelves with inſerting it alone.

1407 Mr Margraaf's proceſs for making. Two pounds of ſal ammonaic are to be accurately mixed with four pounds of minium, and the mixture diſtilled in a glaſs retort; by which means a very penetrating, cauſtic alkaline ſpirit will be obtained. The reſiduum, after the diſtillation, is a kind of *plumbum corneum*; n° 812. This is to be mixed with nine or ten pounds of extract of urine, evaporated to the conſiſtence of honey. (Seventy or eighty gallons of urine are required to produce this quantity of extract.) The mixture is to be made ſlowly in an iron pot ſet over the fire, and the matter frequently ſtirred. Half a pound of powdered charcoal is then to be added, and the evaporation continued till the whole is reduced to a black powder. This powder is to be put into a retort, and urged with a graduated heat, till it becomes red hot, in order to expel all the volatile alkali, fetid oil, and ammoniacal ſalt, that may be contained in the mixture. After the diſtillation, a black friable reſiduum remains, from which the phoſphorus is to be extracted by a ſecond diſtillation and a ſtronger heat. Before it is ſubjected to another diſtillation, it may be tried by throwing ſome of it upon hot coals. If the matter has been well prepared, a ſmell of garlic exhales from it, and a blue phoſphorical flame is ſeen undulating along the ſurface of the coals.

The matter is to be put into a good earthen retort, capable of ſuſtaining a violent fire. Three quarters of the retort are to be filled with the matter which is to yield the phoſphorus, and it is to be placed in a furnace capable of giving a ſtrong heat. Mr Margraaf divides the matter among ſix retorts, ſo that if any accident happens to one, the whole matter is not loſt. The retorts ought to be well luted to a receiver of a moderate ſize, pierced with a ſmall hole, and half full of water; and a ſmall wall of bricks muſt be raiſed between the furnace and receiver, in order to guard this veſſel againſt heat as much as poſſible. The retorts are to be heated by ſlow degrees for an hour and an half; then the heat is to be increaſed till the veſſels are red hot, when the phoſphorus aſcends in luminous vapours. When the retort is heated till between a red and white, the phoſphorus paſſes in drops, which fall and congeal in the water at the bottom of the receiver. This degree of heat is to be continued till no more comes over. When a retort contains eight pints or more, this operation continues about five hours.

1408 Rectification of phoſphorus. In the firſt diſtillation, phoſphorus never paſſes pure, but is always of a blackiſh colour, by reaſon of its carrying along with it ſome part of the coal. From this, however, it may be purified by rectification in a ſmall glaſs-retort, to which is luted a receiver half full of water. A very gentle heat is ſufficient; becauſe phoſphorus, once formed, is very volatile; and as the fuliginous matter was raiſed probably by the fixed air emitted by the charcoal in the inſtant of its union with the phoſphorine acid, none of it can ariſe in a ſecond diſtillation.

The phoſphorus is then to be divided into ſmall cylindrical rolls, which is done by putting it in glaſs-tubes immerſed in warm water; for the phoſphorus is almoſt as fuſible as ſuet. It takes the form of the glaſs-tubes; from which it may be taken out, when it is cold and hardened. This muſt be done under water, leaſt the phoſphorus ſhould take fire.

1409 Proceſs ſometimes dangerous. This concrete continually appears luminous in a dark place; and by a very ſlight heat takes fire, and burns far more vehemently than any other known ſubſtance. Hence it is neceſſary to be very cautious in the diſtillation of it; for if the receiver ſhould happen to break while the phoſphorus is diſtilling, and a little flaming phoſphorus fall upon the operator's legs or hands, it would burn its way to the bone in leſs than three minutes. In this caſe, according to Mr Hellot, nothing but urine will ſtop its progreſs.

Though phoſphorus takes fire very readily by itſelf, it does not inflame at all by grinding it with other inflammable bodies, as camphor, gun-powder, or eſſential oils. In grinding it with nitre, ſome luminous flaſhes are obſerved; but the mixture never burns, unleſs the quantity of phoſphorus be large in proportion to the nitre: rubbed pretty hard on a piece of paper or linen, it ſets them on fire if they are rough, but not if they are ſmooth. It fires written paper more readily than ſuch as is white, probably from the former having more aſperities. On grinding with iron-filings, it preſently takes fire.

1410 Liquid phoſphorus. Oils ground with phoſphorus appear, like itſelf, luminous in a temperately warm place; and thus become a liquid phoſphorus, which may be rubbed on the hands, &c. without danger. Liquid phoſphorus is commonly prepared by grinding a little of the ſolid phoſphorus with oil of cloves, or rubbing it firſt with camphor, and this mixture with the oil. A luminous *amalgam*, as it is called, may be obtained, by digeſting a ſcrua ſcruple of ſolid phoſphorus with half an ounce of oil of lavender, and, when the phoſphorus begins to diſſolve and the liquor to boil,' adding a drachm of pure quickſilver; then briſkly ſhaking the glaſs for five or ſix minutes till they unite.

1411 Experiments on phoſphorus with ſpirit of wine.

Rectified ſpirit of wine, digeſted on phoſphorus, extracts a part of it, ſo as to emit luminous flaſhes on being dropt into water. It is computed that one part of phoſphorus will communicate this property to 600,000 parts of ſpirit. The liquor is never obſerved to become luminous of itſelf, nor in any other circumſtance except that abovementioned. By digeſtion for ſome months, the undiſſolved phoſphorus is reduced to a tranſparent oil, which neither emits light nor concretes in the cold. By waſhing with water, it is in ſome meaſure revived; acquiring a thicker conſiſtence, and becoming again luminous, though in a leſs degree than at firſt. During this digeſtion, the glaſs is very apt to burſt.

1412 With eſſential oils and acids.

Phoſphorus is partially diſſolved by expreſſed oils; and totally, or almoſt ſo, in eſſential oils and ether. When eſſential oils are ſaturated with it by heat, a part of the phoſphorus ſeparates, on ſtanding in the cold, in a cryſtallize form. Concentrated ſpirit of ſalt has no action on it. In diſtillation, the ſpirit riſes firſt, and the phoſphorus after it unchanged. Spirit of nitre diſſolves it, and the diſſolution is attended with great heat and copious red fumes; ſo that great part of the ſpirit diſtils without the application of any external heat, and the phoſphorus at laſt takes fire, explodes, and burſts the veſſels. Oil of vitriol likewiſe diſſolves phoſphorus, but not without a heat ſufficient to make the acid diſtil. The diſtilled liquor is white, thick, and turbid; the reſiduum is a whitiſh tenacious maſs, which deliquates, but not totally, in the air. Phoſphorus itſelf is reſolved into an acid liquor on being expoſed two or three weeks to the air, its inflammable principle ſeeming by degrees to be diſſipated.

Phoſphorus has been reported to produce extraordinary effects in the reſolution of metallic bodies: but from the experiments that have been made with this view, it does not appear to have any remarkable action on them; at leaſt on the precious ones, gold and ſilver, for the reſolution or ſubtilization of which it has been chiefly recommended. The following experiments were made by Mr Margraaf.

1413 Mr Margraf's experiments with metals.

1. A ſcruple of filings of gold were digeſted with a drachm of phoſphorus for a month, and then committed to diſtillation. Part of the phoſphorus aroſe, and part remained above the gold, in appearance reſembling glaſs: this grew moiſt on the admiſſion of air, and diſſolved in water, leaving the gold unaltered. Half a drachm of fine ſilver, precipitated by copper, being digeſted with a drachm of phoſphorus for three hours, and the fire then increaſed to diſtillation, greateſt part of the phoſphorus aroſe pure, and the ſilver remained unchanged Copper filings being treated in the ſame manner, and with the ſame quantity of phoſphorus, the phoſphorus ſublimed as before; but the remaining copper was found to have loſt its metallic brightneſs, and to take fire on the contact of flame. Iron filings ſuffered no change. Tin filings run into granules, which appeared to be perfect tin. Filings of lead did the ſame. The red calx of mercury, called *precipitate per ſe*, treated in the ſame manner, was totally converted into running quickſilver. 2. Regulus of antimony ſuffered no change itſelf, but occaſioned a change in the conſiſtence of the phoſphorus; which, after being diſtilled from this ſemimetal, refuſed to congeal, and continued, under water, fluid like oil-olive. With biſmuth there was no alteration. A drachm of phoſphorus being diſtilled and cohobated with an equal quantity of zinc, greateſt part of the zinc ſublimed in form of very light pointed flowers of a reddiſh-yellow colour: theſe flowers, injected into a red hot crucible, took fire, and run into a glaſs reſembling that of borax. White arſenic, ſublimed with phoſphorus, aroſe along with it in form of a mixed red ſublimate. Sulphur readily unites with phoſphorus into a maſs which ſmells like *hepar ſulphuris*. This does not eaſily take fire on being rubbed; but expoſed to a moderate dry heat, it flames violently, and emits a ſtrong ſulphureous fume. If phoſphorus is burnt in an open veſſel, a quantity of acid remains behind; and if a glaſs bell is held over it, an acid likewiſe ſublimes in the form of white flowers.

1414 Mr Canton's phoſphorus.

3. *Mr Canton's phoſphorus*. This is a compoſition of quicklime and common ſulphur. The receipt for making it is as follows. "Calcine ſome common oyſter-ſhells, by keeping them in a good coal-fire for half an hour; let the pureſt part of the calx be pulverized and ſifted. Mix with three parts of this powder one part of flowers of ſulphur. Let this mixture be rammed into a crucible of about an inch and a half in depth till it be almoſt full; and let it be placed in the middle of the fire, where it muſt be kept red hot for an hour at leaſt, and then ſet by to cool: when cold, turn it out of the crucible; and cutting or breaking it to pieces, ſcrape off, upon trial, the brighteſt parts; which, if good phoſphorus, will be a white powder. This kind of phoſphorus ſhines on being expoſed to the light of the ſun, or on receiving an electrical ſtroke.

1415 Homberg's phoſphorus or pyrophorus.

4. *Phoſphorus of Homberg*. This ſubſtance, which has the ſingular property of kindling ſpontaneouſly when expoſed to the air, was accidentally diſcovered by Mr Homberg, as he was endeavouring to diſtil a clear flavourleſs oil from human excrements. Having mixed the excrement with alum, and diſtilled over as much as he could with a red heat, he was much ſurpriſed at ſeeing the matters left in the retort take fire upon being expoſed to the air, ſome days after the diſtillation was over. This induced him to repeat the operation, in which he met with the ſame ſucceſs; and he then publiſhed a proceſs, wherein he recommended alum and human excrement for the preparation of the phoſphorus. Since his time, however, the proceſs has been much improved; and it is diſcovered, that almoſt every vitriolic ſalt may be ſubſtituted for the alum, and moſt other inflammable ſubſtances for the excrement; but though alum is not abſolutely neceſſary for the ſucceſs, it is one of the vitriolic ſalts that ſucceed beſt. The following proceſs is recommended in the Chemical Dictionary.

1416 Beſt method of preparing.

Let three parts of alum and one of ſugar be mixed together. This mixture muſt be dried in an iron ſhovel, over a moderate fire, till it be almoſt reduced to a blackiſh powder or coal; during which time it muſt be ſtirred with an iron ſpatula. Any large maſſes muſt be be bruiſed into powder; and then it muſt be put into a glaſs matraſs, the mouth of which is rather ſtrait than wide, and ſeven or eight inches long. This matraſs is to be placed in a crucible, or other earthen veſſel, large enough to contain the belly of the matraſs, with about a ſpace equal to that of a finger all round it. This ſpace is to be filled with ſand, ſo that the matraſs ſhall not touch the earthen veſſel. The apparatus is then to be put into a furnace, and the whole to be made red hot. The fire muſt be applied gradually, that any oily or fuliginous matter may be expelled; after which, when the matraſs is made red hot, ſulphureous vapours exhale: this degree of heat is to be continued till a truly ſulphureous flame, which appears at the end of the operation, has been ſeen nearly a quarter of an hour: the fire is then to be extinguiſhed, and the matraſs left to cool, without taking it out of the crucible; when it ceaſes to be red hot, it muſt be ſtopped with a cork. Before the matraſs is perfectly cold, it muſt be taken out of the crucible, and the powder it contains poured as quickly as poſſible into a very dry glaſs phial, with a glaſs ſtopper. If we would preſerve this phoſphorus a long time, the bottle containing it muſt be opened as ſeldom as poſſible. Sometimes it kindles while it is pouring into the glaſs phial; but it may be then extinguiſhed by cloſing the phial expeditiouſly. A ſmall quantity of this pyrophorus laid on paper, and expoſed to the air, immediately takes fire, becomes red like burning coals, and emits a ſtrong ſulphureous vapour greatly reſembling that which ariſes on decompoſing liver of ſulphur.

1417 Is not injured by mere expoſure to light.

It has been generally alleged, that the common black phoſphorus is impaired by being expoſed to the light; but Mr Cavallo has diſcovered the fallacy of this ſuppoſition by the following experiment. Some portions of the ſame pyrophorus were incloſed in three glaſs tubes, and immediately ſealed up hermetically. On the 22th of May 1779, two of them were ſuſpended from a nail out of a window, and the third was wrapped up in paper and incloſed in a box, where not the leaſt glimmering of light could enter. In this ſituation they were left for more than a year; after which one of thoſe that had been kept out of the window was broke, along with that which had been kept in the dark, in the preſence of Mr Kirwan; when the pyrophorus ſeemed to be equally good in each tube, taking fire in about half a minute after it was taken out of the tubes, and expoſed to the air on a piece of paper.

1418 Cauſe of the accenſion.

There are many different kinds of pyrophori: ſome of the moſt remarkable of which are deſcribed under the article Pyrophorus. Many theories have been invented to ſolve the phenomenon of their accenſion on the contact of air. This has been thought owing to the converſion of the earth of alum into lime, or to a remainder of the vitriolic acid attracting moiſture from the atmoſphere; but the formation of pyrophorus without either alum or vitriolic acid, ſhows that neither of theſe opinions can be juſt. It is more probable, therefore, that, the heat is occaſioned by the total diſſipation of that aqueous part which is eſſential to the conſtitution of terreſtrial ſubſtances. In conſequence of this, the water contained in the atmoſphere is not only attracted with avidity, but decompounded by the matter reduced to ſuch a ſtate of extreme dryneſs. By theſe operations it gives out the latent heat contained in it, and this produces the accenſion in queſtion.

§ 2. *Ardent Spirits.*

See Fermentation and Distillation.

§ 3. *Oils.*

1419 Eſſential oils.

1. *Eſſential Oils.* Thoſe oils are called *eſſential* which have evidently the ſmell of the vegetable from which they are drawn. For the method of procuring them, ſee Distillation. They are diſtinguiſhed from all others by their ſuperior volatility, which is ſo great as to cauſe them riſe with the heat of boiling water. All theſe have a ſtrong aromatic ſmell, and an acrid, cauſtic taſte; in which reſpect alſo they differ from other oils. This taſte is thought to proceed from a copious and diſengaged acid, with which they are all penetrated. The preſence of this diſengaged acid in eſſential oils, appears from the impreſſion they make upon the corks of bottles in which they are kept. Theſe corks are always ſtained of a yellow colour, and a little corroded, nearly as they are by nitrous acid. The vapour of theſe oils alſo reddens blue paper, and converts alkalies into neutral ſalts.

1420 Suppoſed cauſe of their taſte.

1421 Of their ſolubility in ſpirit of wine.

This acid is likewiſe ſuppoſed to be the cauſe of their ſolubility in ſpirit of wine. They are not all equally ſoluble in this menſtruum, becauſe they do not all contain an equal quantity of acid. As this acid is much diſengaged, they loſe a great deal of it by repeated diſtillations, and therefore they become leſs and leſs ſoluble on being frequently diſtilled. By evaporation they loſe their moſt volatile and thin part, in which the ſpecific ſmell of the vegetable from which they are extracted reſides; by which loſs they become thick, and acquire the ſmell and conſiſtence of turpentine, and even of reſins. In this ſtate they are no longer volatile with the heat of boiling water; and, if diſtilled with a ſtronger fire, they give over an oil which has neither ſmell nor taſte of the vegetable whence they were extracted, but is entirely empyreumatic, and ſimilar to thoſe oils procured by diſtilling vegetable or animal ſubſtances with a ſtrong fire. See Distillation.

1422 Camphor.

To the claſs of eſſential oils, the volatile concrete called *camphor* ſeems moſt properly to belong. With them it agrees in its properties of inflammability, ſolubility in ſpirit of wine, and a ſtrong aromatic flavour. The only differences between them are, that camphor is always in a ſolid ſtate, and is incapable of decompoſition by any number of ſublimations.

1423 Decompoſed by diſtillation with bole.

It has, however, been found poſſible to decompoſe it by diſtillation with certain additions. By diſtilling it ſeveral times along with bole, we obtain a fluid having the properties of an eſſential oil, ſoluble in water, and ſeparating again on the the addition of ſpirit of wine. On diſtilling it eight times with dephlogiſticated nitrous acid, we obtain a ſalt having the form of a parallelopiped, of an acid and bitter taſte, and changing the juice of violets and turnſole red. This has the properties of a true acid; combines with fixed and volatile alkalies into neutral ſalts capable of being cryſtallized; diſſolves copper, iron, biſmuth, arſenic, and cobalt.

1424 With dephlogiſticated nitrous acid.

cobalt. With magneſia it forms regular cryſtals, in ſome meaſure reſembling baſaltes. It is diſtinguiſhed from the acid of ſugar by not precipitating lime from its ſolution in marine acid, and by forming with magneſia a white powder ſoluble in water.

According to Neumann, all the camphor made uſe of is the produce of two ſpecies of trees; the one growing in Sumatra and Borneo, the other in Japan. Of theſe, the Japan kind is the only one brought into Europe. The tree is about the ſize of a large lime, the flowers white, and the fruit a ſmall red berry. All parts of the tree are impregnated with camphor; but the roots contain moſt, and therefore are chiefly made uſe of for the preparation of this commodity: though, in want of them, the wood and leaves are ſometimes mixed.

The camphor is extracted by diſtillation with water in large iron pots filled with earthen heads ſtuffed with ſtraw; greateſt part of the camphor concretes among the ſtraw, but paſſes down into the receiver among the water. In this ſtate it is found in ſmall bits like gray ſalt-petre, or common bay-ſalt; and requires to be purified either by a ſecond ſublimation, or by diſſolution in ſpirit of wine, filtration, and exſiccation. If the firſt method is followed, there will be ſome difficulty in giving it the form of a perfect tranſparent cake. A difficulty of this kind indeed always occurs in ſublimations; and the only way is to keep the upper part of the glaſs to ſuch a degree of heat as may keep the ſublimate in a half-melted ſtate. Dr Lewis recommends the depuration of camphor by ſpirit of wine, and then melting it into a cake in the bottom of a glaſs.

Camphor poſſeſſes conſiderable antiſceptic virtues; and is a good diaphoretic, without heating the conſtitution; with which intention it is often uſed in medicine. It is likewiſe employed in fire-works and ſeveral other arts, particularly in making varniſhes. See VARNISH.

1425 Soluble in ardent ſpirits and oil.

This ſubſtance diſſolves eaſily and plentifully in vinous ſpirits and in oils; four ounces of ſpirit of wine will diſſolve three of camphor. On diſtilling the mixture, the ſpirit riſes firſt, very little camphor coming over with it. This ſhows that camphor, however volatile it may ſeem by its ſmell, is very far from having the volatility of ether, and conſequently is improperly claſſed with ſubſtances of that kind.

1426 Empyreumatic oils.

2. *Empyreumatic Oils.* Under this name are comprehended all thoſe oils, from whatever ſubſtance obtained, which require a greater heat for their diſtillation than that of boiling water. Theſe are partially ſoluble in ſpirit of wine, and becomes more and more ſo by repeated diſtillations. The empyreumatic oils obtained from animal ſubſtances are at firſt more fetid than thoſe procured from vegetables; but by repeated diſtillations, they become exceedingly attenuated and volatile, becoming almoſt as white, thin, and volatile, as ether. They then acquire a property of acting upon the brain and nervous ſyſtem, and of allaying its irregular movements, which is common to them with all other inflammable matters when highly attenuated and very volatile; but this kind of oil is particularly recommended in epileptic and convulſive affections. It is given from 4 to 10 or 11 drops: but, though prepared with the utmoſt care, it is very ſuſceptible of loſing its whiteneſs, and even its thinneſs, by a ſhort expoſure to air; which proceeds from the almoſt inſtantaneous evaporation of its more thin and volatile parts, and from the property which the leſs volatile remainder has of acquiring colour. To avoid this inconvenience, it muſt be put, as ſoon as it is made, into very clean glaſs bottles with glaſs ſtoppers, and expoſed to the air as little as poſſible.

1427 How rectified.

The moſt important obſervations concerning the method of making the pure animal oils are, firſt to change the veſſel at each diſtillation, or at leaſt to make them perfectly clean; for a very ſmall quantity of the thicker and leſs volatile part is ſufficient to ſpoil a large quantity of that which is more rectified. In the ſecond place, Mr Beaumé has obſerved, that this operation may be greatly abridged, by taking care to receive none but the moſt volatile part in each diſtillation, and to leave a large reſiduum, which is to be neglected, and only the more volatile part to be further rectified. By this method a conſiderable quantity of fine oil may be obtained at three or four diſtillations, which could not otherwiſe be obtained at fifty or ſixty.

1428 Animal fats.

3. *Animal Fats.* Though theſe differ conſiderably from one another in their external appearance, and probably in their medicinal qualities, they afford, on a chemical analyſis, products ſimilar in quality, and differing but inconſiderably in quantity. They all yield a larger portion of oil, and no volatile ſalt; in which reſpect they differ from all other animal ſubſtances. Two ounces of hogs's lard yielded, according to Neumann, two drachms of an empyreumatic liquor, and one ounce five drachms and 50 grains of a clear brown-coloured oil of a volatile ſmell, ſomewhat like horſe-radiſh. The *caput mortuum* was of a ſhining black colour, and weighed 10 grains.

1429 Tallow.

Tallow being diſtilled in the ſame manner, two drachms of empyreumatic liquor were obtained from two ounces of it; of a clear brown oil, ſmelling like horſe-radiſh, one ounce ſix drachms and 12 grains. The remaining coal was of a ſhining black colour, and weighed 18 grains. A particular kind of acid is now found to be contained in it.

1430 Marrow.

The marrow of bones differs a little from fats, when chemically examined. Four ounces of freſh marrow, diſtilled in the uſual manner, gave over three drachms and a ſcruple of a liquor which ſmelled like tallow; two ſcruples and an half of liquor which had more of an empyreumatic and a ſouriſh ſmell; two ounces and an half of a yellowiſh-brown, butyraceous oil, which ſmelled like horſe-radiſh; and ſix drachms and an half of a blackiſh-brown oil of the ſame ſmell. The *caput mortuum* weighed four ſcruples.

1431 Rancid oils purified.

All animal fats, when perfectly pure, burn totally away without leaving any feces, and have no particular ſmell. In the ſtate in which we commonly find them, however, they are exceedingly apt to turn rancid, and emit a moſt diſagreeable and noxious ſmell; and to this they are peculiarly liable, when long kept in a gentle degree of heat. In this ſtate, too, an inflammable vapour ariſes from them, which when on fire is capable of producing exploſions. Hence, in thoſe works where large bellows are uſed, they have been often ſuddenly burſt by the inflammable vapours ariſing from the rancid oil employed for ſoftening the leather

leather. The expreſſed unctuous oils of vegetables are ſubject to the ſame changes; but from this rancidity they may all be freed moſt effectually, by the ſimple proceſs of agitating them well with water: which is to be drawn off, and freſh quantities added, till it comes off at laſt clear and inſipid, without any ill ſmell. The proper inſtrument for performing this operation in large is a barrel-churn, having in it four rows of narrow ſplit deals, from the centre to the circumference, each piece ſet at obtuſe angles to the other, in order to give different directions to the oil and water as the churn turns round, thereby to mix them more intimately. The churn is to be ſwiftly turned round for a few minutes; and muſt then be left at reſt, till the oil and water have fully ſeparated; which will be in 15 or 20 minutes, more or leſs, according to the ſize of the churn. When this water is drawn off, freſh water is to be put in, and the churn again turned round, and this continued till the oil is perfectly ſweet. If the oil and water are allowed to ſtand together for ſome days, a gelatinous ſubſtance is found between them, which is not very eaſily miſcible either with oil or water. Chalk, quicklime, and alkaline ſalts, are found alſo capable of taking off the rancidity from oils and fats; but have the inconvenience of deſtroying a part of their ſubſtance.

§ 4. RESINS and BALSAMS.

THESE are commonly reckoned to be compoſed of an eſſential oil thickened by an acid; as the eſſential oils themſelves are found to be convertible into a ſimilar ſubſtance, by the exhalation of their more volatile parts. True reſins are generally tranſparent in a conſiderable degree, ſoluble in ſpirit of wine, and poſſeſſed of a conſiderable degree of flavour.

1432 Whence procured.

Reſins are originally produced by inſpiſſating the natural juices which flow from inciſions made in the ſtems of growing vegetables, and are in that ſtate called *balſams*. The balſams may be conſidered as eſſential oils thickened by loſing ſome of their odoriferous principle, and of their fineſt and moſt volatile parts. There are ſeveral kinds of balſams, which, however, differ from each other only in the ſmell and degree of conſiſtence; and therefore all yield ſimilar products on diſtillation. An analyſis of turpentine therefore will be ſufficient as an example of the analyſis and natural properties of all the reſt.

1433 Turpentine Chio.

The true turpentine-tree is found in Spain and the ſouthern parts of France, as well as in the iſland of Chio and in the Indies. It is a middling-ſized evergreen-tree, with leaves like thoſe of the bay, bearing purpliſh, imperfect flowers; and on ſeparate pedicles hard unctuous berries like thoſe of juniper. It is extremely reſinous; and unleſs the reſin is diſcharged, decays, produces fungous excreſcences, ſwells, burſts, and dies; the prevention of which conſiſts wholly in plentiful bleeding, both in the trunk and branches. The juice is the *Chio* or *Cyprus turpentine* of the ſhops. This ſort is quite of a thick conſiſtence, of a greeniſh white colour, clear and tranſparent, and of ſcarcely any taſte or ſmell.

1434 Venice.

The kind now called *Venice turpentine*, is no other than a mixture of eight parts of common yellow or black roſin with five parts of oil of turpentine. What was originally Venice turpentine is now unknown. Neumann relates, that the Venice turpentine ſold in his country was no other than that prepared from the larix tree, which grows plentifully in ſome parts of France, as alſo in Auſtria, Tyrol, Italy, Spain, &c. Of this there are two kinds; the young trees yielding a thin limpid juice, reſembling balſam of copaiba; the older, a yellower and thicker one.

1435 Straſburg.

The *Straſburg turpentine* is extracted from the ſilver-fir. Dr Lewis takes notice that ſome of the exotic firs afford balſams, or reſins, ſuperior to thoſe obtained from the native European ones; as particularly that called *balm of Gilead fir*, which is now naturalized to our own climate. A large quantity of an elegant reſinous juice may be collected from the cones of this tree: the leaves alſo, when rubbed, emit a fragrant ſmell; and yield, with rectified ſpirit, an agreeable reſinous extract.

1436 Common.

The common turpentine is prepared from different ſorts of the pine; and is quite thick, white, and opaque. Even this is often counterfeited by mixtures of roſin and common expreſſed oils.

1437 Phenomena on diſtillation.

All the turpentines yield a conſiderable proportion of eſſential oil. From ſixteen ounces of Venice turpentine, Neumann obtained, by diſtillation with water, four ounces and three drachms of oil. The ſame quantity diſtilled, without addition, in the heat of a water-bath, gave but two ounces and an half; and from the reſiduum treated with water, only an ounce could be obtained. The water remaining in the ſtill is found to have imbibed nothing from the turpentine; on the contrary, the turpentine is found to imbibe part of the water; the reſiduum and the oil amounting to a full ounce on the pound more than the turpentine employed. When turpentine is diſtilled or boiled with water till it becomes ſolid, it appears yellowiſh; when the proceſs is further continued, of a reddiſh brown colour: in the firſt ſtate, it is called *boiled turpentine*; and in the latter, *colophony*, or *roſin*.

On diſtilling ſixteen ounces of turpentine in a retort with an open fire, increaſed by degrees, we obtain firſt four ounces of a limpid colourleſs oil; then two ounces and two drachms of a yellowiſh one; four ounces and three drachms of a thicker yellow oil; and two ounces and one drachm of a dark browniſh red empyreumatic oil, of the conſiſtence of balſam, and commonly called *balſam of turpentine*.

1438 Eſſential oil difficult of ſolution.

The limpid eſſential oil called *ſpirit of turpentine*, is exceedingly difficult of ſolution in ſpirit of wine; tho' turpentine itſelf diſſolves with great eaſe. One part of the oil may indeed be diſſolved in ſeven parts of rectified ſpirit; but on ſtanding for ſome time, the greateſt part of the oil ſubſides to the bottom, a much greater proportion of ſpirit being requiſite to keep it diſſolved.

1439 Benzoin.

2. *Benzoin.* This is a very brittle browniſh reſin, of an exceedingly fragrant ſmell. The tree which produces benzoin is a native of the Eaſt Indies; particularly of Siam and the iſland of Sumatra. It is never permitted to exceed the ſixth year; being, after this time, unfit for producing the benzoin. It is then cut down, and its place ſupplied by a young tree raiſed commonly from the fruit. One tree does not yield above three pounds of benzoin.

A tree ſuppoſed to be the ſame with that which affords

fords benzoin in the Eaſt Indies, is plentiful alſo in Virgina and Carolina; from whence it has been brought into England, where it grows with vigour in the open ground. The bark and the leaves have the ſmell of benzion; and yield with rectified ſpirit a reſin of the ſame ſmell; but no reſin has been obſerved to iſſue from it naturally in England, nor has any benzoin been collected from it in America.

1440 Soluble in ſpirit of wine. Benzoin diſſolves totally in ſpirit of wine into a blood-red liquor, leaving only the impurities, which commonly amount to no more than a ſcruple on an ounce. To water, it gives out a portion of ſaline matter of a peculiar kind, volatile and ſublimable in the fire. See 984 *et ſeq.*

The principal uſe of reſins is in the making of lacquers, varniſhes, &c. See VARNISH.

§ 5. *Bitumens.*

THESE are inflammable mineral bodies, not ſulphureous, or only caſually impregnated with ſulphur. They are of various degrees of conſiſtency; and ſeem, in the mineral kingdom, to correſpond with the oils and reſins in the vegetable.

1441 Origin of bitumens. Concerning the origin of bitumens, chemiſts are not at all agreed. Some chemical writers, particularly Mr Macquer, imagine bitumens to be no other than vegetable reſins altered in a peculiar manner by the admixture of ſome of the mineral acids in the earth; but Dr Lewis is of a contrary opinion, for the following reaſons.

"Mineral bitumens are very different in their qualities from vegetable reſins; and, in the mineral kingdom, we find a fluid oil very different from vegetable oils. The mineral oil is changed by mineral acids into a ſubſtance greatly reſembling bitumens; and the vegetable oils are changed by the ſame acids into ſubſtances greatly reſembling the natural reſins.

"From bitumens we obtain, by diſtillation, the mineral oil, and from reſins the vegetable oil, diſtinct in their qualities as at firſt. Vegetable oils and reſins have been treated with all the known mineral acids; but have never yielded any thing ſimilar to the mineral bitumens. It ſeems, therefore, as if the oily products of the two kingdoms were eſſentially and ſpecifically different. The laws of chemical inquiries at leaſt demand, that we do not look upon them any otherwiſe, till we are able to produce from one a ſubſtance ſimilar to the other. When this ſhall be done, and not before, the preſumption that nature effects the ſame changes in the bowels of the earth, will be of ſome weight."

1442 Naphtha. There is a perfectly fluid, thin bitumen, or mineral oil, called *naphtha*, clear and colourleſs as cryſtal; of a ſtrong ſmell; extremely ſubtile; ſo light as to ſwim on all known liquors, ether perhaps excepted: ſpreading to a vaſt ſurface on water, and exhibiting rainbow colours; highly inflammable: formerly made uſe of in the compoſition of the ſuppoſed inextinguiſhable greek fire.

1443 Petroleum. Next to this in conſiſtence is the *oleum petræ*, or *petroleum;* which is groſſer and thicker than naphtha, of a yellowiſh, reddiſh, or browniſh colour; but very light, ſo as to ſwim even on ſpirit of wine. By diſtillation, the petroleum becomes thinner and more ſubtile, a groſs matter being left behind; it does not, however, eaſily ariſe, nor does it totally loſe its colour by this proceſs, without particular managements or additions.

Both naphtha and petroleum are found plentifully in ſome parts of Perſia, trickling through rocks or ſwimming on the ſurface of waters. Kempfer gives an account of two ſprings near Baku; one affording naphtha, which it receives in drops from ſubterraneous veins; the other, a blackiſh and more fetid petroleum, which comes from Mount Caucaſus. The naphtha is collected for making varniſhes; the petroleum is collected in pits, and ſent to different places for lamps and torches.

Native petrolea are likewiſe found in many different places, but are not to be had in the ſhops; what is ſold there for petroleum, being generally oil of turpentine coloured with alkanet root. The true naphtha is recommended againſt diſorders of the nerves, pains, cramps, and contractions of the limbs, &c. but genuine naphtha is rarely or never brought to this country.

There are ſome bitumens, ſuch as amber, ambergris, pit-coal, and jet, perfectly ſolid; others, ſuch as Barbadoes tar, of a middle conſiſtence between fluid and ſolid. Turf and peat are likewiſe thought to belong to this claſs.

1. *Amber.* This ſubſtance melts, and burns in the fire, emitting a ſtrong peculiar ſmell. Diſtilled in a ſtrong heat, it yields a phlegm, an oil, and a particular ſpecies of acid ſalt. The diſtillation is performed in earthen or glaſs retorts, frequently with the addition of ſand, ſea-ſalt, coals, &c. which may break the tenacity of the melted maſs, ſo as to keep it from ſwelling up, which it is apt to do by itſelf. Theſe additions, however, make a perceptible difference in the produce of the diſtillation: with ſome the ſalt proves yellowiſh and dry; with others, browniſh or blackiſh, and unctuous or ſoft like an extract: with ſome, the oil is throughout of a dark brown colour; with others, it proves externally green or greeniſh; with elixated aſhes, in particular, it is of a fine green. The quantity of oil and phlegm is greateſt when coals are uſed, and that of ſalt when ſea-ſalt is uſed. 1444 Amber.

The moſt advantageous method of diſtilling amber, however, is without any addition; and this is the method uſed in Pruſſia, where the greateſt quantities of ſalt and oil of amber are made. At firſt a phlegmatic liquor diſtils; then a fluid oil; afterwards one that is thick and more ponderous; and laſt of all, an oil ſtill more ponderous along with the ſalt. In order to collect the ſalt more perfectly, the receiver is frequently changed; and the phlegm, and light oil, which ariſe at firſt, are kept by themſelves. The ſalt is purified, by being kept ſome time on bibulous paper, which abſorbs a part of the oil: and changing the paper as long as it receives any oily ſtain. For the further depuration as well as the nature of this ſalt, ſee SUCCINUM. 1445 Moſt advantageouſly diſtilled without addition.

2. *Ambergris.* This concrete, which is only uſed as a perfume, yields, on diſtillation, products of a ſimilar nature to that of amber, excepting that the volatile ſalt is in much leſs quantity. See AMBERGRIS. 1446 Ambergris.

3. *Pit-coal.* See the articles COAL and LITHANTHRAX 1447 Pit-coal.

THRAX. This ſubſtance yields by diſtillation, according to the tranſlator of the Chemical Dictionary, 1. phlegm, or water; 2. a very acid liquor; 3. a thin oil, like naphtha; 4. a thicker oil, reſembling petroleum, which falls to the bottom of the former, and which riſes with a violent fire; 5. an acid, concrete ſalt; 6. *an uninflammable earth* (we ſuppoſe he means a piece of charred coal, or cinder) remains in the retort. The fluid oil obtained from coals is ſaid to be exceedingly inflammable, ſo as to burn upon the ſurface of water like naphtha itſelf.

1448 Peat.

4. *Peat.* There are very conſiderable differences in this ſubſtance, proceeding probably from the admixture of different minerals: for the ſubſtance of peat is plainly of vegetable origin; whence it is found to anſwer for the ſmelting of ores, and the reduction of metallic calces, nearly in the ſame manner as coals of wood. Some ſorts yield, in burning, a very diſagreeable ſmell, which extends to a great diſtance; whilſt others are inoffenſive. Some burn into grey or white, and others into red, ferruginous aſhes. The aſhes yield, on elixation, a ſmall quantity of alkaline, and ſome neutral ſalts.

1449 Phenomena on diſtillation.

The ſmoke of peat does not preſerve or harden fleſh like that of wood; and the ſoot into which it condenſes is more apt to liquefy in moiſt weather. On diſtilling peat in cloſe veſſels, there ariſes a clear inſipid phlegm; an acid liquor, which is ſucceeded by an alkaline one; and a dark-coloured oil. The oil has a very pungent taſte, and an empyreumatic ſmell; leſs fetid than that of animal ſubſtances, but more ſo than that of mineral bitumens. It congeals, in the cold, into a pitchy maſs, which liquefies in a ſmall heat: it readily catches fire from a candle; but burns leſs vehemently than other oils, and immediately goes out upon removing the external flame. It diſſolves almoſt totally in rectified ſpirit of wine, into a dark, browniſh-red liquor.

§ 6. CHARCOAL.

1450 Differences between the coals of different ſubſtances.

THIS is the form to which all inflammable matters are reducible, by being ſubjected to the moſt vehement action of fire in cloſe veſſels; but though all the coals are nearly ſimilar to one another in appearance, there is nevertheleſs a very conſiderable difference among them as to their qualities. Thus the charcoal of vegetables parts with its phlogiſton very readily, and is eaſily reducible to white aſhes: charred pitcoal, or, as it is commonly called, *coak*, much more difficultly; and the coals of burnt animal ſubſtances, far more difficultly than either of the two. Mr Macquer acquaints us, that the coal of bullock's blood parts with its phlogiſton with the utmoſt difficulty. He kept it very red, in a ſhallow crucible ſurrounded with charcoal, for ſix hours and more, ſtirring it conſtantly that it might be all expoſed to the air, without being able to reduce it to white, or even grey aſhes. It ſtill remained very black, and full of phlogiſton. The coals of pure oils, or concrete oily ſubſtances, and ſoot, which is a kind of coal raiſed during the inflammation of oils, are as difficultly burnt as animal coals. Theſe coals contain very little ſaline matter, and their aſhes furniſh no alkali. Theſe coals, which are ſo difficultly burnt, are alſo leſs capable of inflaming with nitre than others more combuſtible; and ſome of them, in a great meaſure, reſiſt even the action of nitre itſelf.

1451 Charcoal perfectly refractory.

Charcoal is the moſt refractory ſubſtance in nature; no inſtance having been known of its ever being melted, or ſhowing the leaſt diſpoſition to fuſion, either by itſelf, or with additions: hence, charcoal is found to be the moſt proper ſupport for ſuch bodies as are to be expoſed to the focus of a large burning glaſs. The only true ſolvent of charcoal is *hepar ſulphuris*. By the violent heat of a burning-glaſs, however, it is found to be entirely diſſipable into inflammable air, without having any reſiduum. See AEROLOGY, n° 129. and CHARCOAL.

The different ſubſtances mixed with different coals, render ſome kinds of charcoal much leſs fit to be uſed in reviving metals from their calces, or in ſmelting them originally from their ores. The coals of vegetable ſubſtances are found to anſwer beſt for this purpoſe. See METALLURGY.

SECT. V. *Vegetable and Animal Subſtances.*

THE only ſubſtances afforded by vegetables or animals, which we have not yet examined, are the mucilaginous, or gummy; and the colouring parts obtained by infuſion, or boiling in water; and the calculous concretions found in the bodies of animals, chiefly in the human bladder. The colouring matter is treated of under the article *COLOUR-Making*, to which we refer; and in this ſection ſhall only conſider the nature of the others.

§ 1. *MUCILAGE or GUM.*

1452 Mucilage.

THE mucilage of vegetables is a clear tranſparent ſubſtance, which has little or no taſte or ſmell, the conſiſtence of which is thick, ropy, and tenacious, when united with a certain quantity of ſuperabundant water. It is entirely and intimately ſoluble in water, and contains no diſengaged acid or alkali.

When mucilage is diſſolved in a large quantity of water, it does not ſenſibly alter the conſiſtence of the liquor: but, by evaporation, the water grows more and more thick; and, at laſt, the matter acquires the conſiſtence of gum arabic, or glue; and this without loſing its tranſparency, provided a heat not exceeding that of boiling water has been uſed.

1453 Phenomena on diſtillation.

Gums, and ſolid mucilages, when well dried and very hard, are not liquefied in the fire like reſins, but ſwell, and emit many fumes; which are, at firſt, watery: then oily, fuliginous, and acrid. Diſtilled in cloſe veſſels, an aqueous acid liquor comes over along with an empyreumatic oil, as from other vegetable ſubſtances; a conſiderable quantity of coal remains, which burns to aſhes with difficulty.

Mucilages and gums are not ſoluble either by oils, ſpirit of wine, alkalies, or acids, except in ſo far as they diſſolve in theſe liquors by means of the water in which the alkali or acid are diſſolved. They are, however, the moſt effectual means of uniting oil with water. Three parts of mucilage, poured upon one part of oil, will incorporate with it by trituration or agitation; and the compound will be ſoluble in water. Vegetable gums are uſed in medicine, as well as the mechanic arts; but the particular uſes to which each of them is applicable, will be mentioned under the name of each particular gum.

1454 Jelly and glue.

The mucilage obtained from animal ſubſtances, when not too thick, is called *jelly*, or *gelatinous matter*; when further inſpiſſated, the matter becomes quite ſolid in the cold, and is called *glue*. If the evaporation is ſtill further continued, the matter acquires the conſiſtence of horn.

This gelatinous ſubſtance ſeems to be the only true animal one; for all parts of the body, by long continued boiling, are reducible to a jelly, the hardeſt bones not excepted. Animal jelly, as well as vegetable mucilage, is almoſt inſipid and inodorous; but, though it is difficult to deſcribe the difference betwixt them when apart, it is very eaſily perceived when they are both together. Acids and alkalies, particularly the latter, diſſolve animal jellies with great eaſe; but the nature of theſe combinations is not yet underſtood. The other properties of this ſubſtance are common to it with the vegetable gums, except only that the animal mucilage forms a much ſtronger cement than any vegetable gum: and is therefore much employed for mechanical purpoſes, under the name of *glue*. See Glue and Isinglass.

§ 2. *Of the Human Calculus.*

1455 Scheele's experiments on the human calculus.

This ſubſtance has been repeatedly examined by the moſt eminent chemiſts. Mr Scheele, as has been related n° 982, *et ſeq.* has been able to extract an acid from it. His account of it in other reſpects is to the following purpoſe.

1. All the calculi examined, whether flat and poliſhed, or rough and angular, were of the ſame nature, and conſiſted of the ſame conſtituent parts.

2. The diluted vitriolic acid has no effect upon the calculus, but the concentrated acid diſſolves it, and by abſtraction from it is converted into the ſulphureous kind, leaving a black coal behind.

3. Neither diluted nor concentrated ſpirit of ſalt had any effect upon it.

4. By means of nitrous acid, a new one was produced, and which is poſſeſſed of ſingular qualities, as already mentioned.

5. The ſolution of calculus in nitrous acid is not precipitated by ponderous earth, nor are metallic ſolutions ſenſibly altered by it.

6. It is not precipitated by alkalies, but grows ſomewhat yellower by a ſuperabundance of the latter. In a ſtrong digeſting heat the liquor becomes red, and tinges the ſkin of the ſame colour. It precipitates green vitriol of a black colour; vitriol of copper, green; ſilver, grey; corroſive ſublimate, zinc, and lead, white.

7. The ſolution is decompoſed by lime-water, and lets fall a white precipitate, ſoluble in the muriatic acid without any efferveſcence: but though there be an exceſs of precipitate, the liquor ſtill remains acid; which happens alſo with animal earth, and that of fluor diſſolved in the ſame acids. On evaporation to dryneſs, the matter will at laſt take fire; but when heated only to a dull red heat in a cloſe crucible, it grows black, ſmells like burnt alum, and efferveſces with acids; being convertible before the blow-pipe into quicklime.

8. Neither this ſolution, nor the alkaline mixture, is changed by the acid of ſugar.

9. The calculus is not changed by acid of tartar, though it is diſſolved even in the cold by alkali, when reduced to ſuch a ſtate of cauſticity as not to diſcover the leaſt mark of aerial acid. The ſolution is yellow and taſtes ſweetiſh; and is precipitated by all the acids, even by the aerial. It decompoſes metallic ſolutions, but does not precipitate lime-water; and a ſmell of volatile alkali is produced by a little ſuperabundance of alkali in the ſolution. Dry volatile alkali has no effect upon the calculus; but cauſtic volatile alkali diſſolves it, though a pretty large quantity is required for this purpoſe.

10. Calculus is likewiſe diſſolved by digeſting in lime-water; and for this purpoſe four ounces of lime-water are required to twelve grains of the calculus; but the latter is partly precipitated by adding acids to the ſolution. By this union the lime-water loſes its cauſtic taſte.

11. Calculus is alſo diſſolved entirely by pure water; but for this purpoſe a large quantity of fluid is required. Eight grains of calculus in fine powder will diſſolve by boiling for a ſhort time in five ounces of water. The ſolution reddens tincture of lacmus, but does not precipitate lime-water; and when it grows cold, the greateſt part of the calculus ſeparates in fine cryſtals.

12. On diſtilling a drachm of calculus in a glaſs retort, a volatile liquor was obtained reſembling hartſhorn, but without any oil; and in the neck of the veſſel was a brown ſublimate. On heating the retort thoroughly red hot, and then leaving it to cool, a black coal was left, weighing 12 grains, which retained its black colour on a red hot iron in the open air. The ſublimate, which had ſome marks of fuſion, weighed 28 grains, and became white by a new ſublimation. Its taſte was ſomewhat ſouriſh, but it had no ſmell; it was ſoluble both in water and in ſpirit of wine; but a larger quantity of ſpirit than of water was requiſite for this purpoſe. It did not precipitate lime-water, and ſeemed in ſome reſpects to agree with the ſal ſuccini.

1456 His concluſions concerning its compoſition.

From theſe experiments our author concludes, that the human calculus is neither calcareous nor gypſeous; but conſiſts of an oily, dry, volatile acid, united with ſome gelatinous matter. The calculus is an oily ſalt, in which the acid prevails a little, ſince it is ſoluble in pure water; and this ſolution reddens the tincture of lacmus. That it contains phlogiſton, appears from its ſolution in cauſtic alkalies and lime-water, but eſpecially from the effect of the nitrous acid, by which it acquires quite different properties than from ſolution in alkalies; nor can it be precipitated from this ſolution. The animal gelatinous ſubſtance appears on diſtillation, by which a liquor is obtained reſembling ſpirit of hartſhorn, and a fine coal is left behind.

1457 Is found univerſally in urine.

13. Calculus is found diſſolved in all urine, even in that of children. On evaporating four kannes of freſh urine to two ounces, a fine powder is depoſited as it cools, and a part firmly adheres to the glaſs. The precipitated powder readily diſſolves in a few drops of cauſtic fixed alkali; and has in other reſpects all the properties of calculus. Of the ſame nature is the lateritious ſediment depoſited by the urine of thoſe who labour under an ague. Mr Scheele ſuſpected at firſt, that there was in this urine ſome unknown menſtruum which kept ſuch a quantity of powder diſſolved, and which might afterwards evaporate by expoſure to the air; but altered his opinion on perceiving that the ſediment was equally depoſited in cloſe veſſels.

14. All urine contains ſome animal earth combined with phoſphoric acid; by the ſuperabundance of which acid,

1458 Why freſh urine reddens lacmus.

acid, the earth is kept diſſolved; and by reaſon of this ſuperabundant acid freſh urine communicates a red colour to lacmus. By ſaturation with cauſtic volatile alkali a white powder is precipitated; of which three drachms and an half are obtained from four kannes of urine. It is ſoluble in nitrous acid; and on adding the vitriolic, ſome gypſum is precipitated. On evaporating the nitrous acid, another remained, which precipitated lime-water; and when mixed with lamp-black, afforded phoſphorus by diſtillation; whence it is evident, that the white powder juſt mentioned contained lime and phoſphoric acid.

1459 Salts, &c. contained in urine.

15. From theſe experiments Mr Scheele concludes, that all urine contains, beſides the ſubſtances already known (*viz.* ſal ammoniac, common ſalt, digeſtive ſalt, Glauber's ſalt, microcoſmic ſalt, ſal perlatum, and an oily extractive matter), a concrete acid, or that of calculus, and animal earth. It is alſo remarkable, that the urine of the ſick is more acid, and contains more animal earth than that of healthy perſons. With regard to the ſal perlatum, it was afterwards diſcovered by Mr Scheele not to be a peculiar acid, but only a phoſphoric acid diſguiſed by a ſmall quantity of foſſil alkali united with it. The analyſis is confirmed by ſyntheſis; for, by combining foſſil alkali with phoſphoric acid, our author obtained a true perlate acid.

1460 Bergman's account of the calculus.

In a ſupplement to Mr Scheele's diſſertation on the calculus, Mr Bergman obſerves, that he could not ſucceed in diſſolving it entirely either in pure water or in the nitrous acid, though the undiſſolved part was the leſs in proportion to the fineneſs of the powder to which the calculus was reduced. The undiſſolved part appears moſt conſpicuous, when ſmall pieces, or ſmall calculi of a few grains weight only, are put into a ſuperabundant quantity of menſtruum, and kept in a degree of heat very near to that which makes water boil. Here it will be obſerved, that the greateſt part of the piece is diſſolved; but that at the ſame time ſome ſmall white ſpongy particles remain, which are not affected either by water, ſpirit of wine, acids, or cauſtic volatile alkali. If the liquor be made fully to boil, theſe particles divide into white rare flocculi, and become almoſt imperceptible, but without any entire diſſolution. Mr Bergman could not collect a ſufficient quantity of them to determine their nature with accuracy; only he obſerved, that when expoſed to a ſtrong heat, they were reduced to a coal which burns ſlowly to aſhes, and is not ſoluble in diluted nitrous acid.

“When calculus veſicae (ſays he) is diſſolved in nitrous acid, no precipitation enſues on adding the acid of ſugar; whence one is readily induced to conclude, that there is no calcareous earth preſent, becauſe this experiment is the ſureſt way to diſcover it. But I have found, in the variety of experiments concerning elective attractions, that the addition of a third ſubſtance, inſtead of diſuniting two already united, often unites both very cloſely. That the ſame thing happens here I had the more reaſon to believe, becauſe the acid of ſugar contains ſome phlogiſtic matter, though of ſuch a ſubtle nature, that, on being burned, it does not produce any ſenſible coal; and the event of my experiment has ſhown, that I was not miſtaken in my conjecture. In order to aſcertain this point, I burned coals of the calculus to aſhes, which were quite white, and ſhowed in every reſpect the ſame phenomena as lime; cauſed ſome efferveſcence during their ſolution in acids, united with vitriolic acid into gypſum, were precipitated by the acid of ſugar, and were partly ſoluble in pure water, &c. Notwithſtanding this, there remains about one-hundredth part of the aſhes inſoluble in aquafortis; being the remainder of the ſubſtance abovementioned, which, together with the concrete acid, conſtitutes the calculus. If the calculus be diſſolved in nitrous acid, the ſolution filtered and evaporated to dryneſs, and the dry maſs calcined to whiteneſs, a calcareous powder is thus likewiſe obtained.”

1461 Calcareous earth ſeparated from it by vitriolic acid.

As pure vitriolic acid contains no phlogiſton, our author ſuppoſed, that by dropping it, in its concentrated ſtate, into a ſolution of calculus in nitrous acid, the calcareous earth, if any exiſted in it, would be diſcovered. In this he was not diſappointed; for when the ſolution was ſaturated, ſome ſmall cryſtals were thus immediately ſeparated. Theſe, on examination, were found to be gypſum; and, after being diſſolved in diſtilled water, were precipitated by acid of ſugar. When the ſolution of calculus was very much diluted, no change appeared at firſt on the addition of oil of vitriol; but after a little evaporation, the abovementioned cryſtals began to appear. Some calculi of the bladder or kidneys at leaſt certainly contain lime, but ſeldom more than one half in an hundred parts, or one in 200 parts.

By the aſſiſtance of heat, concentrated vitriolic acid diſſolves the calculus with efferveſcence, and the ſolution is of a dark brown colour. On adding a little water, a kind of coagulation takes place; but by adding more, the liquor again becomes clear, and aſſumes a yellowiſh colour. Mr Bergman agrees with Mr Scheele in ſuppoſing that the muriatic acid has no effect upon the calculus; but he is in no doubt whether it may not extract ſome part of the calcareous earth.

1462 Red colour of the nitrous ſolution accounted for.

The red colour aſſumed by the ſolution of calculus in aquafortis is remarkable. A ſaturated ſolution diſcovers no ſmell of nitrous acid, and if evaporated by itſelf in a large open veſſel, the liquor aſſumes at laſt a deep red colour, and ſcarcely contains any nitrous acid: for, on the one hand, paper tinged with lacmus ſcarce ſhows any redneſs; and, on the other, the colour is deſtroyed irrecoverably by the addition of any acid. By quick evaporation the ſolution at laſt ſwells into innumerable bubbles; the foam grows redder and redder, and at laſt becomes dark red after it is quite dry. This dry maſs communicates its colour to a much larger quantity of water than before, and diſſolves very readily in all acids, even ſuch as have no action on the calculus; but they entirely deſtroy the colour, and that the more quickly in proportion to their degree of ſtrength; even alum has this effect on account of the ſmall quantity of looſe acid it contains. Cauſtic alkalies alſo diſſolve the colouring matter, and deſtroy it, but more ſlowly.

Our author endeavours to account for this red colour produced by the nitrous acid, from the peculiar nature of that acid and the effect it has upon phlogiſton. In order to obtain it, a proportionable quantity of acid muſt be made uſe of, and it ought to be diluted, that there may be no danger of going beyond the neceſſary limit. If too much be uſed, it will not produce the proper effect; but, by reaſon of its ſuperabundance, more or leſs, or even the whole, will be deſtroyed in proportion to the quantity. By pouring it in an undiluted ſtate on powdered calculus, it is converted in a few moments into mere foam. The acid of calculus is the more eaſily ſeparated from the aquafortis by evaporation, as the latter is rendered more volatile by the inflammable particles of the former: alkali added to them both united does not produce any precipitation; a circumſtance generally obſerved where two acids are united. In this caſe both the acids unite with the alkali, according to the different laws of their attraction. The red maſs obtained after deſiccation is, however, very different from the concentrated acid, ſuch as is contained in the calculus; for it is of a darker colour, and very deliqueſcent: the leaſt particle gives a roſe colour to a very conſiderable quantity of water; but the muriatic and other ſtrong acids always certainly deſtroy it; and, in a longer or ſhorter time, produce a colourleſs ſolution. This remarkable change depends, according to our author, more on the action of the nitrous acid upon the inflammable part, than upon any thing remaining behind.—Such red ſpots as are produced upon the ſkin by the ſolution, are likewiſe produced upon bones, glaſs, paper, and other ſubſtances; but more time is required for their becoming viſible, though this too may be a little accelerated by means of heat.

1463
Experiments of Mr Higgins on this ſubject.

The following is an abſtract of Mr Higgins's experiments upon this ſubject.

1. Eight hundred and forty grains of dry and well powdered calculus were introduced into a glaſs retort. It was taken from a laminated ſtone with a ſmall nucleus, which was likewiſe laminated. The outward cruſt appeared very porous, but increaſed in denſity towards the centre. By the application of heat, an elaſtic fluid was firſt ſlowly extricated; and which, on examination, appeared to be compoſed of equal parts of fixed and phlogiſticated air. The laſt portions came over very faſt, and were attended with an urinous ſmell; and, by continuing the diſtillation, it became evident that fixed and alkaline air came over together without forming any union, as they ought, on the common principles of chemiſtry, to have done; though our author is at a loſs to know why they did not unite, unleſs they were prevented by the ſmall quantity of inflammable air which came over along with them.

From the beginning of the 10th meaſure, a black, charry, and greaſy matter began to line the conical tube and air-veſſel adapted to the retort; and as the proceſs went on, the proportion of alkaline air decreaſed, while that of the inflammable air was augmented, until towards the end, when the laſt nine meaſures were all inflammable; after which no more would come over, though the retort was urged with a white heat. On breaking the diſtilling veſſel, a black powder weghing 95 grains was found in it. On digeſting this for an hour in ten ounces of diſtilled water, and then filtering and evaporating it to two ounces, a yellowiſh powder was precipitated, but no cryſtals were formed after ſtanding a whole night. This powder was then ſeparated by filtration, and the liquor evaporated to one ounce; during which time more powder was precipitated. It was then filtered a ſecond time, and the liquor evaporated to half an ounce; when it began to depoſit a white powder, and to emit a ſubacid aſtringent vapour, not unlike that of vitriolic acid. This white precipitate, when waſhed and dried, amounted only to one grain, had a ſhining appearance, and felt very ſoft, not unlike mica in powder. It was not changed, but rather looked whiter by expoſing it to a fierce heat for ten minutes. It diſſolved in diſtilled water without being precipitated by cauſtic volatile alkali. Mineral alkali, acid of ſugar, and nitrated terra ponderoſa, rendered the ſolution turbid; whence our author inferred, that the powder in queſtion was ſelenite.

After the ſeparation of this powder, the remaining ſolution was evaporated to dryneſs with a gentle heat. During the evaporation it continued to emit ſubacid vapours, leaving eleven grains of powder of a dirty yellow colour, having an aluminous taſte. To this powder he added as much diſtilled water as was nearly ſufficient to diſſolve it; after which it was ſet by for three weeks. At the expiration of this term ſeveral ſmall, tranſparent, and cubical cryſtals appeared on the ſide of the veſſel above the ſurface of the ſolution; and theſe likewiſe had an aluminous taſte. The whole was then diſſolved in diſtilled water, and the ſolution filtered. Acid of ſugar produced no change in the liquor for at leaſt five minutes, but an immediate cloudineſs took place on a mixture with volatile alkali; and on filtering the liquor it was again rendered turbid by mineral alkali, though the cauſtic alkali already predominated. Nitrated terra ponderoſa threw down a copious precipitate, and Pruſſian alkali diſcovered a ſmall quantity of iron. This aluminous ſolution left a yellow ſubſtance on the filter; which, when collected and dried, weighed only half a grain: it diſſolved without efferveſcence in nitrous acid; acid of ſugar cauſed no precipitation, but cauſtic volatile alkali threw down a precipitate which diſſolved in diſtilled water. This ſolution was rendered turbid by the acid of ſugar and muriated terra ponderoſa, but no effect was produced by cauſtic volatile alkali or lime-water.

The yellow powder firſt depoſited by the ſolution weighed two grains and a half, and by expoſure to a ſtrong heat acquired a deep orange colour. On digeſtion with diſtilled water, the inſoluble part was reduced to three-fourths of a grain, and appeared to be iron: while the ſoluble part was found to be nothing elſe but gypſum. Our author, however, is of opinion, that this iron is impregnated with a ſmall portion of vitriolic acid, though not in ſuch quantity as to render it ſoluble.

The charred matter remaining in the retort was reduced by lixiviation with water to 80 grains. Theſe were calcined with a red heat in an open fire, but could not be reduced to a grey powder in leſs than three quarters of an hour. When thoroughly calcined and cold, it weighed only 21 grains, which communicated to hot diſtilled water a limy taſte, and gave it the property of turning ſyrup of violets green. Diluted vitriolic acid had no effect upon it, but it was rendered turbid by aerated volatile alkali and acid of ſugar. The remainder when well dried weighed 16 grains, which diſſolved in nitrous acid at firſt with a little efferveſcence; and when this ceaſed, the ſolution went on very ſlowly, until the whole was taken up. Acid of ſugar made no change in the liquid, but the whole was precipitated by cauſtic volatile alkali. Pruſſian alkali threw down a grain, or perhaps more, of blue;

1464 His account of its component parts.

blue; the precipitate digeſted with diſtilled vinegar loſt a grain and an half, which was thrown down by cauſtic volatile alkali. The inſoluble part being waſhed and digeſted in diſtilled water for half an hour, was partly diſſolved; the ſolution was not affected by cauſtic volatile alkali, but acid of ſugar and nitrated terra ponderoſa cauſed an immediate cloudineſs. Seven grains and an half of the powder, which was inſoluble both in acetous acid and diſtilled water, were readily taken up by diluted vitriolic acid, and precipitated by cauſtic volatile alkali: the 16 grains laſt treated, therefore, appeared to contain, of clay $7\frac{1}{2}$ grains; of ſelenite, ſix grains; magneſia, one and a half; and of iron, one grain. The proportions of the different ingredients in the whole calculus, therefore, according to Mr Higgins, are as follows:

	Grains.
Iron - -	$2\frac{1}{9}$
Selenite - -	11
Clay - -	$7\frac{1}{2}$
Alum - -	8
Pure calcareous earth -	5
Aerated magneſia - -	$1\frac{1}{2}$
Charry combuſtible ſubſtance -	59
In all	$94\frac{1}{9}$

1465 Experiments on the ſublimate ariſing from it on diſtillation.

In this experiment, a darkiſh yellow ſublimate adhered to the neck of the retort; the inner part next the retort more compact, but the reſt of a lamellar ſpongy texture. This ſublimate, when carefully collected, was found to weigh 425 grains, and readily diſſolved in eight ounces of hot diſtilled water. A coaly ſubſtance was ſeparated from this ſolution by filtration, which, when waſhed and dried, weighed ten grains, and when expoſed to a red heat burned with a greeniſh flame, emitting white fumes, which ſmelled like vitriolic ſal ammoniac: the reſiduum after calcination weighed half a grain, and was of a whitiſh colour: appearing inſoluble in diſtilled water, but diſſolving with efferveſcence in nitrous acid. Acid of ſugar cauſed a very ſmall precipitation, which did not take place until the mixture had ſtood for ſome time; but cauſtic volatile alkali inſtantly threw down a precipitate, which was taken up, when waſhed, by the acetous acid. The quantity was too ſmall to be examined with greater accuracy; but it ſeemed to poſſeſs the properties of magneſia. The ſaline ſolution had the colour of ſmall beer; and, when evaporated to two ounces, did not depoſit any ſediment, or yield any cryſtals. The black matter with which the conical tube and air veſſel were lined, weighed 28 grains, and adhered ſo faſt to the glaſs, that it was impoſſible to collect the whole from the fragments of the glaſs. When diſſolved in diſtilled water and filtered, four grains of coals, ſimilar to that obtained from the former, were procured; but no ſigns of cryſtallization were obſerved after evaporation to one ounce, and ſuffering the liquor to ſtand all night.

By this treatment the ſolution acquired the conſiſtence of treacle; ſo that it was plainly not cryſtallizable, and therefore its analyſis was plainly to be attempted after a different method. It was now put into a tubulated glaſs retort, together with ſix ounces of diſtilled water to waſh it down. By diſtillation in a ſand-bath three ounces of water were procured, which differed in nothing from common diſtilled water, but in being coloured with a ſmall quantity of the ſolution from the neck of the retort. On changing the receiver, about half an ounce of liquor of the ſame kind came over, after which the diſtillation began to be attended with an urinous ſmell. This continued barely perceptible for ſome time; but when about an ounce and an half had paſſed over, it became ſo very pungent, that our author could no longer doubt of its being in a cauſtic ſtate. A ſmall quantity of mild alkali, however, adhered to the lower part of the neck of the retort, ſome of which was waſhed down by the diſtillation; ſo that the proportions betwixt the two could not be aſcertained. The volatile alkaline ſolution in the retort had the colour of ſpirit of hartſhorn, and like it became darker coloured by the contact of air; on account of the evaporation of part of the alkali, and the reſt becoming leſs capable of ſuſpending the coaly matter mixed with it.

After all the liquor had paſſed over, and nothing remained in the retort but a ſmall quantity of black matter, the fire was raiſed; and, as the heat increaſed, this black ſubſtance acquired a white colour, with a kind of arrangement on the ſurface, which was occaſioned by the heat applied to the bottom of the retort being only ſufficient to raiſe the ſalt to the top of the matter in the retort; but as the ſand became nearly red-hot, white fumes began to appear, which condenſed on the upper part of the retort, and a little way down the neck. The proceſs laſted until the matter was nearly red-hot, when the fumes ceaſed, and nothing more paſſed over. The ſublimate, when collected, was found to weigh 72 grains, a black porous brittle ſubſtance remaining on the bottom of the retort, which weighed 12 grains. This reſiduum, when expoſed to a ſtrong heat, emitted white fumes, with a ſlight alkaline ſmell; by which proceſs it was reduced, with very little appearance of combuſtion, to a grey powder weighing three grains, which was accidentally loſt.

Five grains of this purified ſublimate, mixed with as much quicklime, emitted no ſmell of volatile alkali; and, when thrown upon a red-hot iron, emitted white fumes. The ſame effect was produced by a mixture of equal quantities of vegetable alkali and ſublimate. The remainder, conſiſting of 62 grains, was divided into two equal parts; the one of which was mixed with two ounces of diſtilled water, and on the other was poured 60 grains of vitriolic acid diluted with half an ounce of water. Theſe two mixtures being ſuffered to remain for ſix weeks, ſeemed to be but little acted upon. That with vitriolic acid was then put into a ſmall matraſs, and boiled on ſand for half an hour with two ounces of diſtilled water, when the whole was taken up. The ſolution looked clear, and depoſited nothing on ſtanding. Mild mineral alkali had no effect upon it; but mild vegetable alkali threw down a copious ſediment in white flocculi, which was rediſſolved by cauſtic alkali, lime-water, and partly by mild mineral alkali. Phlogiſticated alkali, acid of ſugar, and acid of tartar, had no effect upon it. The other portion of ſublimate, which had been mixed with diſtilled water, was very little diſſolved; but in pouring it into a matraſs ſome ſmall round lumps were obſervable on the bottom of the glaſs. Theſe were ſix or ſeven in number, ſome weighing a whole grain, others not more than one-half. They were very hard and compact, with a ſmooth ſurface, and in figure reſembling the nucleus of the original calculus. The whole was then put into a matraſs with about three ounces of water. On boiling it on ſand for three quarters of an hour, about one-half, of it was taken up: the ſolution paſſed the filter very clear whilſt hot; but on cooling became turbid, and at laſt depoſited white flocculi, which were rediſſolved on the addition of cauſtic volatile alkali and lime-water. It turned ſyrup of violets green; which, however, our author thinks might have been occaſioned by its retaining volatile alkali, though it had not the ſmalleſt appearance of any ſuch impregnation. He has nevertheleſs frequently obſerved, that ſometimes the pureſt vegetable alkali contains volatile alkali, notwithſtanding the various operations and degrees of heat it undergoes before it can be brought to the degree of purity at which it is called ſalt of tartar.

On filtering the ſolution to ſeparate what had been depoſited by cooling, no change was produced in the filtered liquor by mineral alkali; but mild vegetable alkali produced a cloudineſs, which was inſtantly taken up on adding mineral alkali and lime-water. Neither Pruſſian alkali, nor the acids of arſenic, tartar, ſugar, or borax, nor any of the three mineral acids, had any effect upon it.

1466 Experiments with nitrous acid.

2. An hundred and twenty grains of the ſame calculus were put into a tubulated glaſs retort, and half an ounce of ſtrong nitrous acid poured upon it. An effervescence immediately enſued; and ſome part of the extricated aerial fluid being perſerved, appeared to be fixed air mixed with a ſmall quantity of nitrous air. When the effervescence ceaſed, a quarter of an ounce more of nitrous acid was added. On digeſting the mixture upon hot ſand for an hour, it emitted nitrous vapour and nitrous air; but the latter in very ſmall proportion. When the ſolution was completed, the whole was poured into a ſmall matraſs, and gently boiled till the ſuperabundant nitrous acid was nearly expelled. The ſolution was of a deep yellow colour and turbid; but on adding five ounces more of water, and digeſting it for a quarter of an hour longer, it acquired the colour and conſiſtency of dephlogiſticated nitrous acid. On cooling it became ſomewhat turbid, and in a few days depoſited a darkiſh yellow powder; which, when ſeparated, waſhed, and dried, weighed little more than a quarter of a grain, and, on examination, was found to be a calx of iron.

1467 Cryſtallizes on expoſure to the ſun.

Our author being deſirous to know what effect the ſun would have upon it, placed it in a window where the ſun ſhone full upon it for four hours every day. Here a little moiſture ſeemed daily to exhale from it, the weather being hot, and the matraſs, which had a ſhort wide neck, being only covered, with bibulous paper to keep out the duſt. In this ſituation, in the courſe of a week, a few very ſmall cryſtals appeared to float upon the ſurface. Theſe in time fell to the bottom, where they adhered together ſo as to form a hard concretion, ſtill retaining a cryſtalline appearance, but ſo ſmall and confuſed, that it was impoſſible to diſtinguiſh their figure; and this depoſition of cryſtals continued for a month, after which it ſeemed to ceaſe. The ſolution was then filtered to ſeparate the ſalt; after which one-half of the liquor was evaporated away, and the reſt ſet in the uſual place for a fortnight longer, but no more cryſtals appeared. The ſalt, which weighed three grains, was then digeſted in four ounces of diſtilled water; but no part ſeemed to be diſſolved. Three ounces of the water were then decanted off, and ſix drops of vitriolic acid added to the remainder, which by the help of digeſtion ſeemed to diſſolve the ſalt ſlowly; but on adding half an ounce more diſtilled water, the whole was readily taken up. Acid of ſugar had no effect on this ſolution; but lime-water rendered it turbid. The whole was then precipitated with cauſtic volatile alkali, and the ſolution filtered, which likewiſe threw down the lime from lime-water. The precipitate was then waſhed, and diſtilled vinegar poured upon it, which did not take it up; but it was diſſolved by marine acid. Phlogiſticated alkali had no effect upon it; and the acid of ſugar occaſioned very little cloudineſs after ſtanding three or four hours; from which our author ſuppoſed that the matter was phoſphorated clay.

The ſolution, being now free from iron and phoſphorated clay, had a ſubacid taſte, and looked clearer, though ſtill retaining a yellow caſt. Acid of ſugar had no effect upon it; but nitrated terra ponderoſa threw down a precipitate, as did likewiſe the cauſtic volatile alkali. Mild vegetable alkali cauſed no precipitation; which our author attributed to the ſolution of the manganeſe and clay by the fixed air extricated from the alkali. Two-thirds of the ſolution were then put into a ſmall glaſs retort, and two ounces diſtilled off, which had no taſte, but ſmelled very agreeably, and not unlike roſe-water. After all the liquor had paſſed over, white fumes appeared in the retort, and theſe were ſoon followed by an aerial fluid. On collecting ſome of this, a candle was found to burn in it with an enlarged flame. Nitrous air did not diminiſh it in the leaſt; and it ſeemed to be that ſpecies of air into which nitrous ammoniac is convertible. No more than 13 or 14 inches of this kind of air could be obtained; and as ſoon as it ceaſed to come over, cryſtals were obſerved in the lower part of the neck of the retort. On augmenting the heat, a white ſalt began to ſublime and adhere to the upper part of the retort; the operation was continued until the retort was red-hot; but, on breaking it, the quantity of ſublimate was ſo ſmall, that very little of it could be collected; though, from the ſmall quantity obtained, our author was convinced of its being the ſame in quality with what was obtained in the former analyſis. The ſalt which cryſtallized in the neck of the retort was nitrous ammoniac, as appeared from its detonation *per ſe*, &c. A grey powder was left in the bottom of the retort, which hot diſtilled water partly diſſolved; muriated terra ponderoſa, acid of ſugar, and vegetable alkali, rendered this ſolution turbid: but cauſtic volatile alkali had no effect upon it. The remaining part of the powder which was left by the diſtilled water, readily diſſolved with effervescence in the marine acid, and was precipitated by cauſtic volatile alkali; the part ſoluble in diſtilled water appearing to be gypſum, and that ſoluble in marine acid to be magneſia.

From all theſe experiments, Mr Higgins concludes the compoſition of the human calculus to be vaſtly different

1468
Higgins's account of the conſtituent parts of calculus.

ferent from what either Mr Scheele or Mr Bergman have ſuppoſed it to be. "It appears (ſays he), that the calculus was compoſed of the following different compounds blended together; *viz.* ſelenite, alum, microcoſmic ſalt, mild volatile alkali, lime, and cauſtic volatile alkali, combined with oil, ſo as to form a ſaponaceous maſs; calx of iron, magneſia combined with aerial acid, clay enveloped by a ſaponaceous and oily matter, and the ſublimate already deſcribed." Conſidering this to be the true ſtate of the calculus in the bladder, the ſmall proportions of clay, ſelenite, magneſia, and iron, which are the moſt inſoluble of the ingredients; the great ſolubility of microcoſmic ſalt and alum, and the miſcibility of lime, volatile alkali, and oil, in water; tend to ſhow, that the ſublimate is the cementing ingredient. Indeed, its inſolubility in water, and property of forming nuclei out of the body, as above obſerved, leave no room to doubt it. The proportion of the other ingredients, and very likely their preſence, depend upon chance, volatile alkali and oil excepted; therefore this ſublimate ſhould be the object of our inveſtigation.

1469
Remarks on the remedies proper for diſſolving it.

Mr Higgins concludes his diſſertation with ſome practical remarks concerning the remedies proper for diſſolving the ſtone, for counteracting that diſpoſition in the body which tends to produce it, and concerning the regimen proper for thoſe who are to undergo the operation of cutting for it. "The effect of mild mineral alkali (ſays he) on the ſublimate, is well worth the attention of thoſe who may have an opportunity of trying its efficacy. Mild mineral alkali may be taken in large doſes, and continued for a length of time with impunity to the moſt delicate conſtitutions, only obſerving a few circumſtances; but this alkali, in a cauſtic ſtate, muſt very often be attended with miſchievous conſequences. Beſides, if we conſider that it muſt enter the maſs of blood before any part can reach the bladder, and the ſmall portion of the doſe taken ſecreted with the urine, and, laſtly, the action of cauſtic alkali upon animal ſubſtances; we ſhall be at a loſs to know on what principle cauſtic alkalies have been recommended in preference to mild. Soap itſelf might as well be recommended at once; for ſoon after cauſtic alkali is taken, it muſt be in a ſaponaceous ſtate. Fixed vegetable alkali ſhould be avoided, and the perference given to the other two alkalies. As it is evident that alkalies have no real action on the ſtone in the bladder, though their efficacy has been experienced in alleviating the diſeaſe when timely adminiſtered, their mode of action is only explicable in the following manner: They either prevent the generation of the ſublimate in the ſyſtem, or elſe keep it in ſolution in the maſs of fluids: and being in the utmoſt degree of diviſibility, its ultimate particles are capable of paſſing through the moſt minute emunctories; by which means it is carried off by other ſecretions as well as the urinary. Thus urine, not being ſaturated with this matter, acts as a ſolvent on the ſtone; and as the moſt ſoluble parts are firſt waſhed away, it falls through time into fragments of irregular ſurfaces, which by their friction irritate and inflame the bladder, as has been obſerved by ſeveral practitioners.

"Allowing that the ſublimate is the cementing ſubſtance in the calculus, and judging, from the effects of alkalies upon it, their *modus operandi* in the conſtitution, it remains now to inquire into the origin of the calculus. Mr Scheele has found this ſublimate in the urine of different perſons; and hence inferred, that it was a common ſecretion; but it ſtill remains to be aſcertained, whether there be a greater quantity of it procured from the urine of patients who labour under this diſorder than in thoſe who do not? If this ſhould not be the caſe, may not a deficiency of volatile alkali in the conſtitution be the cauſe of the concretions in the kidneys, bladder, &c.; or, which muſt have the ſame effect, too great a proportion of acid, which, uniting with the alkali, may take up that portion which would have kept the ſublimate in ſolution until conveyed out of the ſyſtem by the urinary and other ſecretions; and may not this be the phoſphoric acid? If this latter ſhould be the caſe, an increaſe of microcoſmic ſalt muſt be found in the urine; but if the former, a decreaſe of the volatile alkali, and no increaſe of the neutral ſalt. The ſmall quantity of phoſphoric acid found in the calculus proceeds from the ſolubility of microcoſmic ſalt. Do not volatile alkali and phoſphoric acid conſtitute a great part of the human frame? and is their not a proceſs continually carried on to generate theſe in the ſyſtem? and is not this proceſs liable to be retarded or checked by intemperance, &c. which may vary their quantities and proportions? and may not a due proportion of theſe be neceſſary to a vigorous and ſound conſtitution? If ſo, no wonder that an increaſe or deficiency in either or both of theſe ſhould be productive of ſeveral diſorders."

1470
Sublimate of calculus found in conſumptive and gouty people.

On this ſubject, however, our author has not had ſufficient leiſure to make the experiments neceſſary for its elucidation. Indeed, it ſeems not eaſy to do ſo; as, in his opinion, at leaſt 500 would be required for the purpoſe. "That the urinary ſublimate is preſent in tubercles found in the lungs of perſons who die of pulmonary conſumptions, and likewiſe in what are vulgarly called *chalk ſtones*, is what I have experienced: but in what proportion, or whether in quantities ſufficient to cauſe the concretion, is what I cannot ſay; for I have had but a few grains of each to examine. I have every reaſon to ſuſpect, that conſumptions and ſcorbutic complaints very frequently ariſe from a ſuperabundance of this ſublimate in the ſyſtem; and that it is chiefly the cauſe of the gout and rheumatiſm, and ſolely the cauſe of the ſtone in the bladder. I make no doubt but theſe diſorders generally proceed from obſtructions: and it is probable, that either a precipitation of this ſublimate in the ſyſtem, or elſe a deficiency of ſome other ſecretion, which would hold it in ſolution until conveyed out of the body, may be the chief cauſe of thoſe obſtructions; and likewiſe, that different degrees of precipitation may produce different ſymptoms and diſorders.

"That mineral or volatile alkali and bark have been uſeful in the above diſorders, has been affirmed by experienced phyſicians; and I know an inſtance myſelf of mineral alkali and nitrous ammoniac being ſerviceable in a pulmonary complaint of ſome ſtanding.

"With reſpect to the ſtone, when it acquires a certain magnitude, it is abſurd to attempt to diſſolve it in the bladder, it waſtes ſo very ſlowly; and during this time the patient muſt ſuffer vaſt pain, particularly when

when the ſtone acquires a rugged ſurface: therefore cutting for it at once is much preferable.

“ Mineral alkali taken in the beginning of the complaint, and before the ſtone accumulates, will no doubt check its progreſs, and may in time change that diſpoſition in the habit. Patients who are cut for the ſtone ſhould, I think, take mineral alkali for ſome time when the wound is healed, but not before, for fear of bringing on a mortification.”

APPENDIX;

Containing ſuch DISCOVERIES as have appeared ſince the Compilation of the Article, and which could not be inſerted in their proper Places.

I. *VITRIOLIC ETHER.*

1471 Various methods of rectifying vitriolic ether.

M. PELLETIER formerly propoſed a method of rectifying this fluid by putting mangancſe into the veſſels; but as the vitriolated manganeſe might perhaps communicate ſome injurious quality, another method is propoſed by M. Tingry. After firſt drawing off the ether, he adds a diluted ſolution of volatile alkali, and avoids as much as poſſible the diſſipation of the vapours: the ether is then rediſtilled. It may afterwards in this way be waſhed more ſafely, and with leſs loſs. The little proportion of the ether which is ſeparated in the water, may be again recovered, or the water may be again employed for the ſame purpoſe. M. Lunel propoſes calcined magneſia for this purpoſe, as its ſalt is not ſoluble; though perhaps pure terra ponderoſa might be better.

II. *NITROUS ACID.*

1472 Mr Higgins's obſervations.

ON this ſubject Mr Higgins has ſeveral curious and intereſting obſervations. “ It is not an eaſy matter (ſays he), to aſcertain exactly the greateſt quantity of dephlogiſticated air, which a given quantity of nitrous acid may contain. I always found nitre to vary, not only in its product of phlogiſticated and dephlogiſticated air, but likewiſe in their proportion to one another. The pureſt nitre will yield, about the middle of the proceſs, dephlogiſticated air ſo pure as to contain only about $\frac{1}{13}$ of phlogiſticated air. In the beginning, and nearly about the latter end of the proceſs, air will be produced about twice better than common air. On mixing the different products of a quantity of pure nitre, it was found that, by expoſure to liver of ſulphur, $\frac{1}{6}$ part was left unabſorbed; and this was the utmoſt purity in which I obtained dephlogiſticated air from nitre.

1473 Account of its conſtituent parts by M. Lavoiſier.

“ According to M. Lavoiſier, 100 grains of nitrous acid contain $79\frac{1}{2}$ of dephlogiſticated air, and $20\frac{1}{2}$ of phlogiſticated air, which is not quite four to one. But his experiments contradict this; for whatever mode he adopted to decompoſe nitrous acid, it appeared that the proportion of dephlogiſticated air was nearly as five to one of phlogiſticated air.

1474 By Mr Cavendiſh.

“ Mr Cavendiſh has proved, that nitrous acid may be formed by taking the electric ſpark in a mixture of three parts of phlogiſticated air, and ſeven of dephlogiſticated air, which is but $\frac{1}{7}$ more of dephlogiſticated air than nitrous air contains; which may apparently contradict M. Lavoiſier's, as well as my own, eſtimation of the proportion of the conſtituent principles of nitrous acid, when in its perfect ſtate. The red nitrous vapour contains three parts of nitrous air and one of dephlogiſticated air, or one of phlogiſticated and three of dephlogiſticated air; but nitrous vapour may be formed with a leſs proportion of dephlogiſticated air; and which, though it may not be ſo condenſible as a more perfect nitrous vapour, yet will, when in contact with pure alkali, unite with it, and form nitre, as was the caſe in the experiment of Mr Cavendiſh. The common ſtraw-coloured nitrous acid contains more dephlogiſticated air than the red nitrous acid or vapour; the proportion appears to be about four to one; but the colourleſs contains about five of dephlogiſticated to one of phlogiſticated air.

1475 Method of obtaining colourleſs nitrous acid.

“ Having once a charge of nitrous and vitriolic acid in a green glaſs retort, I put it in a ſand-pot to diſtil; but the pot being ſmall, the edge came too near the retort, about a quarter of an inch or more above the charge; which, before the proceſs commenced, and when it acquired more than the heat of boiling water, cracked it all round in that direction. Being thus ſituated, I was obliged to withdraw the fire, and, before the charge got cold, to ladle it into an earthen pan. On introducing it into a freſh retort, I obtained from it nitrous acid nearly as colourleſs as water. The vitriolic acid uſed in this proceſs not being very perfect, the goodneſs of the nitrous acid was attributed to the purity of the nitre from whence it was diſtilled; but in another proceſs, though the ſame nitre was uſed with much purer vitriolic acid, the produce was of an high ſtraw colour. On recollecting the abovementioned circumſtance, the vitriolic acid and nitre were next mingled in due proportion, and expoſed in an earthen pan ſet in ſand, to nearly the heat of boiling water, for half an hour or more, continually expoſing freſh ſurfaces to the air. When the charge was quite cold, I introduced it into a retort, and diſtilled as colourleſs nitrous acid as the former. As no nitrous air was emitted during digeſtion, it muſt have imbibed dephlogiſticated air from the atmoſphere.”

1476 How to ſet charcoal on fire by means of nitrous acid.

Mr Prouſt found, that ſtrong nitrous acid will ſet fire to charcoal if it be rendered very dry. He likewiſe remarked, that charcoal expoſed to the air a few hours after calcination, was unfit for the experiment. Charcoal, he obſerves, attracts moiſture very forcibly. The firſt effect of the charcoal on the nitrous acid, he obſerves, is to withdraw a portion of its water from it; by which it is rendered highly concentrated, at the ſame time that the condenſation of the water heats the charcoal in a ſmall degree, but ſufficiently to volatilize a nitrous vapour; which, as ſoon as it reaches that portion of dry charcoal next the humid part, is condenſed

denſed by it, and generates heat enough to promote the decompoſition of the nitrous acid. Hence we ſee why the experiment will not ſucceed if the acid be poured on the ſurface of the charcoal.

1477 Effect of nitrous acid on blood.

The effect of nitrous acid on blood, according to Mr Higgins, is very ſingular. Two parts of blood procured freſh at the butchers, one of ſtrong nitrous acid, and about one fifth of the whole of water, were digeſted in the heat nearly of boiling water (freſh portions of water being occaſionally added until the whole of the acid was expelled), when it acquired almoſt the colour, and exactly the taſte, of bile. When mixed with a large quantity of water, it acquired a fine yellow colour; and, on ſtanding, depoſited a ſubſtance of a brighter yellow, though the ſupernatant liquor ſtill retained a yellow colour and bitter taſte, but not ſo intenſely as when the precipitate was ſuſpended in it. The different ſtages of this proceſs were well worthy of obſervation. No nitrous air was produced, and the acid was expelled in the ſtate of a white vapour. The liquor was found to increaſe in bitterneſs as the acidity vaniſhed. About the middle of the proceſs, the ſolution firſt taſted acid, but was quickly ſucceeded by a bitter ſenſation. It appears that the nitrous acid took dephlogiſticated air from the blood; for though red nitrous acid was uſed, it was expelled in a perfect ſtate.

III. *Nitre.*

1478 Nitre generated without putrefaction.

Though the artificial generation of the nitrous acid, from a mixture of dephlogiſticated and phlogiſticated air, is now ſufficiently underſtood, yet we do not well know in what manner nature performs the operation. Some chemiſts, particularly M. Thouvenal, have found, that putrefaction favours the production of nitrous acid. All animal ſubſtances, during their decay, give out a vaſt quantity of phlogiſticated air; therefore, if dephlogiſticated air be preſent, it will unite to the phlogiſticated air in its naſcent ſtate, and form nitrous acid: but Mr Higgins has obſerved, that nitrous acid may be generated in plenty where there is no putrid proceſs going on. "The chemical elaboratory at Oxford (ſays he) is near ſix feet lower than the ſurface of the earth. The walls are conſtructed with common limeſtone, and arched over with the ſame; the floor is alſo paved with ſtone. It is a large room, and very lofty. There are ſeparate rooms for the chemical preparations, ſo that nothing is kept in the elaboratory but the neceſſary implements for conducting experiments. There is an area adjoining it on a level with the floor, which, though not very large, is ſufficient to admit a free circulation of air. The aſhes and ſweepings of the elaboratory are depoſited in it. There is a good ſink in the centre of this area, ſo that no ſtagnated water can lodge there. Notwithſtanding all this, the walls of the room afford freſh crops of nitre every three or four months. Dr Wall, who paid particular attention to this circumſtance, and who told me it contained fixed vegetable alkali, requeſted I would analyſe it, and let him know what it contained. I found that two ounces of it contained ſix drachms of nitrated fixed vegetable alkali, and three of calcareous nitre. The nitre firſt appears in ſmall whitiſh filaments as fine as cob-web, which, when they get a little larger, drop off; ſo that they never acquire ſufficient growth to diſtinguiſh their figure to a naked eye. On finding that they contained fixed vegetable alkali, I concluded that it proceeded from minute vegetation; but in this I was miſtaken; for I found that they were ſoluble in water, and that they detonated with charcoal at every ſtage of their growth. Having ſwept this ſaline efflореſcence from the wall, I dug deep into it, but could not obtain nitre from it. When a part had been white-waſhed, it yielded nitre, but not ſo abundantly as a neighbouring ſpot which had not been treated in the ſame manner. Hence it is evident, that nitrous acid may be formed without the aſſiſtance of putreſcent proceſſes in a ſtill damp air, where there is a ſubſtance to attract it when half formed, whereby it is in time brought to perfection. The above facts moreover prove, that fixed vegetable alkali is a compound."

IV. *Marine Acid.*

1479 Unſucceſsful attempts to decompoſe ſea-ſalt.

Mr Higgins informs us, that he has, with a view to decompoſe ſea-ſalt, mixed it with mangan eſe in various proportions, and expoſed them in a reverberating furnace in a well cloſed crucible for three hours, to a heat nearly ſufficient to melt caſt iron. In the ſame manner he treated manganeſe, ſalt, and charcoal, as well as clay, ſalt, and charcoal, and ſalt and clay alone, with very little ſucceſs. He treated calcined bones, ſalt, and charcoal, and calcined bones and ſalt, as well as lime and ſalt, in the ſame manner, without effecting any apparent change in the ſalt. He was informed, however, by Mr Robertſon, apothecary in Biſhopsgate-ſtreet, that he had partially alkalized it, by expoſing it with clay to a fierce heat; but that ſoon after it got into contact with air, it became neutral again. "If common ſalt and litharge be fuſed (ſays Mr Higgins), it is in part decompoſed; the acid ſuffers no decompoſition, but unites with the lead; whereby it acquires, when the ſaline matter is waſhed away, a yellow colour. It is evident (adds he) from theſe facts, that the baſis of marine acid is a combuſtible body, and quite different from light inflammable air, charcoal, or any known inflammable ſubſtance; and that it attracts dephlogiſticated air with greater force than any ſubſtance hitherto diſcovered. Though charcoal will decompoſe all other acids, except a few, when united to bodies which will fix them until they acquire a ſufficient degree of heat, yet it has no effect upon marine acid."

According to Fourcroy, if alkaline air be confined by mercury, and dephlogiſticated marine acid air be added to it (which muſt be done quickly, as the acid air would diſſolve the mercury), each bubble produces a ſlight detonation, and furniſhes a very amuſing ſpectacle.

1480 Method of diſtilling ſpirit of ſalt with clay.

Though in Britain the diſtillation of the ſpirit of ſalt with clay has long been entirely laid aſide for the proceſs with oil of vitriol, yet it is ſtill practiſed in other countries, and may be effected in the following manner: Having previouſly decrepitated the ſalt, and dried the clay, they are then to be ground, mixed, and ſifted together. The mixture is next to be worked with a ſpatula, and then with the hands, until it is brought into a moderately ſtiff and uniform maſs.

This is to be divided into balls about the ſize of a pigeon's egg, ſo that they can paſs through the neck of the retort; but before they are put into the diſtilling veſſel, it is proper to dry them thoroughly. The retorts muſt be of ſtone-ware, and carefully coated, in order to prevent them from breaking with the intenſe heat to which they are expoſed. They are to be filled two-thirds full of materials, and the diſtillation muſt be performed in a reverberatory furnace. The receiver at firſt is not luted on, becauſe that which riſes in the beginning of the diſtillation, being very aqueous, is to be put by itſelf. When this has come over, another receiver is then to be applied, and cemented with fat lute, and covered with a cloth daubed with a mixture of lime and the whites of eggs. The heat is to be raiſed until the retort is red-hot, and continued in this degree until the diſtillation ceaſes.

Various proportions of clay and ſalt have been recommended for this proceſs; but it ſeems probable that not leſs than ten parts of clay to one of ſalt, as Pott has directed, will be found neceſſary. Inſtead of the clay, ſome direct the uſe of bole; but this is inconvenient on account of the iron it contains. Powdered talc has alſo been recommended, but this is not always free from iron; and where a very pure ſpirit is wanted, there is a neceſſity for having recourſe to oil of vitriol, and glaſs or ſtone-ware veſſels. As the marine acid cannot be ſeparated from the earthy mixtures abovementioned, but by means of moiſture, M. Beaumé adviſes to moiſten the reſiduum, and repeat the diſtillation, by which more acid will be obtained.

1481
Effect of marine acid upon phlogiſtic matters.

As the marine acid has very little action upon phlogiſtic matters, it cannot therefore affect oils, either expreſſed or eſſential, in a manner ſimilar to the vitriolic or nitrous. M. Marges, however, has obſerved yellow cryſtals reſembling amber formed in bottles, containing a mixture of oils and marine acid of moderate ſtrength, which had ſtood for ſeveral months. The little effect which the marine acid has upon theſe ſubſtances was firſt ſuppoſed to be owing to its want of phlogiſton in itſelf; but when it was afterwards found, that, by the application of certain ſubſtances which have a great attraction for phlogiſton, the marine acid was rendered capable of uniting very readily with inflammable matters, the former theory was abandoned. It was now aſſerted, that the acid, inſtead of containing no phlogiſton, was naturally endowed with a very conſiderable quantity; and that, in its new ſtate, it was dephlogiſticated by the ſubſtances applied. On the other hand, the antiphlogiſtians aſſerted, that no change was thus made upon it, farther than adding a quantity of pure air, which they ſuppoſe to be the baſis of all acids. On this ſubject, however, M. Cornette maintains, that the marine acid ſeems to have ſo little action upon inflammable ſubſtances, merely becauſe it is weaker than the reſt; and likewiſe that it is often previouſly combined with ſome inflammable matter, by which its attraction is prevented. He maintains, that if the marine acid be concentrated in ſuch a manner as to render its ſpecific gravity to that of water as 19 to 16, it will then act upon oils with heat and efferveſcence, reducing them to a black and thick ſubſtance, and even burning them to a kind of coal. Some experiments have been made by Mr Haſſe, with a view to inveſtigate the action of the marine and vitriolic acids upon balſams and oils; for which purpoſe he mixed two drachms of ſmoking ſpirit of ſalt with one of each of the oily ſubſtances to be tried. The reſults were, that Canada balſam gained one ſcruple in weight; balſam of capivi 19 grains; ſtorax, and Venice turpentine, each one ſcruple; aſphaltum 18 grains; but the eſſential oils of aniſe-ſeed, benzoin, bergamot, coriander, and many others, were not altered in any degree. The action of this acid upon inflammable matters, however, is augmented by its being reduced into the form of air.

Gmelin relates, that, by diſtilling a mixture of five parts of ſalt, twelve of ſpirit of wine, and four of vitriolic acid, to which he had previouſly added one or two parts of water, he obtained a completely dulcified ſpirit of ſalt, and an imperfectly dulcified ſpirit of vitriol, upon rectifying the liquor.

1482
Glaſs corroded by it.

Homberg found, that glaſs was corroded by the marine acid: and his obſervation has been confirmed by Dr Prieſtley; who finds that its corroſive power is augmented by confining the acid in tubes hermetically ſealed. Its power is exerted not only on flint-glaſs, but even on common green glaſs; though more powerfully on the former, where it chiefly attacks the red-lead uſed in its compoſition. By incloſing marine acid gas for ſome weeks in a glaſs tube expoſed to heat, an incruſtation was formed on the inſide, while the air was diminiſhed to $\frac{1}{8}$ of its original bulk, one half of which was abſorbed by water; the other was phlogiſticated air.

1483
Cauſe of the yellow colour of marine acid.

The marine acid is generally met with of a yellow or reddiſh colour, which by Macquer is given as one of its characteriſtic marks. In general, however, this colour is thought to proceed from iron; but Dr Prieſtley has found that it may be produced by many different ſubſtances; and his obſervations have been confirmed by Scheele and other chemiſts. The Doctor is of opinion that it is occaſioned for the moſt part, if not always, by a mixture of earth; and he was able to communicate it by means of calcined oyſter-ſhells, calcined magneſia, pipe-clay, or pounded glaſs; but not by wood-aſhes, from whence the air had been expelled by heat. It was effectually diſcharged by flowers of zinc, a coal of cream of tartar, and by liver of ſulphur; but he found that the colour which had been diſcharged by liver of ſulphur, would return by mere expoſure of the acid to the atmoſphere, but not that which had been diſcharged by flowers of zinc.

Dephlogiſticated ſpirit of ſalt.

1484
Expeditious method of bleaching linen.

When the action of this vapour upon any thing is to be examined, the ſubſtance muſt be put into a bottle in ſuch a manner as to remain in contact with it; or it may be put into a glaſs tube, which is ſuſpended and fixed to the ſtopper, and thus introduced into the bottle.—From its property of deſtroying all vegetable colours, it promiſes to be of very conſiderable uſe in the arts, provided it could be had in ſufficient quantity, and cheap. It bleaches yellow wax, and when properly applied to linen, will whiten it ſufficiently, and without injury in a few hours. This may be effected by ſteeping the linen for that ſpace of time in water impregnated with the dephlogiſticated marine gas. It unites with this fluid rather more eaſily than fixed air.

Ber-

Berthollet, in order to impregnate water with it without expoſing the operator to the fume, which is extremely diſagreeable, put the mixture of marine acid and manganeſe into a retort. To this he applied firſt an empty bottle, and then ſeveral others filled with water, and communicating with each other by means of bent tubes; ſurrounding the whole with ice. When the water in the bottles was ſaturated, the gas became concrete, and fell to the bottom; but with the ſmalleſt heat it aroſe to the top in bubbles. The ſpecific gravity of the ſaturated water was to that of diſtilled water, when the thermometer was only five degrees above the freezing point, as 1003 to 1000. This impregnated water is not acid, but has an auſtere taſte, and has the ſame action as the gas, though in a weaker degree. Mr Berthollet has obſerved, that the addition of alkalies does not prevent, but rather promotes, the diſcharge of colours; for which reaſon he directs to add a fixed alkali to the impregnated water in which linen is to be ſteeped for bleaching. This is the expeditious method hinted at under the article BLEACHING; but which has not hitherto come into uſe, principally through the high price of the dephlogiſticated gas.

The dephlogiſticated marine acid does not diſcharge all colours with equal eaſe. Thoſe of litmus and ſyrup of violets are entirely deſtroyed, and turned white. The colouring matter of Brazil-wood, and ſome green parts of plants, retain a yellow tint. The leaves of evergreen plants reſiſt its action for a long time, and at laſt only acquire the yellow colour which they aſſume by long expoſure to the air; and in general the changes of colour which vegetable matters ſuffer from this gas, are ſimilar to thoſe which take place on long expoſure to the air; and by this operation the gas is converted into common marine acid.

1485
Effect of the dephlogiſticated acid on phlogiſtic matter, &c.

Oils and animal fats are thickened by this gas; and by theſe and other inflammable ſubſtances it is reduced to the ſtate of common marine acid. Light is ſaid to produce the ſame effect. It unites with fixed alkalies and calcareous earths, but without any ſenſible effervеſcence; and thus they loſe their peculiar taſte and colour. M. Berthollet having boiled in a retort, to which a pneumatic apparatus was affixed, ſome of the dephlogiſticated marine acid liquor with mineral alkali, thus obtained a conſiderable quantity of elaſtic fluid, compoſed partly of fixed air, partly of the air contained in the veſſels, and partly of air conſiderably purer than that of the atmoſphere. The reſult of the combination was common ſalt. On repeating the experiment with lime, no fixed air was obtained; but that which came over became gradually more and more dephlogiſticated. Volatile alkali, even when cauſtic, occaſioned an effervеſcence, and emitted a peculiar kind of air, which was neither fixed nor dephlogiſticated, but of a peculiar kind.

Green vitriol is changed to a red by the dephlogiſticated gas, but the colour of blue and white vitriol is not affected. By the aſſiſtance of light, it acts upon phoſphorus, and the reſult is phoſphoric and common marine acids. It does not diſſolve ice nor camphor; in which reſpects it differs from the common marine acid gas.

1486
Marine ether.

On mixing marine acid, manganeſe, and ſpirit of wine, and diſtilling them with a very gentle heat, little air of any kind is produced, but a quantity of ethereal liquor very ſlightly acid. The proportion uſed by Pelletier were an ounce and a half of manganeſe, five ounces of concentrated marine acid, and three ounces of ſpirit of wine. "In this proceſs (ſays Mr Kier), the whole of the dephlogiſticated acid ſeems to have united with the ſpirit of wine, and to have formed ether. The difficulty of combining marine acid with ſpirit of wine, ſo as to form an ether, is well known, and though there have been ſome approximations to it, yet the only inſtances in which it has been completely effected, have ſucceeded in conſequence of the marine acid being dephlogiſticated; by which its action on ſpirit of wine, as well as on all inflammable matters, is greatly increaſed."

1487
Method of procuring a detonating ſalt from the acid in quantity.

M. Pelletier has obſerved, that when we put a bit of phoſphorus into dephlogiſticated marine gas, the former is immediately diſſolved, and a light is perceived, the veſſel being filled at the ſame time with white vapours. He has likewiſe obſerved, that ſea-ſalt, with an exceſs of pure air, thrown into heated vitriolic acid produces a ſmall detonation. To make this ſalt in quantity, take, for inſtance, ten pounds of ſea-ſalt, mixing it with from three to four pounds of manganeſe, pour on the mixture ten pounds of vitriolic acid, and diſtil with Woulfe's apparatus. Paſs the diſengaged acid through a ſolution of fixed vegetable alkali, either cauſtic or otherwiſe. A little more than ten ounces of the new marine ſalt with exceſs of pure air is obtained, and a quantity of ſalt of Sylvius, or digeſtive ſalt. The ſalt with exceſs of pure air cryſtallizes firſt, and by means of repeated cryſtallizations, is entirely diſengaged from the other.

V. *AQUA REGIA.*

1488
Various ways of preparing aqua-regia.

THIS acid, which is named from its property of diſſolving gold, is compounded of the nitrous and marine acids. Gold and platina cannot be diſſolved in any other menſtruum, nor can regulus of antimony and tin be ſo eaſily diſſolved by any other as aqua-regia. It may be made various ways. 1. By adding the two acids to each other directly. 2. By diſſolving in the nitrous acid ſome ſalt containing marine acid, particularly ſal ammoniac and common ſalt. 3. By diſtilling nitrous acid from either of theſe ſalts. And, 4. In Dr Prieſtley's method of impregnating marine acid with nitrous acid vapour.

1489
Differences between theſe acid liquors.

The only difference between thoſe liquors prepared by the methods abovementioned is, that when ſal ammoniac or ſea-ſalt are diſſolved in the nitrous acid, the aqua-regia contains a quantity of cubic nitre, or nitrous ammoniac, which, tho' it cannot much affect the acid as a ſolvent, may make a conſiderable difference in the nature of the precipitate. Thus, gold precipitated from an aqua-regia formed by the pure nitrous and marine acids, does not fulminate, though it does ſo when precipitated from one made with ſal ammoniac. There are no eſtabliſhed rules with regard to the proportions of nitrous and marine acids, or of nitrous acid and ſal ammoniac, which ought to be employed for the preparation of aqua-regia. The common aqua-regia is made by diſſolving four ounces of ſal ammoniac in 16 ounces of nitrous acid; but theſe proportions muſt be varied, according to the nature of the intended ſolution.

tion. Platina, for inſtance, is diſſolved in the greateſt quantity by equal parts of the two acids; regulus of antimony by four parts of nitrous acid to one of marine; and, in general, the greater the quantity of marine acid employed in the mixture, the leſs are the imperfect metals, particularly tin, calcined or precipitated by it. A mixture of two parts of ſpirit of nitre, and one of ſpirit of ſalt, diſſolves nearly an equal weight of tin into a clear liquor, without forming any precipitate; but, for this purpoſe, the operation muſt be conducted ſlowly, and heat avoided as much as poſſible.

VI. *Borax.*

1490 Methods of purifying borax.

In a memoir in Crell's Chemical Annals, by M. Tychſon, the author ſhews, by different experiments, that it may ſometimes be purified by ſolution, filtration, and evaporation only; but that ſometimes the operation is more eaſy and effectual by previous calcination; but then the product is a little leſſened, eſpecially if the calcined maſs be not well powdered, and then boiled ſufficiently in water. Powder of charcoal, he ſays, may be ſometimes advantageouſly employed in the purification; but in general there is no difference between the crude and purified borax, except in the addition of extraneous matters; at leaſt, as the quantity of acids is the ſame, the addition of mineral alkali is uſeleſs: theſe extraneous matters are an animal fat, and a ſand compoſed of clay, lime, and a martial earth. If the oily matter of tartar be ſeparated by paſſing the lixivium through a ſtratum of clay, as is ſuppoſed in the preparation of the cryſtals at Montpelier, it would ſuggeſt a method of greatly abridging the proceſs of the purification of borax.

VII. *Acid of Borax, or Sedative Salt.*

1491 Methods of preparing the ſedative ſalt from borax.

On the preparation of this ſalt Mr Beaumé obſerves, that a little more acid ought to be added to the borax than what is juſt ſufficient to ſaturate its alkaline baſis. Unleſs this be done, the ſedative ſalt remains confounded with the other ſaline matters in the ſolution, and of conſequence the cryſtallization muſt be diſturbed. The ſalt, though formed in an acidulated liquor, is eaſily deprived of its ſuperfluous acid by draining upon paper. It does not cryſtallize as ſoon as the ſtronger acid ſeparates it from its baſis, even tho' the ſolution of borax had been previouſly made as ſtrong as poſſible; but this delay is occaſioned by the heat of the liquor; for as ſoon as it cools, a conſiderable quantity of cryſtals is formed.

1492 Its properties.

The acid of borax does not fall into powder when expoſed to the air, but rather attracts a little moiſture from it. Its taſte is at firſt ſomewhat ſouriſh, then cooling and bitteriſh; and laſtly, it leaves an agreeable ſweetneſs on the tongue. It makes a creaking ſound, and feels a little rough between the teeth; and when vitriolic acid is poured upon it, exhales a tranſient odour of muſk. It is ſoluble, according to ſome chemiſts, in the proportion of one to 20 in cold water, or of one to eight in boiling water. Wenzel informs us, that 960 grains of boiling water diſſolve 434 of the ſalt; while, on the other hand, Morveau aſſerts, that he could diſſolve no more than 183 grains in a pound of diſtilled water. Rouſs informs us, that fixed air prevents the ſolution of the ſalt in water; and Morveau, that its ſolubility is much augmented by cream of tartar. When previouſly made red hot, it diſſolves in water with a ſmell of ſaffron, and a grey powder of an earthy appearance is precipitated, which is ſoluble in vitriolic and marine acids, and may be again precipitated in the form of ſedative ſalt.

Acid of borax and its combinations.

Phlogiſticated alkali makes no change on ſedative ſalt in ſolution; but paper dipped in a ſolution of it in vinegar, and afterwards dried, burns with a green flame. It is capable of vitrification, though mixed with fine powder of charcoal; and with ſoot unites into a black maſs like bitumen; which, however, is eaſily ſoluble in water, and can ſcarce be reduced to aſhes, but partly ſublimes. By the aſſiſtance of heat it diſſolves in oils, eſpecially thoſe of the mineral kind; and with theſe it yields ſolid and fluid compounds, which gives a green colour to ſpirit of wine. Rubbed with phoſphorus it does not prevent its inflammation; but a yellow earthy matter is left behind. It ſeems alſo to give to white and red arſenic a great degree of fixity, ſo as even to become vitreſcible in the fire; and this property it communicates alſo to cinnabar. When mixed and heated with powder of charcoal, it forms no liver of ſulphur.

Sedative Salt COMBINED,

1. *With volatile alkali.* The produce of this is a peculiar ammoniacal ſalt, which does not evaporate when thrown on burning coals, or otherwiſe intenſely heated, but melts into glaſs of a greyiſh colour, but tranſparent, which cracks when expoſed to the air; and, on diſſolution in water, ſhoots into ſmall cryſtals, which appear to have loſt none of their alkaline baſis. It may be decompoſed by the acetous as well as the mineral acids, and by fixed alkalies and lime.

2. *With magneſia* this acid ſhoots into irregular cryſtalline grains ſoluble in vinegar and acid of ants; in which liquids they cryſtallize like ſmall needles joined together at right angles. They are decompoſed by all other acids, and likewiſe by ſpirit of wine. In the fire, however, they melt eaſily without any decompoſition; and in the dry way ſedative ſalt decompoſes all the earthy ſalts formed by magneſia and any of the volatile acids.

3. *With pure earth of alum,* ſedative ſalt forms a ſalt very difficult of ſolution, when one part of earth is ground with four times its weight of ſedative ſalt and water. The ſame kind of earth, mixed with half its weight of ſedative ſalt, forms a hard grey maſs, reſembling pumice ſtone; part of which is ſoluble in water, and yields a mealy ſediment, together with ſome ſedative ſalt unchanged.

4. *With ſiliceous earth* the ſedative ſalt does not unite in the moiſt way; but, on melting one part of acid with two of this earth, we obtain a frothy, hard, greyiſh-white maſs, from which, however, the acid may be again procured.

5. *Gold* is not acted upon in the wet way by acid of borax; nevertheleſs Rouſs obſerved, that when ſedative ſalt was melted with gold-leaf, it did not vitrify, but became frothy and hard, did not colour the flame of ſpirit of wine, and only a little of it was ſoluble in water in which ſedative ſalt had been cryſtallized.

A ſolution of borax in which ſedative ſalt was diſſolved, did not precipitate gold.

6. *Platina* is not precipitated from aqua-regia by ſedative ſalt.

7. *Silver* is not affected by melting with an equal quantity of ſedative ſalt; but the latter is vitrified in ſuch a manner as to become inſoluble in water.

8. *Mercury* is not diſſolved either in the dry or wet way; but a ſolution of borax ſaturated with ſedative ſalt precipitates it in a yellow powder from nitrous acid.

9. *With copper.* On this metal ſedative ſalt acts but weakly, even when the ſolution is boiling hot; nevertheleſs, as much of the metal is diſſolved, as gives a little white precipitate on the addition of fixed alkali; but volatile alkali does not throw down a blue precipitate, nor turn the ſolution of that colour. The ſolution of borax precipitates all ſolutions of copper in acids, and then the ſedative ſalt unites with the copper in form of a light green jelly, which, after drying, is of very difficult ſolution in water. Bergman ſays, it is of an agreeable green colour, which it preſerves after being dried; and that, when expoſed to the fire, it melts into a dark-red vitreous ſubſtance. Wenzel aſſerts, that by long continued trituration of copper filings with ſedative ſalt he obtained a ſolution of the metal, which yielded cryſtals on being evaporated. With twice its weight of copper in a covered crucible, an inſoluble vitreous maſs was obtained.

10. *Tin* is not apparently acted upon by boiling with ſedative ſalt; nevertheleſs, the ſolution becomes turbid on the addition of an alkali. By melting the calx with half its weight of ſedative ſalt, we obtain a black maſs like the dark coloured tin ore. By rubbing for a long time filings of tin with ſedative ſalt and water, and afterwards digeſting the mixture with heat for one day, an hard, ſandy, and irregularly ſhaped ſalt was obtained, which, by diſſolution in water, yielded tranſparent, white, polygonous cryſtals; and a ſalt of of the ſame kind was obtained from the ſlag produced by melting equal parts of ſedative ſalt and tin filings.

11. *Lead* is not acted upon directly; but, on adding a ſolution of borax to ſolutions of the metal in vitriolic, nitrous, marine, or acetous acids, the ſedative ſalt unites with the lead. One part of ſedative ſalt with two of minium gives a fine, greeniſh-yellow, tranſparent, and inſoluble glaſs.

12. *With iron.* The acid of borax diſſolves this metal more eaſily than any other. The ſolution is amber-coloured, and yields an ochry ſediment, with cluſters of yellow cryſtals containing a little iron. The metal is precipitated by borax from its ſolutions in vitriolic nitrous, marine, and acetous acids, and the precipitates are ſoluble in ſedative ſalt. A ſolution of iron may alſo be obtained by melting this ſalt with iron filings, and lixiviating the maſs.

13. *Zinc* communicates a milky colour by digeſtion with ſolution of ſedative ſalt. By evaporation it affords a confuſed ſaline maſs, and a white earthy powder by precipitation with alkali. Flowers of zinc, melted with ſedative ſalt, form a light green inſoluble ſlag.

14. *Biſmuth,* in its metallic ſtate, is not acted upon by ſedative ſalt, but is precipitated by borax from a mixture of vitriolic and marine acids, in form of a very white powder, which keeps its colour when expoſed to air, and melts in the fire to a white, tranſparent, and permanent glaſs.

15. *Regulus of antimony* is not acted upon directly, but its calx is diſſolved when precipitated by borax from a ſolution in aqua-regia.

16. *White arſenic* unites with ſedative ſalt either in the dry or moiſt way, and forms a cryſtallizable compound, forming either pointed ramifications, or white, greyiſh, and yellowiſh ſaline powder.

17. *On regulus of cobalt* the acid has no direct action; but borax precipitates it from its ſolution, and the calx melts with the ſalt into a ſlag of a bluiſh-grey colour; and this, by lixiviation and evaporation, affords a ſedative ſalt impregnated with cobalt, of a reddiſh white colour, and of a ramified form.

18. *Nickel* is precipitated from its ſolution, and the ſedative ſalt unites with it into a ſaline ſubſtance difficult of ſolution.

1493
Experiments made to determine the nature of the ſedative ſalt.

A variety of opinions have been formed concerning the nature of ſedative ſalt. M. Beaumé and M. Cadet particularly have made a great number of experiments on the ſubject; but as none of theſe have led to any certain concluſion, we forbear to mention them at preſent. Thoſe of Meſſrs Exſchaquet and Struve have indeed eſtabliſhed ſome kind of relation between the acids of borax and phoſphorus, and they have made ſeveral attempts to analize the former, but with little ſucceſs. The moſt remarkable of theſe experiments are the following. 1. They diſtilled, with a ſtrong heat, two parts of phoſphoric acid evaporated to the conſiſtence of honey, one of ſedative ſalt, and two of water. Towards the end of the diſtillation a very acid liquor was obtained; and the reſiduum was a white earth, in quantity above three-fourths of the ſedative ſalt employed, and which, on examination, was found to be the ſiliceous earth; the liquor which paſſed over into the receiver being found to be the volatile phoſphoric acid. If, in this experiment, too much phoſphoric acid be added, a greaſy matter remains; and, if too little, a part of the ſedative ſalt will remain undecompoſed. In their attempts to compoſe borax, they combined phoſphoric acid with mineral alkali, the reſult of which was a compound reſembling borax in many reſpects. When expoſed to the fire it melts into a very fuſible glaſs, which has a mild taſte, and ſeems neutral, but on expoſure to the air, becomes moiſt and acid. On being ſaturated with alkali a ſecond time and vitrified, it again deliqueſces and becomes acid; and the more frequently this operation is repeated, the greater is the reſemblance it bears to borax. In this experiment they ſuppoſed that the alkali was decompoſed, and converted into an earth ſimilar to that of ſedative ſalt.

With earthy ſubſtances the reſults were very remarkable. With earth of alum a cryſtallizable ſalt was obtained, which made paper burn with a green flame. Fixed alkali added to a ſolution of this ſalt precipitates an earth, and the ſalt then formed by cryſtallization reſembles borax in ſeveral properties.—In the dry way the earth of alum, with the phoſphoric acid, melts into a glaſs of the ſame fuſibility as that of borax, and like it is fixed in the fire. The ſolution of this glaſs did not cryſtallize. Common clay

Acid of amber.

clay digeſted with phoſphoric acid produces ſilky cryſtals reſembling ſedative ſalt. When dried with their mother-water, theſe give a clear glaſs, which when united with mineral alkali, has the taſte of borax, ſmells in the ſame manner, and has the ſame effect upon metals. With lime, magneſia, and terra ponderoſa, this acid produces fuſible glaſſes, inſoluble in water, and which communicate a green colour to flame. Earth of bones and ſelenite mixed with the acid give a white, hard, ſhining glaſs, like the beſt cryſtal, but fuſible as the glaſs of borax, and which continued flexible after it had ceaſed to be red-hot. Two parts of gypſum, with one of phoſphoric acid, gave a milk white glaſs fit for ſoldering metals and enameling. In theſe experiments, however, it muſt be remembered, that unleſs the heat be raiſed very quickly, the phoſphoric acid will be evaporated before any fuſion takes place.

VIII. *Acid of Amber.*

It was known to Agricola, that a particular kind of ſalt could be obtained from amber by diſtillation; but neither he, nor any ſucceeding chemiſt for ſome time aſcertained its acid properties. On the contrary, ſome erred ſo far as to imagine that it was a volatile alkali; but, about the beginning of the preſent century, its acidity began to be generally acknowledged. This property indeed diſcovers itſelf by the taſte, which is manifeſtly acid and empyreumatic, along with the peculiar flavour of amber. According to Scheele, alſo, the aqueous fluid which paſſes over in the diſtillation of amber, is an acid reſembling vinegar both in taſte and chemical properties; and which of conſequence ought not to be confounded with the true acid of amber, which manifeſts qualities of a very different kind.

1494 Methods of purifying the ſalt of amber.

The properties of ſalt of amber can hardly be inveſtigated until it has been purified; for which, of conſequence, various methods have been propoſed. Pott recommends cryſtallization, after having filtered the ſolution through cotton-wool, in order to retain the oil. Cartheuſer attempts the purification by diſſolving the impure ſalt in ſpirit of wine, then diluting with ſix times its quantity of water, and cryſtallizing the ſalt. Others recommend ſublimation with common ſalt or ſand, and Bergman with pure clay.

The ſalt of amber diſſolves, by the aſſiſtance of heat, in nitrous and marine acids, and in the vitriolic without heat. In none of theſe combinations, however, does it either alter the diſſolving acids, or ſuffer any alteration itſelf, except that it becomes whiter; with nitre it detonates and flies off; and if the quantity of ſalt of amber has been greater than that of nitre, the latter is alkalized. Stockar informs us, that it expels the marine acid from ſal ammoniac, and ſublimes before that ſalt; with which it does not form any union. When ſublimed from common ſalt, it does not alter the latter in any other reſpect than giving it a darker colour. It precipitates calcareous earth from its ſolution in vinegar; and it decompoſes ſugar of lead; but the precipitate differs from plumbum corneum. It does not prevent the ſolution of lead in the acids of ſea-ſalt and nitre; nor does it produce any ſulphureous ſmell by calcination with charcoal. Hence it appears that it is neither a vitriolic, nitrous, nor marine acid; and M. Bourdelin muſt have been miſtaken, when he affirms, that, after detonation of this ſalt with nitre, he obtained a reſiduum, which taſted like common ſalt, decrepitated in the fire, yielded cryſtals of a cubical form, precipitated ſilver and mercury from the nitrous acid; and thence concluded that it was the ſame with acid of ſea-ſalt. It is very dear, as only about half an ounce can be obtained from a pound of amber.

Acid of amber and its combinations.

Acid of Amber COMBINED,

1. *With fixed vegetable alkali.* By ſaturating ſalt of amber with the fixed vegetable alkali, and then ſlowly evaporating the ſolution, we obtain, according to Wenzel, a light deliqueſcent ſaline maſs; but, according to Stockar, whoſe experiments are confirmed by thoſe of Mr Keir, the ſolution abovementioned affords ſhining white tranſparent cryſtals of a triangular priſmatic figure, with the terminating points truncated. Theſe cryſtals readily diſſolve in water, deliqueſce in the air, and have a peculiarly bitter ſaline taſte. In the fire they decrepitate, melt, and remain neutral; though Wenzel has obſerved, that with an intenſe heat they are decompoſed and become alkaline. Theſe cryſtals do not change aquafortis into aqua-regia; and though they precipitate both the ſolutions of lead and ſilver, the precipitates are neither plumbum corneum nor luna cornea.

2. *With Mineral alkali.* This combination produces long three-ſided columnar cryſtals, intermixed with ſome that are foliated. Theſe cryſtals do not deliqueſce in the air, and have a ſaline, bitter, and ſmoky taſte. They are leſs ſoluble than common ſalt, and melt with more difficulty than nitre. They do not become alkaline on burning coals, and, in their other properties, reſemble the former.

3. *With volatile alkali.* This ſalt ſhoots into acicular cryſtals, having a ſharp, ſaline, bitter, and cooling taſte; when heated in a ſilver ſpoon, they melt and evaporate entirely; in cloſe veſſels they ſublime. They do not precipitate ſolution of ſilver, nor change ſpirit of nitre into aqua-regis. A powerful antiſpaſmodic remedy is prepared from rectified ſpirit of hartſhorn and ſalt of amber.

4. *With lime.* This ſhoots into oblong pointed cryſtals, which do not deliqueſce in the air, and are ſoluble with difficulty even in boiling water; nor, according to Mr Stockar de Neuforn, can they be decompoſed by diſtillation either with acetous or marine acids. They detonate by diſtillation with nitrous acid; and are decompoſed, either in the moiſt or dry way, by the vitriolic. When mixed with common ſal ammoniac in the dry way, they ſuffer a decompoſition; the ſuccinated ammoniacal ſalt flying off and the combination of marine acid with lime remaining behind.

5. *With magneſia.* This yields a white, gummy, frothy, ſaline maſs, which acquires a yellowiſh colour when dried by the fire; and, when cool, deliquates in the air. It is decompoſed by alkalies and lime, as well as by the vitriolic acid.

6. *With clay.* By uniting the acid of amber with an edulcorated precipitate of alum with vegetable alkali, Wenzel obtained priſmatic cryſtals, which could not be decompoſed by alkalies.

7. *With ſilver.* The acid of amber has no effect on
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Acid of amber and its combinations.

ſilver in its metallic ſtate ; but with its precipitate forms thin oblong cryſtals, radiated and accumulated upon one another, from which the ſilver may be ſeparated by alkalies, by quickſilver, and by copper.

8. *With copper.* By a long digeſtion of copper with acid of amber a green ſolution is obtained, which by mixture with common ſalt is rendered turbid, by vitriolic acid white, and lets fall a green precipitate on the addition of fixed alkali. Wenzel, however, could not obtain this precipitation by alkalies. His ſolution yielded groups of green cryſtals, gave a cruſt of copper to zinc, and was precipitated by liver of ſulphur.

9. *With iron.* Wenzel diſſolved a precipitate of this metal in acid of amber, and from the ſolution obtained ſmall, brown, tranſparent, and ſtellated cryſtals. Zinc precipitated the metal, but not alkalies. From a ſlightly coloured ſolution of metallic iron, Pott obtained, by means of alkali, a white precipitate, which ſoon became yellow, and at length green, by pouring water upon it.

10. *With tin.* Acid of amber diſſolves tin when precipitated by a fixed alkali ; and the ſolution yields thin, broad, and foliated tranſparent cryſtals. Alkalies throw down but little from this ſolution ; liver of ſulphur more ; and lead, iron, or zinc, nothing.

11. *With lead.* Acid of amber whitens the ſurface of lead in its metallic ſtate, but does not diſſolve it ; neither can lead be precipitated from its ſolutions in nitrous and marine acids by ſalt of amber, though this is denied by Pott. According to Stockar, however, it forms a white precipitate with ſugar of lead. This metal precipitated by an alkali, and diſſolved in acid of amber, forms long foliated cryſtals lying upon one another ; from the ſolution of which the lead may be precipitated by alkalies in the form of a grey powder, and by zinc in its metallic ſtate.

12. *Zinc*, in its metallic ſtate, is readily diſſolved by the acid of amber ; and by a combination with the precipitate formed by fixed alkali, we obtain long, ſlender, foliated cryſtals, lying upon one another. The ſolution lets fall a white precipitate on the addition of fixed alkali ; but this is denied by Stockar, who ſays that volatile alkali produces a red precipitate.

13. *Biſmuth.* By means of heat, Stockar obtained a ſolution of this ſemimetal in acid of amber, which was decompoſed by alkalies. Wenzel obtained, from a precipitate of biſmuth prepared by means of fixed alkali, ſmall, ſlender, foliated, and yellow cryſtals; which alkalies cannot decompoſe, though black precipitates are thrown down by lead and zinc.

14. *Regulus of antimony.* Little or none of this ſemimetal, in its reguline form, is diſſolved in the acid of amber ; but it attacks the precipitate made with fixed alkali. This ſolution is very copiouſly precipitated by liver of ſulphur, but not by alkalies.

The combinations of this acid with gold, platina, nickel, arſenic, and manganeſe, have either been found impracticable, or not yet attempted ; all thoſe above deſcribed are non-deliqueſcent, and part with their acid when expoſed to the fire. The elective attractions of this acid, according to Bergman, are ſingular, as it adheres more ſtrongly, not only to terra ponderoſa and lime, but to magneſia, than to fixed alkali.

Acid of amber and its combinations.

1495
On the nature of the acid of amber.

On the origin of ſalt of amber, Mr Keir remarks, that "it deſerves to be conſidered as a pure and diſtinct acid. No proofs have been adduced of its being a modification either of the marine or vegetable acids, as Mr Cornette and M. Hermbſtadt have ſuppoſed. The former, having diſtilled ſpirit of ſalt with oil of lavender, obtained an acid which ſmelled like ſalt of amber, but on examination was found to retain the properties of the muriatic acid. He alſo relates, that, when purifying a conſiderable quantity of the ſalt of amber which he had prepared himſelf, ſome ſea-ſalt was ſeparated, which in the diſtillation had ariſen along with it. But this obſervation cannot be juſtly applied to ſhow any reſemblance betwixt theſe two, any more than the ſmell in the former caſe could ſhow an analogy betwixt it and oil of lavender. This mixture of ſea-ſalt with acid of amber, however, may readily explain the miſtake of M. Bourdelin already mentioned. M. Weſtrumb and M. Hermbſtadt have both laboured in vain to convert the acid of amber into acids of ſugar and tartar by frequent diſtillations with ſpirit of nitre ; and their want of ſucceſs confirms the account already given, that the acids of nitre and amber have no action upon each other, farther than that the former is phlogiſticated or changed into red fumes, and the latter becomes whiter. Nevertheleſs, if Mr Scheele's obſervation of the identity of the acid liquor, which comes over in the diſtillation of amber with acetous acid, holds good, we ſhall have the beſt reaſon yet given to aſcribe the origin of this acid to the vegetable kingdom ; and when we conſider the very different properties that are aſſumed by the vegetable acids, which, however, are convertible into one another, no reaſon can be drawn from the diverſity of its properties with thoſe of other vegetable acids, againſt its having a common origin with them. Indeed the natural hiſtory of amber, its ſimilarity to gums and reſins, and its involved inſects, afford other arguments in favour of the opinion.

IX. *Acid of Arsenic.*

1496
M. Pelletier's method of procuring the arſenical acid.

M. Berthollet remarks upon Mr Scheele's proceſs, that during the operation a great quantity of dephlogiſticated air is expelled from the acid. M. Pelletier has found another method of procuring the arſenical acid. He mixes common white arſenic with nitrous ammoniac, and diſtils the mixture. At firſt phlogiſticated nitrous acid paſſes over, then the volatile alkali, and laſtly the arſenical acid remains in the retort in form of a vitreous maſs, which deliqueſces into a very denſe acid liquor, reddening ſyrup of violets, and effervеſcing with alkalies. Mr Macquer had formerly deſcribed this proceſs, and obſerved, that the nitrous acid paſſes over firſt, and then the volatile alkali ; but was of opinion that the reſiduum was nothing but arſenic. He mentions a detonation which took place in his experiment ; but nothing of this kind was obſerved by M. Pelletier: he only informs us, that the nitrous acid was driven over with great violence, while that of arſenic united with the volatile alkali. M. Berthollet, who has endeavoured to aſcertain the weight gained by the converſion of ſulphur, phoſphorus, and arſenic, into acids, determines that of arſenic to be about one-ninth of the whole. At the ſame time he obſerves, that this additional weight does not diſcover the whole weight of the air contained in

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the arſenic, as it had that neceſſary to convert it into calx before the operation of converting it into an acid was begun. On the other hand, M. Bergman aſſerts, that one-fifth of white arſenic is phlogiſton, and that this calx is converted into acid merely by being deprived of its phlogiſton. Thus the *facts* related by theſe two celebrated chemiſts differ enormouſly from one another; M. Berthollet affirming that the arſenic *gains* a ninth of its original weight in the proceſs of acidification; and M. Bergman, that it *loſes* a fifth part of the ſame. M. Berthollet endeavours to reconcile this, by ſuppoſing that Bergman had employed marine acid for the preparation of his arſenical acid, which is well known to cary off with it ſome part of moſt of thoſe ſubſtances with which it is capable of combining; and to this he attributes the loſs of weight in Bergman's proceſs.

IX. *Acid of Molybdæna.*

1497 M. Pelletier's experiments.

The opinion of M. Bergman concerning the metallic nature of the acid of molybdæna has obtained ſome confirmation from the experiments of M. Pelletier. He was not able indeed to obtain any regulus; but by means of oil alone he procured, by two hours vehement heat, a ſubſtance ſlightly agglutinated with a metallic luſtre, containing ſmall round grains of a grey metallic colour, very viſible by the help of a magnifier. Theſe he ſuppoſes to have been a true regulus of molybdæna; which he found to poſſeſs the following properties. 1. It is calcinable by fire into white calx. 2. It detonates with nitre, and the reſiduum is a calx of molybdæna united with the alkali of the nitre. 3. It is converted into a white calx by means of nitrous acid. 4. It yields inflammable air when treated with alkalies in the dry way, and forms peculiar compounds with them. 4. It forms regenerated molybdæna with ſulphur. 6. It unites, and forms peculiar ſubſtances with metals. By uniting it with ſilver, iron, and copper, we have friable reguline maſſes; and refractory powders with lead and tin.

Our author, in conſequence of his experiments, conſiders molybdæna as a metallic ſubſtance mineralized by ſulphur; and the earth called the acid of molybdæna as a calx much dephlogiſticated, which has retained part of the air contained in the nitrous acid. He obſerves likewiſe an analogy betwixt molybdæna and antimony in their chemical reſults. Both of them yield vitrifiable argentine flowers by ſimilar operations, and both are changed into white earths by nitrous acid; but they differ in the two following reſpects. 1. The latter eaſily gives a fuſible regulus; but the molybdæna ſeems to be the moſt refractory of all the ſemimetals. 2. The calx of regulus of antimony is ſoluble by alkalies in the moiſt way, but that of molybdæna is not.

X. *Acid of Tungsten or Wolfram.*

1498 Properties of tungſten.

Mr Luyart, who has examined this mineral, gives the following account of it. 1. It is infuſible by the blow-pipe, though the angles of the pieces into which it is broken are thereby rounded. 2. It efferveſces with microcoſmic ſalt, and melts before the blow-pipe into a reddiſh glaſs. 3. With borax it efferveſces; and by the outward flame of the blow-pipe is changed into a reddiſh glaſs; by the internal flame into a greeniſh one. 4. Heated by itſelf in a crucible, it ſwelled, became ſpongy, ſemivitrified, and was attracted by the magnet. 5. With an equal part of nitre it detonated, or boiled up with a blue flame round the edges, and nitrous vapours aroſe. The maſs was ſoluble in water, and let fall a white precipitate with acid. 5. It melted readily with fixed alkali, leaving a kind of black matter in the crucible, and a ſmaller quantity of lighter coloured ſubſtance on the filter. Theſe reſiduums ſhowed a mixture of iron and manganeſe. 6. With nitrous acid the filtered ſolution let fall a white precipitate, at firſt ſweet, but afterwards bitteriſh and ſharp, and which cauſed a diſagreeable ſenſation in the throat; and the acidity of the ſolution of it was manifeſt, by its turning the tincture of turnſole red.

Having examined the ſubſtance by means of liquids in Mr Scheele's way, they obtained the ſame yellow powder which he had characterized as the acid of tungſten, along with a very ſmall reſiduum, which appeared to contain a mixture of tin. Proceeding farther in the analyſis, they found that wolfram is compoſed of manganeſe, calx of iron, the yellow matter called the *acid of tungſten* by Bergman and Scheele, with a very little mixture of quartz and tin, and which they conſidered as accidental.

1499 Of the yellow matter, called its acid by Mr Scheele.

They now proceeded to examine the yellow matter, ſuppoſed by the two celebrated chemiſts juſt mentioned to be a ſimple acid ſalt, but which turned out very different on their inquiries. In order to procure a quantity of it, they melted ſix ounces of wolfram with as much vegetable alkali, diſſolved the mixture in diſtilled water, filtrated the liquor, and evaporated it to dryneſs. Thus they obtained a white ſalt; upon which, when dry, they poured nitrous acid, and ſet it to boil in a ſand-bath; by which operation it became yellow. They then decanted the liquor, pouring freſh acid upon the reſiduum; and repeated the operation a third time in order to deprive it of all the alkali. The remaining powder was then calcined in a cupelling furnace under a muffle, when it came out quite pure and yellow. The properties of it were then found to be as follow. 1. It is entirely inſipid, and of the ſpecific gravity of 6.12. 2. Before the blow-pipe, it continues yellow in the exterior flame even though put on charcoal; but grows black and ſwells, though it does not melt, in the internal flame. 3. In the internal flame it forms a blue tranſparent glaſs with microcoſmic ſalt. The colour vaniſhes in the external flame, but appears again in the internal one; but by a continuance of this operation, it at laſt loſes its colour ſo much that it cannot be recovered. 4. It efferveſces, and forms a browniſh yellow tranſparent glaſs with borax, which keeps its colour in both flames. 6. When triturated with water, it forms an emulſion which paſſes through filters without becoming clear, and continues a long time without any depoſition. 7. It is inſoluble in acids, but diſſolves readily in the vegetable alkali both in the moiſt and dry way; though the produce has always an exceſs of alkali. 8. On adding nitrous acid in greater quantity than what is neceſſary to ſaturate this exceſs, a white powder falls, which is the ſame with the acid of tungſten diſcovered by Mr Scheele; but which Meſſrs Luyarts will

1500 No ſimple acid procurable from tungſten.

not allow to be a ſimple acid, though they admit that it contains one; and affirm, that its properties are various according to the circumſtances of its precipitation. The properties of it, as deſcribed by them, are the following. 1. It is fuſible before the blow-pipe, exhibiting the ſame phenomena as the yellow matter. 2. By calcination in a little pot or teſt, it emits the ſmell of nitrous acid, and turns yellow; but, on cooling, remains white, inſipid, and inſoluble; and this reſiduum melts by itſelf before the blow-pipe. 3. A yellow colour is produced either by vitriolic or marine acids; and the filtrated liquor affords a neutral ſalt with baſis of fixed alkali, according to the nature of the acid employed. If the vitriolic acid is employed, and the operation performed in a retort, a quantity of nitrous acid paſſes over. 4. If, inſtead of pouring the acid on the ſalt, it be poured upon its ſolution, no precipitate will be formed, not even by making the liquor boil, if the quantity of acid is ſmall; only the ſolution loſes its ſweet taſte, and acquires more bitterneſs. On pouring on a large quantity of acid, and cauſing the liquor boil, a yellow precipitate is formed in every reſpect ſimilar to the yellow matter ſo often mentioned. 5. This ſalt is completely diſſolved by the boiling with vinegar. On leaving the ſolution to cool, a white waxy matter adheres to the ſides of the veſſel; which being waſhed and kneaded with the fingers, forms an adheſive maſs like bird-lime, having a fat and greaſy taſte. By expoſure to the air it acquires a dark grey colour, loſes its adheſive property, and becomes bitter. It diſſolves in water; and gives at firſt a ſweet, then a bitter taſte, making the tincture of turnſole red. 6. On evaporating the alkaline ſolution to dryneſs, pouring acetous acid upon the reſiduum, and then making it boil, the greater part of the reſiduum, was diſſolved, and on cooling afforded feathery cryſtals. Theſe when edulcorated had a ſweet taſte, though leſs ſtrong than that of the former ſalt, which afterwards became bitter. Their ſolution turned blue paper red; was precipitated, and became like an emulſion with ſpirit of wine; and the reſiduum, which did not diſſolve, appeared to be of the ſame nature. The cryſtals diſſolved in freſh acetous acid, and communicated a blue colour to the acid; but this gradually diſappeared on cooling, and a glutinous matter was depoſited on the ſides of the veſſel, which had the properties of the former ſubſtance of that ſort. If, in place of letting the ſolution cool, it ſhould be kept boiling, the blue colour diſappears, and nothing is precipitated. By adding ſpirit of wine when the liquor is almoſt evaporated to dryneſs, a white powder is precipitated; which after being edulcorated with freſh ſpirit of wine, taſtes exceedingly bitter, and is very ſoluble in water. This ſolution, however, does not redden blue paper, nor make a blue with vinegar. With vitriolic acid its ſolution is blue; with vitriol of copper it forms a white precipitate. All theſe ſalts, by calcination, firſt become blue, then yellow, and laſtly white. 7. On pouring a quantity of lime-water upon the ſolution of the precipitate formed by the nitrous acid, as well as on thoſe obtained by the acetous acid, white precipitates were formed, all of which were a true regenerated tungſten. Having afterwards impregnated the liquors with fixed air, and boiled them in order to precipitate the lime more completely, they found in the ſolutions, after they were filtrated and evaporated to dryneſs, neutral ſalts formed of the precipitating acids, joined with alkaline and calcareous baſes. This proved, that both alkali and acid were concerned in the precipitation. 8. On pouring the vitriolic ſolutions of iron, copper, and zinc, as well as that of marine mercurial ſalt, alum, and Pruſſian alkali, upon the ſolution of the precipitate formed by the nitrous acid, no precipitation enſues, and the acetous ſalts of copper and lead give white precipitates; but the Pruſſian alkali forms no precipitate with the acetous ſalts. Hence it appears that this ſalt is not a ſimple acid, but rather a ſalt compoſed of the yellow matter, fixed alkali, and the precipitating acid; and its compoſition appears more fully from the following experiments with the volatile alkali.

1. The yellow powder diſſolves entirely in volatile alkali, but without any perfect ſaturation taking place; and the alkali always prevails. 2. The ſolution being ſet in a ſand-bath, produced needle-like cryſtals, which had a ſharp bitter taſte, exciting a diſagreeable ſenſation in the throat. Their ſolution turned the tincture of turnſole red, and the liquor from which they were cryſtallized had the ſame properties. 3. Having repeated this operation with different quantities of the ſame cryſtals, leaving ſome longer on the fire than others, ſolutions were obtained, whoſe acidity was in proportion to the time they had remained on the fire; but during the operation they all emitted the ſmell of volatile alkali. By calcination this alkali was entirely diſſipated, and the reſiduum was a yellow powder, perfectly ſimilar to that with which the operation was begun. On making uſe of a retort for the operation, the remaining powder was blue. 4. This ſalt precipitates the vitriolic ſalts of iron, copper, zinc, and alum, calcareous nitre, marine mercurial ſalt; the acetous ſalts of lead and copper; and with lime-water regenerates tungſten. The vitriolic acid decompounds it, and forms a blue precipitate; the nitrous and marine acids produce a yellow; but no precipitate is occaſioned by the Pruſſian alkali.

Having poured nitrous acid upon a portion of the ſolution with exceſs of alkali, a white powder was precipitated, which, after edulcoration, had a taſte at firſt ſweet, but afterwards ſharp and bitter, and its ſolution turned the tincture of turnſole red. This, on examination, appeared to be a triple ſalt formed of the yellow powder, volatile alkali, and the precipitating acid.

1501 A kind of ſemimetal procurable from tungſten.

The following experiments realize the conjecture of Bergman, that the acid of tungſten is the baſis of a particular ſemimetal.

1. “ Having kept 100 grains of the yellow powder (ſays M. Luyart) in a Zamora crucible well covered, and ſet the whole in a ſtrong fire for half an hour, it became a ſpongy maſs of a bluiſh black colour, the ſurface of which was cryſtallized into fine points, like plumoſe antimony, and the inſide compact, and of the ſame colour. It was too hard to be broken in pieces by the fingers; and, when ground, was reduced to a dark-blue colour.

2, “ Having mixed 100 grains of the ſame powder with 100 of ſulphur, and put the mixture in a Zamora crucible on a ſtrong fire for a quarter of an hour, it came out a dark-blue maſs, which was eaſily broke by the fingers; and the inſide preſented a cryſtallization like needles as the laſt, but tranſparent, and of the colour of a dark lapis lazuli. This maſs weighed 42 grains, and when placed on burning coals yielded no ſmell of ſulphur.

3. "Having put another 100 grains of this powder into a Zamora crucible, provided with charcoal, and well covered, and placed it in a ſtrong fire, where it remained an hour and a half, we found, on breaking the crucible after it was cool (A), a button, which fell to powder between the fingers. Its colour was dark brown; and on examining it with a glaſs, there was ſeen a congeries of metallic globules, among which ſome were the bigneſs of a pin's head, and when broke had a metallic appearance at the fracture in colour like ſteel. It weighed 60 grains: of courſe there was a diminution of 49. Its ſpecific gravity was 17.6. Having calcined part of it, it became yellow, with $\frac{24}{100}$ increaſe of weight. Having put one portion of this ſubſtance powdered, in digeſtion with the vitriolic acid, and another with the marine acid, neither of them ſuffered more diminution than $\frac{2}{100}$ of their weight; then decanting the liquor, and examining the powder with a glaſs, the grains were ſtill perceived of a metallic aſpect. Both the acid liquors gave a blue precipitate with the Pruſſian alkali, which let us know that the ſmall diminution proceeded from a portion of iron which the button had undoubtedly got from the powder of the charcoal in which it had been ſet. The nitrous acid, and aqua-regia extracted likewiſe from two other portions the ferruginous part; but beſides, they converted them into yellow powder, perfectly ſimilar to that which he uſed in this operation.

4. "Having put 100 grains of gold and fifty of the yellow powder in a Zamora crucible furniſhed with charcoal, and kept in a ſtrong fire for three quarters of an hour, there came out a yellow button which crumbled in pieces between the fingers; the inſide of which ſhowed grains of gold, ſeparated from others of a dark-brown colour. This demonſtrated there had not been a perfect fuſion and likewiſe that this ſubſtance was more refractory with gold, ſince the heat which it endured was more than ſufficient to have melted it. The button weighed 139 grains; of courſe there was a diminution of 11 grains. Having put this button with lead in the cupelling furnace, the gold remained pure in the cupel; but this operation was attended with conſiderable difficulty.

5. "Having made a mixture of platina and yellow powder in the preceding proportions, and expoſed it to a ſtrong fire, with the ſame circumſtances, for an hour and a quarter, it produced a button which crumbled with eaſe between the fingers, and in which the grains of platina were obſerved to be more white than uſual, and ſome of them changed ſenſibly in their figure. This button weighed 140 grains, and of conſequence there had been a loſs of 10 grains. When calcined, it took a yellow colour, with very little increaſe of weight; and after waſhing it to ſeparate the platina, there remained 118 grains of a black colour. Having placed this portion again to calcine over a ſtrong fire in a muffle, it ſuffered no ſenſible alteration in weight or colour; for it neither grew yellow, nor took the brown colour of the platina, but kept the ſame blackneſs as before it was calcined. It muſt be attended to, that in the waſhings there was not ſo much care taken to collect all the platina as to deprive it of the yellow colour, and for this reaſon the water carried off part of the fine black powder: and conſequently the increaſe which the platina preſerved, after being waſhed and calcined the ſecond time, ought to be computed more than the 18 grains which it ſhowed by its weight.

"Having mixed the yellow powder with other metals in the preceding proportions, and treated them in the ſame manner, the reſult was as follows:

6. "With ſilver it formed a button of a whitiſh-brown colour, ſomething ſpongy, which with a few ſtrokes of a hammer extended itſelf eaſily, but on continuing them ſplit in pieces. This button weighed 142 grains, and is the moſt perfect mixture we have obtained, except that with iron.

7. "With copper it gave a button of a copperiſh red, which approached to a dark brown, was ſpongy, and pretty ductile, and weighed 133 grains.

8. "With crude or caſt-iron, of a white quality, it gives a perfect button, the fracture of which was compact, and of a whitiſh brown colour: it was hard, harſh, and weighed 137 grains.

9. "With lead it formed a button of a dull dark-brown, with very little luſtre; ſpongy, very ductile, and ſplitting into leaves when hammered: it weighed 127 grains.

10. "The button formed with tin was of a lighter brown than the laſt, very ſpongy, ſomewhat ductile, and weighed 138 grains.

11. "That with antimony was of a dark-brown colour, ſhining, ſomething ſpongy, harſh, and broke in pieces eaſily: it weighed 108 grains.

12. "That of biſmuth preſented a fracture, which, when ſeen in one light, was of a dark-brown colour, with the luſtre of a metal; and in another appeared like earth, without any luſtre: but in both caſes one could diſtinguiſh an infinity of little holes over the whole maſs. This button was pretty hard, harſh, and weighed 68 grains.

13. "With manganeſe it gave a button of a dark bluiſh-brown colour and earthy aſpect; and on examining the internal part of it with a lens, it reſembled impure drops of iron: it weighed 107 grains."

XI. *Acid of Ants.*

Etmuller is among the firſt authors who mentions the exiſtence of this acid, and ſpeaks of obtaining it by diſtillation. Nothing of its properties, however, was known, until Margraaf undertook to examine it; of whoſe experiments we have an account in the Memoirs of the Berlin Academy for 1749. Since his time a number of chemiſts have proſecuted the ſubject to

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(A) "The firſt time we made this experiment, we broke the crucible without letting it cool entirely; and as ſoon as the matter was in contact with the air, it took fire, and its dark brown colour turned inſtantly yellow."

to a conſiderably greater length ; but Mr Keir prefers the reſearches of Arvidſon, Bucholtz, and Hermbſtadt, to the reſt.

The acid in queſtion is a natural juice which the inſects diſcharge when irritated, and which is very pungent to the ſmell as well as taſte. Thus it may inſtantly be perceived on turning up an ant-hill in ſpring or ſummer. The *formicæ rubræ* of Linnæus are thoſe inſects which have hitherto ſupplied this acid. Mr Arvidſon adviſes to collect them in the months of June and July, by laying ſome ſmooth ſticks upon an ant-hill; which being then diſturbed, the ants will run upon the ſticks in great numbers, and may then be ſwept off into a veſſel containing water until it be full. Hermbſtadt collects them in the ſame manner, but into a dry bottle, to avoid the evaporation of the ſuperfluous liquid. Bucholtz having moiſtened the inſide of a narrow necked glaſs bottle with honey and water, ſunk it into a diſturbed ant-hill until the mouth was level with the ground ; on which the inſects, allured by the ſmell of the honey, went into the bottle, and could not get out.

1502
Different methods of obtaining this acid.

For obtaining the acid, Margraaf employed diſtillation, with the addition of freſh water. Thus he obtained, from 24 ounces of freſh ants, 11 ounces and two drachms of acid, ſome volatile alkali, empyreumatic oil, and a reſiduum containing earth and fixed ſalt. Arvidſon made uſe of two methods : One conſiſted in diſtilling the ants when dry ; from a pound of which, in this ſtate, he obtained eight ounces of acid beſides the empyreumatic oil. His other method was to incloſe, in a piece of linen, the ants previouſly cleaned by waſhing in water, then to pour boiling water upon them, and to repeat the operation until it could extract no more acid ; which is then obtained by ſqueezing the linen, mixing all the liquors, and filtering them. Thus from a pound of ants he obtained a quart of acid liquor, which taſted like vinegar, but was ſpecifically heavier. By diſtillation Hermbſtadt obtained from a pound of dry ants ten ounces and a half of yellow empyreumatic liquor, which did not taſte more ſtrongly acid than the ſpirit obtained by diſtilling wood, on which ſwam three drachms of a brown fetid oil, in all reſpects like that of hartſhorn. In the retort was left a black reſiduum weighing one ounce ſix drachms, which exhibited ſigns of containing volatile alkali. By diſtilling a pound of ants with three of water, according to Mr Margraaf's method, he obtained an acid liquor and ſome oil in the receiver ; and from the ſurface of that which remained undiſtilled, he collected a drachm and an half of fat oil.

The ſpecific gravity of the acid liquor obtained by Mr Arvidſon's maceration was 1,0011 ; that of the ſame liquor, when diſtilled, 1.0075 ; and of the acid concentrated by freezing, 1.0453. According to Bucholtz, the acid liquor thus obtained by maceration did not grow in the leaſt mouldy in the ſpace of four weeks ; during which it was allowed to reſt in order to free itſelf perfectly from the impurities it contained. Mr Hermbſtadt, however, prefers Margraaf's method of diſtillation to that of Arvidſon's macerations, not only as being a more perfect analyſis, but as leſs laborious ; though he finds fault alſo with Margraaf's method, as diluting the acid too much, and altering it ſo that it has not the ſmell of living ants. He totally diſapproves of the method of diſtilling dried ants, as the acid is thus in a great meaſure decompoſed, and the remainder united with much oil. To avoid all theſe inconveniences, he contrived another method, namely, to expreſs the juice of the inſects ; by which means he obtained at once a concentrated liquor fit for diſtillation. In this way he obtained from two pounds of dried ants 21 ounces and two drachms of juice, which had a pungent and highly acid ſmell, reſembling the vapours of fluor acid ; in taſte reſembling concentrated vinegar and acid of tartar ; to which laſt it might be compared for ſtrength of acidity. By diſtilling eight ounces of this expreſſed liquor, he obtained ſix ounces and a half of clear acid, equal in ſtrength to a very concentrated vinegar.

1503
Properties of the pure acid.

The acid, when thus procured in purity, has a pungent, not unpleaſant ſmell, a ſharp, cauſtic taſte, and an agreeable acidity. It reddens blue paper, ſyrup of violets, and litmus ; blackens the vitriolic acid, and converts part of it into a ſulphureous vapour. It is alſo decompoſed by diſtillation with nitrous acid. Spirit of ſalt likewiſe, when dephlogiſticated, decompoſes it, but not in its ordinary ſtate. It does not form ſulphur by an union with phlogiſton, but produces inflammable vapours by diſſolving iron or zinc. By the aſſiſtance of a gentle heat it diſſolves ſoot, but oils with much more difficulty, and powder of charcoal not at all. It does not unite with vitriolic ether ; but in diſtilling a mixture of this acid with ſpirit of wine, Mr Arvidſon ſaw ſome traces of an ether, and M. Bucholtz perfectly ſucceeded in making an ether by means of it. It unites with fixed alkali, forming, according to M. Margraaf, a neutral ſalt, conſiſting of oblong deliqueſcent cryſtals, from which very little acid could be procured by diſtillation *per ſe*, but on adding concentrated oil of vitriol, a very ſtrong and pure acid was obtained ; from a mixture of which with ſpirit of wine, M. Bucholtz readily obtained a true ether. With mineral alkali it forms deliqueſcent foliated cryſtals of a ſaline bitter taſte, and ſoluble in twice their weight of water. With volatile alkali it forms an ammoniacal liquor ; which, according to Arvidſon, cannot be brought into a dry ſtate ; but Mr Arvidſon ſays he has obtained cryſtals from it, though very thin and deliqueſcent. Margraaf obtained dry cryſtals by uniting this acid, with chalk or coral ; and Arvidſon obſerves that this ſalt is tranſparent, cubical, or rhomboidal, nondeliqueſcent, ſoluble in eight parts of water, of a bitter taſte, and inſoluble in ſpirit of wine. No acid can be obtained from it by diſtillation *per ſe*. From a ſolution of magneſia in this acid, Mr Arvidſon obtained ſome ſaline particles by depoſition, and afterwards an effloreſcence of tranſparent ſalt riſing round a ſaline maſs. This ſalt had ſcarcely any taſte, was ſoluble in 13 parts of water, and inſoluble in ſpirit of wine. With ponderous earth the acid formed a cluſter of bitter needle-like cryſtals, which did not deliqueſce, were ſoluble in four times their quantity of water, inſoluble in ſpirit of wine, and when burnt gave out a ſmell like that of burnt ſugar, leaving a coal which efferveſced with acid. It unites with difficulty to the earth of alum, and can ſcarcely be ſaturated with it. It does not precipitate ſilver, lead, or mercury, from their ſolution in nitrous acid ; whence it ſeems to have no affinity to the marine acid: and as it does not precipitate lime from the marine acid, it ſeems to have as little with the vitriolic.

1504 Has an affinity with the acetous acid.

From his experiments, however, Margraaf concluded, that the acid of ants, in many reſpects, though not in all, has a great affinity with the acetous acid. From this it is diſtinguiſhed by forming different compounds, and likewiſe by having different affinities. It diſlodges the acetous acid alſo in all inſtances, and the arſenical acid from cobalt and nickel. It has a greater attraction for fixed alkalies than for lime.

1505 Its effects on metals.

As a ſolvent it acts but weakly upon copper; not at all, or very little, on ſilver, lead, tin, regulus of antimony, or biſmuth, but ſtrongly on iron or zinc. It diſſolves, however, the calces of copper, ſilver, zinc, and lead, without affecting thoſe of tin, regulus of antimony, or biſmuth. The calx of quickſilver, according to Margraaf, is revived by it. According to Arvidſon, it cryſtallizes with iron, zinc, or lead; does not act upon the regulus of antimony, of arſenic, cobalt, or nickel; though it diſſolves their calces as well as the precipitate of mangaueſe. Gold, mercury, and the calx of platina, are not affected by it; but it cryſtallizes with thoſe of copper, ſilver, lead, biſmuth, and mercury.

In its ſtrength of attraction, the acid of ants exceeds thoſe of vinegar, borax, and the volatile ſulphureous and nitrous acids.

1506 Acid procured from various inſects.

Inſects armed with ſtings, as bees, waſps, and hornets, are likewiſe ſaid to diſcharge a very acid juice when irritated; and Mr Bonnet has obſerved a very ſtrong acid ejected by a caterpillar which he diſtinguiſhes by the name of *grande chenille du ſaule a queu fourchue*. None of theſe, however, have been as yet particularly examined.

XII. *Acid of Apples.*

That the juices of unripe fruits contain ſome kind of acid has been univerſally known, and attempts to inveſtigate the nature of it have been made ſome time ago: but it is to Mr Scheele that we owe the diſcovery of the particular acid now treated of.

1507 Acid of citrons how procured.

He had obſerved that the juice of citrons contained a particular acid; which, by being united with lime, formed a ſalt very inſoluble in water; and which therefore by means of lime could be readily ſeparated from the mucilaginous part of the juice. By adding vitriolic acid to this compound of lime with the acid juice, almoſt in the ſame manner in which he uſed to procure the acid of tartar, the lime was again ſeparated, and the pure acid of citrons obtained. Proceeding in the ſame manner with other fruit, he found that an acid, agreeing in every reſpect with that of citrons, could be procured from the juice of the *ribes groſſularia*.

1508 Another acid procured from the juice of fruits.

Examining the juice which remained after the ſeparation of the former acid from the citrons, he found that it ſtill contained another acid; which being ſaturated with more calcareous earth, formed a ſalt eaſily ſoluble in water, and therefore remained ſuſpended in the juice. To ſeparate this new ſalt, he added ſome ſpirit of wine, by which the ſalt was precipitated; but finding that it ſtill contained much gummy matter, he judged that it would be proper to attempt a ſeparation of this gum before he precipitated the ſalt. For this purpoſe he evaporated ſome of the juice of the ribes groſſularia to the conſiſtence of honey, diſſolving the maſs afterwards in ſpirit of wine. Thus the acids, which are ſoluble in the ſpirit, were eaſily ſeparated by filtration from the inſoluble gum. He then evaporated the ſpirit, adding to the remainder twice its quantity of water, with as much chalk as was neceſſary for the ſaturation. The liquor was next boiled for two minutes; during which the inſoluble ſalt was precipitated, and the liquor ſeparated from it by filtration contained the ſolution of chalk in the new acid. To this ſolution he added ſpirit of wine, which again precipitated the ſalt, while ſome ſaponaceous and ſaccharine matters remained diſſolved in the ſpirit.

1509 Its properties.

Having thus at laſt obtained the ſalt in a ſtate of purity, he proceeded to examine its nature; and found, 1. That ſome of it, ſpread on his nail, ſoon dried, and aſſumed the appearance of varniſh. 2. It was very ſoluble in water, and turned litmus red. 3. When the ſolution had ſtood ſome days expoſed to air, it was found to have depoſited a number of ſmall cryſtals, which could only be diſſolved by a quantity of boiling water; and this ſalt was alſo found to be completely neutralized, ſo that, it yielded its calcareous earth to a fixed alkali. 4. The ſalt was decompoſed by heating *per ſe* in a crucible, and left a mild calcareous earth. 5. The acid was ſeparated from the earth by adding oil of vitriol diluted with water until gypſum was no longer precipitated, and the new acid was left diſengaged, ſo that it could be ſeparated by filtration. 6. By this operation, however, all the lime was not precipitated; ſo that the ſeparation of the acid was not complete. 7. He obſerved that the acid had a greater attraction for lead than for lime; and therefore made uſe of the method he had formerly diſcovered for ſeparating the acid of ſorrel. To the acid he added a ſolution of ſugar of lead; by which the acid was precipitated along with the lead, and the vinegar was left in the liquor.

1510 How procured in perfect purity.

To this precipitate, cleaned from the acetous acid by filtration, he added vitriolic acid, which expelled the weaker vegetable one, and thus left it quite pure and free from any heterogeneous mixture.

The juice of apples, either ripe or unripe, was found to contain no acid of citrons, but a large quantity of the new acid; which, being thus alone, he could more eaſily procure by a ſingle operation. The beſt method of procuring this he found to be by ſaturating the juice of the apples with a ſolution of fixed vegetable alkali, and pouring a ſolution of ſugar of lead to that of the ſalt juſt mentioned. The effect of this was a double decompoſition, and a precipitate of lead combined with the new acid. To the edulcorated precipitate he then added a dilute vitriolic acid till he could no longer perceive any ſweet taſte in the liquor; for the firſt portions of the vitriolic acid diſſolve a part of the calx of lead, and impart a ſweetiſh taſte to the liquor, which is ſenſible, notwithſtanding its acidity; but when the quantity of vitriolic acid is ſufficient to ſaturate the whole of the calx, all the metal falls to the bottom, and the ſweetneſs ceaſes; ſo that the acid is at once obtained pure.

1511 Properties of it when obtained from the juice of apples.

The acid of apples is poſſeſſed of the following properties. 1. It cannot be cryſtallized, but always remains in a liquid ſtate; or, if much evaporated, attracts the moiſture of the air. 2. With fixed alkalies of all kinds it forms deliqueſcent ſalts. 3. With calcareous earth it forms ſmall irregularly ſhaped cryſtals, which cannot be diſſolved but in a large quantity of boiling water; but if the acid is ſuperabundant, the ſalt readily diſſolves in lime-water. 4. It is effected by ponderous, earth in the ſame manner as by lime. 5. Earth of alum forms, with the acid of apples, a ſalt not very ſoluble in water. 6. With magneſia the acid forms a deliqueſcent ſalt. 7. Iron is diſſolved into a brown liquor, which does not cryſtallize. 8. The ſolution of zinc affords fine cryſtals. 9. On other metals it has no remarkable effects. From the acid of citrons it differs. 1. The acid of citrons ſhoots into fine cryſtals. 2. The acid of apples can be eaſily converted into that of ſugar, which Mr Scheele could not accompliſh with that of citrons; though Mr Weſtrumb has ſince done it. 3. The ſalt formed with the citron acid and lime is almoſt inſoluble in water; but that with acid of apples and lime is eaſily ſoluble. 4. Acid of apples precipitates mercury, lead, and ſilver from their ſolution in nitrous acid, and likewiſe the ſolution of gold, when diluted with water; but the acid of citrons does not alter any of theſe ſolutions. 5. The acid of citrons ſeem to have a greater attraction for lime than that of apples.

1512
Produced from ſugar by means of nitrous acid.

It is remarkable that this acid is the firſt produced in the proceſs for making ſugar. If a diluted acid of nitre be drawn off from a quantity of ſugar until the mixture becomes a little brown, which is a ſign that all the nitrous acid is evaporated, the ſyrup will be found to have acquired a ſouriſh taſte; and if, by means of lime, we next ſeparate all the acid of ſugar, another will ſtill remain, which diſſolves the calcareous earth. When this acid is ſaturated with chalk, and the ſolution filtered and mixed with ſpirit of wine, a coagulation takes place. On ſeparating the curdled part by means of a ſieve, diſſolving it in water, and then adding ſome vinegar of lead, the calx of lead will be precipitated; and if the new acid is then ſeparated from the metal by means of diluted oil of vitriol, it will be found to poſſeſs all the properties of the acid of apples, and is indeed the ſame. The ſpirit of wine, which has been employed to precipitate the calcareous ſalt, leaves on evaporation a reſiduum of a bitter taſte, very deliqueſcent, and ſimilar to the ſaponaceous extract of the citron.

1513
Experiments with nitrous acid on various ſubſtances.

The following are the reſults of Mr Scheele's experiments with the nitrous acid upon different ſubſtances. 1. From gum arabic he obtained both the acid of apples and of ſugar. 2. The ſame products were obtained from manna. 3. From ſugar of milk he obtained not only its own peculiar acid, but thoſe of apples and ſugar. 4. Gum tragacanth, during its ſolution in nitrous acids, lets fall a white powder, which was found to be the acid of the ſugar of milk. This gum contained alſo the acid of apples and of ſugar, and a ſalt formed from lime and the acid of apples. 5. Starch left an undiſſolved matter; which being ſeparated by filtration, and waſhed, reſembled a thick oil like tallow, which, however, was found to be very ſoluble in ſpirit of wine. By diſtillation he obtained from this oily matter an acid ſimilar to that of vinegar, and an oil which has the ſmell of tallow, and congeals by cold; and, beſides theſe ſubſtances, he found that ſtarch yielded the acids of apples and ſugar. 6. From the root of ſalep he obtained the acid of apples, with a large quantity of calcareous ſaccharine ſalt. 7. Extract of aloes indicated the exiſtence of the acids of ſugar and apples, and loſt the greateſt part of its bitter taſte. During the digeſtion a reſinous matter was ſeparated, which ſmelled like flowers of benzoin, and took fire on being heated in a retort. 8. Extract of colocynth was converted by nitrous acid into a reſinous ſubſtance, and ſhowed ſome ſigns of containing acid of ſugar. 9. The extracts of Peruvian bark and of the other plants examined by Mr Scheele, gave both the acids of apples and ſugar. 10. Theſe two acids were likewiſe obtained from an infuſion of roaſted coffee, evaporated to the conſiſtence of a ſyrup. 11. The ſame products were obtained from an extract of rhubarb, which yielded alſo a reſinous matter. 12. Juice of poppies afforded the ſame reſults. 13. Extract of galls did the ſame. 14. The eſſential oils afforded little or none of the acids; but the oil of parſley-ſeeds ſeemed to be entirely convertible into them. 15. With a very concentrated acid he was able alſo to decompoſe animal ſubſtances. From glue he thus obtained fine cryſtals of acid of ſugar, and afterwards acid of apples. Iſinglaſs, whites and yolks of eggs, afforded the ſame products. From all theſe ſubſtances, eſpecially the laſt, a fat matter was ſeparated: but it was remarkable that the gas, expelled during the proceſs, was compoſed of a little fixed air, a great quantity of phlogiſticated air, and very little nitrous air, whereas no phlogiſticated air is obtained in the uſual proceſs for preparing acid of ſugar. He obſerved alſo that in the proceſs for this acid, a ſmall quantity of vinegar is found in the receiver. He could not obtain the acid of ſugar from the ſaponaceous extract of urine; but got inſtead of it a ſalt, which, when completely purified, reſembled exactly the flowers of benzoin. The ſame ſalt is precipitated in abundance by adding to the extract of urine a little vitriolic or marine acid; and Mr Scheele had already remarked that the ſame ſalt is obtained in the diſtillation of ſugar of milk.

1514
Of the nature of this acid.

From the various experiments which have been made on this acid, it ſeems, according to Mr Keir, to be in an intermediate ſtate betwixt acid of tartar and acid of ſugar. This, however, ought not to prevent it from being accounted a ſeparate and diſtinct acid, otherwiſe we might confound all the vegetable acids with one another. It approaches more nearly to the nature of acid of milk than of any other. From this alſo, however, it is diſtinguiſhed, becauſe the ſalt formed by the union of acid of milk with lime is ſoluble in ſpirit of wine, but not that from lime and the acid of apples. According to Mr Hermbſtadt, if three parts of ſmoking nitrous acid be abſtracted from one part of ſugar, and if the brown acid maſs which remains in the retort be diluted with ſix times its weight of diſtilled water, and ſaturated with chalk, two compounds will be formed; one conſiſting of the acids of tartar and lime, which will precipitate; and the other of lime and the acid of apples, which will remain ſuſpended. If the calcareous earth be precipitated from this latter ſolution by adding acid of ſugar, a pure acid of apples will be left in the liquor: and

and he further informs us, that this acid of apples may be changed entirely into thoſe of ſugar and vinegar, by means of ſtrong nitrous acid.

XIII. *Acetous Acid.*

1515 How to cryſtallize ſpiritus Mindereri.

It is generally believed, that the combination of this acid with volatile alkali is altogether incapable of cryſtallization; but Scheffer and Morveau inform us, that it may be reduced into ſmall needle-ſhaped cryſtals, when the ſpiritus Mindereri is evaporated to the conſiſtence of a ſyrup, and left expoſed to the cold. The ſalt has a very ſharp and burning taſte, but a conſiderable quantity is loſt during the evaporation. Weſtendorf, by adding his concentrated vinegar to volatile alkali, obtained a tranſparent liquor which did not cryſtallize. By diſtillation it went over intirely into the receiver, leaving a white ſpot on the retort. A ſaline tranſparent maſs, however, appeared in the receiver under the clear fluid. On ſeparating it from the liquid, and expoſing it to a gentle heat, it melted, threw out white vapours, and in a few minutes ſhot into ſharp cryſtals reſembling nitre. Theſe remained unchanged in the cold; but when melted with a gentle warmth, ſmoked and evaporated. Their taſte was firſt ſharp and then ſweet.

1516 Salt from the acetous acid combined with calcareous earth.

The ſalt formed by uniting acetous acid with calcareous earth has a ſharp bitter taſte, and ſhoots into cryſtals ſomewhat reſembling ears of corn. Theſe do not deliquate in the air, unleſs the acid has been ſuperabundant. They are decompoſed by diſtillation *per ſe*, the acid coming over in white inflammable vapours ſmelling like acetous ether, ſomewhat empyreumatic, and condenſing into a reddiſh brown liquor. By rectification this liquor becomes very volatile and inflammable; on adding water, it acquires a milky appearance, and drops of oil ſeem to ſwim upon the ſurface; a reddiſh brown liquor, with a thick black oil, remain after rectification in the retort. On mixing this calcareous ſalt with that of Glauber, a double decompoſition takes place; we have a gypſum and the mineral alkali combined with acetous acid. By calcination, the mineral alkali may be obtained from this ſalt in a ſtate of purity. This acetous calcareous ſalt is not ſoluble in ſpirit of wine.

1517 With magneſia.

On ſaturating this acid with magneſia, and evaporating the liquor, we obtain a viſcid ſaline maſs like mucilage of gum arabic, which does not ſhoot into cryſtals, but deliqueſces in the air. It has a ſweetiſh taſte at firſt, but is afterwards bitter. It is ſoluble in ſpirit of wine, and parts with its acid by diſtillation without addition.

1518 With zinc.

Acetous acid diſſolves zinc both in its metallic and calciform ſtate, and even when mixed with other metals. By concentrated vinegar the zinc is diſſolved with great heat, ſulphureous ſmell, and exhalation of inflammable matter. By this union we obtain a congealed maſs, which on dilution with water ſhoots into oblong ſharp cryſtals at the firſt cryſtallization, and afterwards into cryſtals of a ſtellated form. From this liquor indeed cryſtals of various forms have been obtained by different chemiſts. Monnet obtained from it a pearl-coloured ſalt in friable talky cryſtals; which when thrown on the coals, fulminated a little at firſt, and gave a bluiſh flame, and then melted, letting its acid eſcape, while a yellow calx remained. Hellot informs us, that this ſalt by diſtillation *per ſe* in water, affords an inflammable liquor, and an oil at firſt yellow and then green, with white flowers burning with a blue flame. Weſtendorf obtained no oil in this diſtillation, but ſome acetous acid; a ſweet-taſted empyreumatic liquor impregnated with zinc; ſweet flowers, or ſublimate, ſoluble in water, and burning with a green flame. On applying a ſtronger heat, the zinc was ſublimed in its metallic form, leaving a ſpongy coal at the bottom of the retort. The ſolution gives a green colour to ſyrup of violets, lets fall a white precipitate on the addition of alkalies or an infuſion of galls. It is not precipitated by common ſalt, vitriolated tartar, vitriolic or marine acids, blue vitriol, or corroſive ſublimate; but forms a red precipitate when added to a ſolution of gold; a white precipitate with ſolution of ſilver; a cryſtalline pearly precipitate with ſolution of mercury; and cryſtalline precipitates with ſolutions of biſmuth and tin. According to Bergman, it is decompoſed by acid of arſenic.

1519 Its phenomena with arſenic.

Though regulus of arſenic is not ſoluble in this acid, its calx may be diſſolved either in common or diſtilled vinegar. M. Cadet obtained a ſmoking liquor by diſtillation from a mixture of white arſenic and terra foliata tartari. This experiment has been repeated by the chemiſts of Dijon, and attended with the following curious circumſtances. "We digeſted (ſay they), in a ſand-bath, five ounces of diſtilled vinegar on white pulverized arſenic; the filtrated liquor was covered, during evaporation, with a white ſaline cruſt. Of this ſubſtance were formed 150 grains; on which fixed alkali appeared to have no effect, and which was at firſt conſidered as pure arſenic. However, a cat, which had ſwallowed 72 grains of it, was only affected with vomitings that day and the next, and afterwards perfectly recovered. A ſimilar doſe was given to a little dog; but as he ran away, the effect it had upon him could not be diſcovered; but he returned afterwards in good health, and never ſhowed any uneaſineſs: whence it may be concluded, that vinegar is in ſome meaſure an antidote againſt the pernicious qualities of arſenic.

1520 Vinegar ſuppoſed to be an antidote againſt arſenic.

"On rediſſolving this ſaline cruſt in pure water, filtering and mixing it with liquid alkali, an irregularly cryſtallized ſalt was formed in it after a few days ſtanding. By this ſalt a yellow precipitate was thrown down from the nitrous ſolution of ſilver; whereas the ſolution of arſenic and terra foliata tartari threw down a white one.

"Equal parts of terra foliata tartari and arſenic, diſtilled in a retort, gave firſt a ſmall quantity of limpid liquor with a penetrating ſmell of garlic, and which had the property of reddening ſyrup of violets; while ſolution of arſenic in water turns that ſyrup green. The vinegar which now aroſe was not ſaturated when arſenic, but effervеſced ſtrongly with fixed alkali, with which it became turbid, but did not let fall any precipitate. On changing the receiver, there came over a reddiſh brown liquor, accompanied with thick vapours, diffuſing an intolerable ſmell, in which that of arſenic could ſcarcely be diſtinguiſhed. On continuing the operation, a black powder ſublimed into the neck of the

the retort, together with a little arſenic in its metallic form, and a matter which took fire by a lighted candle like ſulphur.

“ The red liquor ſtill preſerved its property of ſmoking though cold; diffuſing at the ſame time its peculiar and abominable fetor, from which the apartment could ſcarcely be freed in ſeveral days. This liquor does not alter the colour of ſyrup of violets, but efferveſces ſlightly with fixed alkali, letting fall at the ſame time a yellow precipitate, which, however, diſappeared on an attempt to ſeparate it by filtration.

1521 **Curious phoſphoric liquor.**

“ M. Cadet had obſerved, that the ſmoking liquor of arſenic did not kindle at the approach of a lighted candle; but that, on pouring it from the receiver into another veſſel, it had kindled the fat lute with which the junctures had been cloſed, and which had been dried during the operation: but we, being deſirous of examining more fully the nature of the red liquor which collects at the bottom, and has the appearance of oil, having decanted that which ſwims on the top, and poured the remainder on a filter of paper, before many drops had paſſed, there aroſe a thick ſmoke forming a column from the veſſel to the ceiling; a ſlight ebullition was perceived at the ſides of the veſſel, and a beautiful roſe-coloured flame appeared for a few moments. The paper filter was burnt at one ſide, but moſt of it was only blackened. After the flame was extinguiſhed, a fat reddiſh matter remained: which being melted on burning coals, ſwelled conſiderably, emitting a white flame. It then ſunk, and left on the coal a black ſpot, which could not be effaced but by the moſt vehement fire.

“ At the time theſe obſervations were made, the liquor had been diſtilled for three weeks, and the bottle frequently opened. The inflammability could not proceed from the concentration of the vinegar: for the roſe-colour of the flame, the precipitation of the ſublimate, and the fixity of the ſpot remaining on the coal, evidently ſhowed that the two ſubſtances were in a ſtate of combination; which is alſo further evinced by the loſs of the inflammable property when the liquor was decompoſed by fixed alkali.—The ſmell of the liquor, however, though ſo intolerably fetid, was attended with no other inconvenience than a diſagreeable ſenſation in the throat, which further ſtrengthens the ſuſpicion that vinegar is an antidote againſt arſenic.

“ The ſaline brown maſs remaining in the retort was partly diſſolved by hot water; and the filtrated lixivium was very limpid, but emitted the peculiar ſmell of the phoſphoric liquor. By evaporation it yielded a ſalt which did not deliqueſce in the air, of an irregular ſhape; and which being put on burning coals, did not ſmell ſenſibly of arſenic; loſt its water of cryſtallization; and became mealy and white without being diſſipated by heat. On expoſing the reſiduum to the air, it was found next day reſolved into a liquor; whence it is probable that moſt of it was compoſed of cryſtallized alkali, having received from the decompoſition of the vinegar as much fixed air as was neceſſary for its cryſtallization.”

1522 **Effect of the acetous acid on mercury.**

This acid does not act upon mercury in its metallic ſtate, but diſſolves the mercurial calces, as red precipitate, turbith mineral, and the precipitate formed by adding fixed alkali to a ſolution of mercury in nitrous acid; with all which it forms white, ſhining, ſcaly cryſtals, like thoſe of ſedative ſalt.

1523 **On ſilver.**

Vinegar does not act upon ſilver in its metallic ſtate, but readily diſſolves the yellow calces precipitated from its ſolution in nitrous acid by microcoſmic ſalt and volatile alkali. By the help of a boiling heat alſo it very copiouſly diſſolves the precipitate obtained by means of a fixed alkali. The laſt mentioned ſolution yields ſhining, oblong, needle-ſhaped, cryſtals, which are changed to a calx by means of ſeveral acids, eſpecially the muriatic. The ſilver is thrown down in its metalic form by zinc, iron, tin, copper, and quickſilver.

1524 **On gold.**

Though the acetous acid has no effect upon gold in its metallic ſtate, yet a ſolution of this metal is decompoſed by crude vinegar, which produces both a metallic precipitate and dark violet-coloured powder. Diſtilled vinegar throws down the gold in its metallic form. The precipitate by fixed alkali digeſted with acetous acid is of a purple colour. This, as well as fulminating gold, is diſſolved by Weſtendorff's concentrated vinegar; the fulminating gold very eaſily. The ſolution is of a yellow colour; and with volatile alkali affords a yellow precipitate; with lixivium ſanguinis, a blue one; both of which fulminate. The dry ſalt of gold diſſolves in the acetous acid, and produces oblong yellow cryſtals.

1525 **On inflammable ſubſtances.**

This acid has no effect on fat oils, farther than that when diſtilled together, ſome mixture takes place, as the Abbé Rozier has obſerved. Neither does diſtilled vinegar act upon eſſential oils, though M. Weſtendorff's diſtilled vinegar diſſolved about a ſixth part of oil of roſemary, and about half its weight of camphor. The latter ſolution was inflammable, and let fall the camphor on the addition of water. The acid diſſolves all the true gums, and ſome of thoſe called gum-reſins, after being long digeſted with them. By long boiling, Boerhaave obſerves, that it diſſolves the bones, cartilages, fleſh, and ligaments of animals.

1526 **Concentration of the acetous acid.**

The concentration of this acid may be effected by combining it with alkalies, earths, and metals. By combining it with copper, and then cryſtallizing and diſtilling the compound, we obtain the acid in the higheſt ſtate of concentration in which it is uſually met with. To produce this ſtrong acid, we have only to diſtill verdegris, or rather its cryſtals in a retort. The operation muſt be begun by a very gentle fire, which brings over an aqueous liquor. This is to be ſet aſide, in order to procure the more concentrated acid, which comes over with a ſtronger fire. On changing the receiver, and augmenting the heat, we obtain a very ſtrong acid which comes over partly in drops, and partly in white vapours. It is called radical vinegar, or ſometimes ſpirit of Venus, and has a very pungent ſmell, almoſt as ſuffocating as that of volatile ſulphureous acid. As the laſt portions of it adhere pretty ſtrongly to the metal, we are obliged to raiſe the heat to ſuch a degree as to make the retort quite red in order perfectly to ſeparate them. Hence ſome part of the metal is raiſed along with the acid, which, diſſolving in the receiver, gives the liquor a greeniſh colour; but from this it may be eaſily freed by a ſecond diſtillation, when it riſes with a very gentle heat, and

and becomes extremely white. Cryſtals of verdegris afford about one half their weight of radical vinegar; but verdegris itſelf much leſs, and of a more oily quality.

1527 Of its cryſtallization.

If this acid be heated in a wide-mouthed pan, and fire applied to it, it will burn entirely away like ſpirit of wine. This obſervation we owe to the count de Lauragais, who has likewiſe obſerved, that it is capable of cryſtallization. This, however, takes place only with the laſt portions which came over, and the cryſtals appear in the form of plates or needles. The marquis de Courtrivon, who has repeated and confirmed the experiment of the count de Lauragais, ſuppoſes this phenomenon to be owing to a ſulphur-like mixture of acetous acid and phlogiſton. Leonhardi ſuppoſes an analogy between theſe cryſtals and the white ſalt of copper expelled at the end of the operation by the count de Laſſone. This ſalt was at firſt very white, and fixed on the neck of the retort pretty thick; but unleſs quickly collected, was ſoon deſtroyed by the ſucceeding vapours. When expoſed to the air, it attracts moiſture, and runs into a greeniſh liquid. It is uncommonly light, and in ſuch ſmall quantity, that ſcarce five or ſix grains can be collected from a pound of verdegris. Its taſte is acid, auſtere, very unpleaſant and permanent. It readily and totally diſſolves in water, and partially in ſpirit of wine, leaving a yellow powder totally ſoluble in volatile alkali, and which burns with a green flame. From this ſalt, volatile alkali acquires a blue colour, and litmus a red one; and thus it diſcovers itſelf to be compoſed of acetous acid and copper.

1528 Difference between radical vinegar and common acetous acid.

Experience has ſhown that radical vinegar differs conſiderably in its properties from the common acid. It has a greater attraction for alkalies, forms with them more perfect combinations, and is leſs volatile. M. Berthollet obſerves, that when vinegar concentrated by froſt and radical vinegar, are reduced to equal denſities, by adding water to the heavier of the two, they differ very much both in ſmell and taſte. Laſſone found, that radical vinegar formed a cryſtallizable compound with volatile alkali; and Berthollet has obſerved the ſame with regard to fixed vegetable alkali. The cryſtals of the latter with radical vinegar were flat, tranſparent, and flexible, ſlowly deliqueſcent in the air. On comparing the ſalts formed by the two acids, he found, that the acetous ſalt rendered the ſyrup of violets green; but its colour remained unaltered with that made with radical vinegar. The latter alſo required a ſtronger fire to expel part of its acid; it was alſo whiter, and had a leſs acid taſte. On pouring radical vinegar on the acetous ſalt, the ſolution afforded, by evaporation and cryſtallization, a ſalt perfectly ſimilar to that procured directly from radical vinegar and fixed alkali. On diſtilling the mixture, the radical vinegar appeared to have expelled the common acetous acid, as the liquor which came over efferveſced with vegetable alkali, and formed with it a terra foliata tartari.

“It ſeems probable (ſays Mr Keir), that the radical vinegar contains a larger portion of the aerial principle than the common acetous acid; by which it undergoes a change ſimilar to that of marine acid, when brought into that ſtate in which it is ſaid to be dephlogiſticated. This air it may acquire from the metallic calx, which being deprived of its air is reduced to its metallic ſtate. Thoſe who believe in the phlogiſton of metals, may ſay that the acid is dephlogiſticated by imparting its phlogiſton to the metal, which is thereby metallized. It appears, however, to be very diſtinct from common acetous acid, and deſerves to have its properties and compounds farther inveſtigated.”

1529 How to obtain it pure from terra foliata tartari.

Concentrated acetous acid, of a great degree of ſtrength may alſo be obtained by diſtilling terra foliata tartari with vitriolic acid; but Leonhardi obſerves, that the acid thus obtained is always more or leſs contaminated with the volatile acid of ſulphur. He obſerves alſo, that the method propoſed of ſeparating the ſulphureous acid by a ſecond diſtillation from ſalt of tartar is not effectual, becauſe the ſulphureous acid has leſs attraction for alkalies than the acetous. Weſtendorf recommends the neutral ſalt formed by acetous acid and mineral alkali, inſtead of the terra foliata tartari. Thus, in the firſt place, we readily obtain cryſtals free from the inflammable matter of the vinegar; and, in conſequence of this, though we diſtil it afterwards with concentrated oil of vitriol, no ſulphureous taint can be produced. Even ſuppoſing this to be the caſe (he ſays), it may be removed by a ſecond diſtillation from ſome mineral alkali. Mr Keir, however, obſerves, that “probably all the acids diſtilled from acetous ſalts by means of the vitriolic, partake of the property of that procured by diſtilling cryſtals of verdegris; and none of them can compare with that from which Mr Louitz obtained acetous ether without addition, as a pure concentrated and unaltered vinegar.”

XIV. *Acid of Benzoin.*

1530 M. Lichtenſtein's account of its properties.

The properties of this acid have been inveſtigated by M. Lichtenſtein, and are as follow. 1. Expoſed to the heat of a candle in a ſilver ſpoon, it melts as clear as water, without burning, though it is deſtroyed by contact of flame. 2. When thrown upon coals, it evaporates, without reſiduum, in a thick white ſmoke. 3. It is not volatile without a conſiderable degree of heat. 4. By very ſlow cooling its aqueous ſolution yields large cryſtals, long, thin, and of a feathery ſhape. 5. It is ſoluble in the concentrated acids of nitre and vitriol, but ſeparates from them, without decompoſition, on the addition of water. 6. By the other acids it cannot be diſſolved without heat, and ſeparates from them alſo without any change, merely by cooling. 7. It is copiouſly diſſolved by ſpirit of wine, and precipitated from it on the addition of water. 8. With alkalies it forms neutral ſalts, very ſoluble in water, and of a ſharp ſaline taſte. With vegetable alkali it forms cryſtals of a pointed feathery form: with mineral alkali it yields larger cryſtals, which fall into powder on being expoſed to the air; and with volatile alkali it is difficultly cryſtallizable into ſmall, feathery, and deliqueſcent cryſtals. It is ſeparable from alkalies by the mineral acids. 9. With calcareous earth it forms white, ſhining, and pointed cryſtals, not eaſily ſoluble, and which have a ſweetiſh taſte without any pungency. 10. With magneſia

Acetous acid.

ſmall feathery cryſtals are formed, of a ſharp ſaline taſte, and eaſily ſoluble in water. 11. An aſtringent ſalt is formed with earth of alum.

All theſe earthy ſalts are eaſily decompoſed by the mineral acids as well as by alkalies. The acid of benzoin itſelf reddens litmus, but has little effect upon ſyrup of violets.

1531
Effects of nitrous acid upon it.

Meſſrs. Hermbſtadt and Lichtenſtein have both tried the effects of nitrous acid upon that of benzoin. In this operation, however, a great obſtacle aroſe from the volatility of the acid of benzoin, which prevented it from bearing any conſiderable heat without paſſing over into the receiver. By repeated diſtillations, however, the acid of benzoin, diminiſhed in its volatility, aſſumed a darker colour, and acquired a bitteriſh taſte. A coal was alſo left at the bottom; and, at the end of the third operation, when the nitrous acid had been all drawn off, M. Hermbſtadt obſerved that ſome brown drops came over which had the appearance of a dark-coloured tranſparent oil, ſoluble in diſtilled water, emitting acrid fumes, and having a very cauſtic taſte. On diſtilling this acid liquor a ſecond time, a yellow ſaline maſs was obtained, which, when diſſolved in diſtilled water, formed a fluid acid, which precipitated a ſolution of ſugar of lead and lime-water. On examining the charred reſiduum left in the retort, he obſerved, that, after calcination, ſome of the earth had been vitrified, while another was of a ſoft conſiſtence, and had acquired a cauſtic taſte. From a mixture of the abovementioned dark-brown acid and ſpirit of wine, he obtained an ether, which differed from the nitrous in being much leſs volatile, and ſmelling like bitter almonds.

From this reſiduum Mr Lichtenſtein obtained a reſinous ſubſtance, to which he aſcribes the volatility of the acid of benzoin, as well as the ſmell of bitter almonds already mentioned.

Scheele failed in his attempt to obtain ether from flowers of benzoin and ſpirit of wine; but, by adding a little ſpirit of ſalt, he obtained a kind of ether which fell to the bottom. On diſſolving this in alkalized ſpirit of wine, and drawing off the latter by diſtillation, he obtained from it a quantity of flowers of benzoin.

1532
Acid of benzoin procurable from Peruvian balſam and urine.

From Peruvian balſam alſo Lehman obtained a quantity of the acid of benzoin. It may alſo be procured from urine, either by precipitation, from the ſaponaceous extract (A), or by repeatedly diſtilling from it ſpirit of nitre, as in the preparation of acid of ſugar. In the urine it is found combined with volatile alkali, by which it becomes ſoluble in ſpirit of wine.

XV. *Sebaceous Acid.*

This is ſaid to have been firſt diſcovered by Mr Gruitzmacker, who publiſhed an account of it in 1748. It was afterwards more accurately treated of by Mr Rhades in 1753. Its properties were inveſtigated by Meſſrs Segner and Knappe in 1754; and afterwards more fully by Dr Crell, of whoſe diſcoveries an account is given in the Philoſophical Tranſactions for 1780 and 1782. It is found not only in the fat of all animals, but in ſpermaceti, the butter of cocoa, and probably in other vegetable oils.

Sebaceous acid.

1533
Sebaceous acid procurable from various ſubſtances.

In ſeveral reſpects it ſeems analogous to the marine acid; but in others it is remarkably different, particularly in precipitating a ſolution of corroſive ſublimate. It is probable, however, that is principles are the ſame with thoſe contained in all other vegetable and animal acids; and this opinion is ſupported by what happens on treating tallow in the uſual manner for obtaining acid of ſugar; for thus, not the ſebaceous, but the ſaccharine acid is found to be produced.

1534
Has a remarkable power of attraction.

It has a very great ſtrength of attraction, and by means of heat decompounds even the vitriolic ſalts themſelves; but in the moiſt way is expelled by the three mineral acids, though it expels all the vegetable ones, as well as thoſe of fluor and arſenic.

1535
Remarkable effect on tin.

Its moſt remarkable property is its effect on tin. The filings of this metal, eſpecially with the aſſiſtance of heat, are corroded by it into a yellow powder, and at the ſame time give out a very fetid ſmell. The ſolution, though filtered, ſtill continues turbid, and depoſits more yellow powder, acquiring at the ſame time a fine roſe-red colour. By adding water to this yellow powder, a white deliqueſcent ſalt may be obtained, and a ſimilar one obtained by diſſolving a yellow powder precipitated by this acid from ſolution of tin in aqua-regia.

1536
Its effects on other ſubſtances.

It corrodes lead rather than diſſolves it; but diſſolves a conſiderable quantity of minium, and changes the reſt to a white powder. This ſolution is ſweetiſh, and is not precipitated by common ſalt. The metal is precipitated by ſebaceous acid from the nitrous, in white needle-like cryſtals, eaſily ſoluble in water. A like precipitation takes place in ſolution of ſugar of lead; but the precipitate is ſtill ſoluble in ſtrong vinegar, provided it be not adulterated with oil of vitriol. In its elective attractions it agrees with the acids of apples and of fluor, preferring magneſia to fixed alkali.

XVI. *Acid of galls.*

Though it has for a long time been known that the infuſion of galls has the property of reddening vegetable juices, diſſolving iron, and decompoſing liver of ſulphur, theſe effects were generally aſcribed to its aſtringency. Of late, however, it has been found, that beſides this aſtringent principle a true acid exiſts in galls; and to this, rather than to the aſtringent principle, are we to aſcribe the properties of galls in ſtriking a black with ſolution of vitriol, &c.

1537
Method of ſeparating the acid.

To ſeparate the acid from the other matters contained in the galls, we muſt add fixed alkali to a decoction of them; by which means the aſtringent matter will be thrown down, and the acid remain in the liquor joined to the alkali, the precipitate, waſhed with clean water, dried, and rediſſolved, blackened a ſolution of vitriol but faintly, and no more than what may be ſuppoſed to proceed from ſome remaining acid, which could not be abſtracted. This is proved by di-

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(A) By this is meant urine evaporated to a thick conſiſtence, and deprived of moſt of its ſalts by ſolution in ſpirit of wine.

Acid of galls.

1538 An acid obtained from galls by diſtillation.

ſtilling the aſtringent matter in queſtion, when an acid liquor comes over, which has the property of blackening ſolution of vitriol. Scheele has obſerved, that when galls in ſubſtance are expoſed to diſtillation, an acid liquor riſes of an agreeable ſmell, without oil, and afterwards a kind of volatile ſalt, which is the true acid of the galls. Hence he infers, that this ſalt is contained ready formed in the galls themſelves; but ſo much involved in ſome gummy or other matter, that it cannot be eaſily obtained ſeparately.

1539 Properties of this acid.

The acid of galls is capable of being ſeparated by cryſtallization. In an infuſion made with cold water, Scheele obſerved a ſediment which appeared to have a cryſtalline form, and which was acid to the taſte, and had the property of blackening ſolution of vitriol. By expoſing the infuſion for a long time to the air, and removing from time to time the mouldy ſkin which grew upon it, a large quantity of ſediment was formed. On rediſſolving this in warm water, filtering and evaporating it very ſlowly, an acid ſalt was obtained in ſmall cryſtals like ſand, which had the following properties: 1. It taſted acid, effervеſced with chalk, and reddened litmus. 2. Three parts of boiling water diſſolved two of the ſalt; but 24 parts of cold water were required to diſſolve one. 3. It is likewiſe ſoluble in ſpirit of wine; four parts of which are required to diſſolve one of the ſalt when cold, but only an equal quantity when aſſiſted by a boiling heat. 4. The ſalt is deſtructible by an open fire, melts and burns with a pleaſant ſmell, leaving behind a hard inſoluble coal, which does not eaſily burn to aſhes. 5. By diſtillation an acid water is firſt obtained without any oil: then a ſublimate, which remains fluid while the neck of the retort is hot, and then cryſtallizes. This ſublimate has the taſte and ſmell of flowers of benzoin; is ſoluble in water and in ſpirit of wine; reddens litmus; and precipitates metallic ſolutions of the following colours, viz. gold of a dark brown; ſilver of a grey colour; copper of a brown; iron of a black; lead of a white colour; mercury of an orange; biſmuth, lemon-coloured. The acid of molybdæna became yellow coloured, but no precipitate enſued. Solutions of various kinds of earths were not altered; but lime-water afforded a copious grey-coloured precipitate. 6. By treating this acid with that of nitre, in the manner directed for producing acid of ſugar, it was changed into the latter.

XVII. *Identity of the Vegetable Acids.*

1540 Mr Keir's objections to the opinions on this ſubject.

On the proofs of the identity of the vegetable acids with one another, Mr Keir makes the following remarks: "The experiments and obſervations which have been made, prove evidently a ſtrong analogy between the acetous acid, ſpirit of wine, tartar, and acid of ſugar; and they ſeem to ſhow the exiſtence of a common principle or baſis in all of them, modified either by the addition of another principle not common to all of them, or by different proportions of the ſame principle. None of the opinions on this ſubject, however, are quite ſatisfactory. The production of the acetous acid by treating ſpirit of wine with other acids, does not prove that the acetous acid was contained in the ſpirit of wine, but only in concurrence with them, that they contain ſome common principle. There is no fact adduced to ſupport Morveau's opinion, that fixed air is abſorbed during the acetous fermentation; or that the preſence of this fixed air is neceſſary. The decompoſition of all vegetable acids by heat, and the production therefrom of fixed and inflammable gaſes, ſhow that theſe acids contain ſome of the ſame principles as theſe elaſtic fluids, but do not prove that the gaſes exiſted in the fluids. We have good reaſon to believe that acetous acid does not contain any fixed air already formed; for it yields none when vitriolic acid is added to it, or to foliated earth; nevertheleſs, my opinion that vegetable and animal acids are, by heat, in a great meaſure convertible into fixed air, ſeems to be ſufficiently proved by experiments. Thus Hales has ſhown the great quantities of this gas which tartar yields on diſtillation. Berthollet has obtained the fixed and inflammable gaſes from foliated earth; and Dr Higgins has verified this experiment, and deduced the quantities. From 7680 grains of foliated earth, the Doctor obtained.

Indentity of the vegetable acids.

1542 Quantities of the different ſubſtance obtained from foliated earth.

Cauſtic alkali -	3862.994 grains.
Fixed air -	1473.564
Inflammable air -	1047.6018
Oily matter retained in the reſiduum - - -	78
Oil - - -	182
Water condenſed -	340
Deficiency attributed chiefly to water - -	726.9402"

As fixed and inflammable gaſes may be obtained from every vegetable ſubſtance by fire, nothing can be inferred from theſe experiments to explain particularly the nature of the acetous acid, excepting that it contains ſome of the inflammable matter common to the vegetable kingdom, and eſpecially of the matter common to vegetable acids; all which alſo, when analyſed, furniſh large quantities of theſe two gaſes.

1543 Air abſorbed in the formation of all acids.

"Although we are far (adds our author) from the knowledge requiſite to give a complete theory of the acetous fermentation, yet it may be uſeful to explain the ideas that appear moſt probable. In all the inſtances that we know of the formation of acids, whether effected by combuſtion, as the acids of ſulphur and phoſphorus, or by repeated abſtractions of nitrous acid, as in the proceſs for making acid of ſugar, a very ſenſible quantity of pure air is abſorbed. In the caſe of combuſtion we know, from the weight acquired, that there is a great abſorption of air; and in the latter caſe, of acids being produced by application of nitrous acid, as this acid conſiſts of nitrous and pure air, and as in theſe operations a quantity of the nitrous gas is expelled, there ſeems but little doubt that there alſo the pure air of the nitrous acid is united with the ſubſtance employed in the formation of the new acid. Hence, from all that we know, the abſorption of air takes place in all acidifying proceſſes. But it alſo actually takes place in the acetous fermentation, as has been obſerved, particularly by the Abbe Rozier; and it is generally known, that air is neceſſary to the formation of vinegar. The next queſtion is, What is the baſis? And from the experiments already related, of forming the acetous acid by means of ſpirit of wine, it ſeems probable, either that this ſpirit is the baſis of the acetous acid, or that it contains this baſis: and from the convertibility of the acids of tartar and of ſugar

Identity of the vegetable acids.

ſugar into the acetous acid by the proceſſes above deſcribed, it ſeems probable that theſe alſo contain the ſame common baſis; which, being united with a determined quantity of pure air, forms acid of tartar; with a larger quantity, acid of ſugar; and with a ſtill larger, the acetous acid.

1544 Inflammable ſpirit produced from radical vinegar.

“ An inflammable ſpirit is ſaid to appear at the end of the diſtillation of radical vinegar from verdigris. Now, if the ardent ſpirit were contained in the verdigris, as it is more volatile than the acid, it ought to come over firſt; but as it appears only towards the end of the diſtillation, it ſeems to be formed during the operation; and I imagine, that the metal, when almoſt deprived of its acid, attracts ſome of the air of the remaining acid; and the part or baſis of the acid thus deprived of its air becomes then an inflammable ſpirit, and in ſome caſes an oil appears. But as the quantity of acid thus decompoſed is very ſmall, and little air of conſequence remains united with the metallic part of the verdigris, the copper appears rather in a metallic than calciform ſtate after the operation. But zinc, during its ſolution in concentrated vinegar, decompoſes the acid as it does the vitriolic and other ſtrong acids, and accordingly inflammable vapours are produced; and what is remarkable, theſe vapours have a ſulphureous ſmell. Iron always, during its ſolution in concentrated vinegar, produces an expulſion of inflammable vapours; which, however, do not explode like inflammable gas.

1545 Sulphureous inflammable vapours produced from it.

1546 Of the conſtituent parts of the acetous acid.

“ We muſt not imagine that we are yet able to explain completely what paſſes in the acetous fermentation, or that the acetous acid is a compound of mere ſpirit and pure air. Beſides this combination of ſpirit and air, it is obſerved, that a precipitation always takes place before the fermentation is completed, of ſome mucilaginous matter, which diſpoſes the vinegar to putrefy, and from which it therefore ought to be carefully ſeparated. Stahl affirms, that without a depoſition of ſuch ſediment, vinegar cannot be made from ſugar, wine, or other juice. Beſides the matter that is depoſited, probably as much remains in the liquor as can be diſſolved therein; for, by diſtillation, much of a ſimilar extractive matter is left in the retort. What the nature of this matter is, and how it is formed, has not yet been examined. Though diſtillation frees the acid from much of this extractive ſubſtance, yet we have no reaſon to believe that we have ever obtained it entirely free from inflammable matter; as it retains it even when combined with alkalies and with metals. When ſugar of lead and other acetous ſalts are diſtilled with a ſtrong heat, the ſubſtances remaining in the retort have been obſerved to poſſeſs the properties of a pyrophorus; and this will happen whatever pains have been taken to purify the vinegar employed. See the article Pyrophorus. This fact ſhows the exiſtence of an inflammable matter in this acid; and which may perhaps be eſſential in its compoſition, and neceſſary to its properties. Although fermentation is the uſual mode of obtaining acetous acid, yet it appears from the inſtances obſerved by latter chemiſts, that it is not eſſential to its formation, but that it is alſo formed in various chemical proceſſes; and the acid obtained by diſtillation from woods, wax, &c. are very analogous to vinegar. It appears alſo on treating the acid of ſugar with nitrous acid, as has been obſerved both by Weſtrumb and Scheele. The latter further acquaints us, that he obtained it in analyſing a tallow like oil, which remained undiſſolved upon digeſting ſtarch in nitrous acid. As acid of ſugar alſo may be obtained from a variety of animal ſubſtances, and as this acid is convertible into the acetous we have one reaſon more added to many others, to prove that the matters of vegetable and animal ſubſtances are not capable of any chemical diſtinction.”

1547 It is formed in various chemical proceſſes.

Addition to Sect. I. § 20.

XVIII. Addition to Sect. I. § 20. *concerning the volatility of a Mixture of Marine and Nitrous Acids.*

1548 How to deprive aqua-regia of its volatility.

This is much leſs ſenſible when the acids are weak than when they are concentrated. On mixing the two when moderately ſmoking, and which had remained for a long time ſeparate without occaſioning any diſturbance, a vaſtly ſmoking aqua-regia has been produced, which would either drive out the ſtopple, or burſt the bottle in warm weather. On diſtilling a pretty ſtrong nitrous acid from ſal ammoniac, M. Beaumé obſerved, that the vapours which came over were ſo exceedingly elaſtic, that notwithſtanding every precaution which could be taken in ſuch a caſe, the diſtillation could not be continued. By letting this eſcape, however, Mr Cornette obſerved, that the diſtillation of theſe two ſubſtances may be carried on to the end without any inconvenience, and the aqua-regia will then be no longer troubleſome.

XIX. *Test for Acids and Alkalies.*

The general method recommended for diſcovering a ſmall quantity of acid or alkali in any liquid, is by trying it with any vegetable blue, ſuch as ſyrup of violets; when, if the acid prevails in the liquor, the ſyrup will acquire a red colour, more or leſs deep according to the quantity of acid; or if the alkali prevail, it will change the ſyrup green in like proportion. Since the late improvements in chemiſtry, however, the ſyrup has been found deficient in accuracy, and the infuſion of turneſole, or of an artificial preparation called litmus, have been ſubſtituted inſtead of it. The infuſion of litmus is blue, and, like ſyrup of violets, becomes red with acids. It is ſo ſenſible that it will diſcover one grain of oil of vitriol though mixed with 100,000 of water. Unfortunately, however, this infuſion does not change its colour on mixture with alkalies; it is therefore neceſſary to mix it with juſt as much vinegar as will turn the infuſion red, which will then be reſtored to its blue colour by being mixed with any alkaline liquor. The blue infuſion of litmus is alſo a teſt of the preſence of fixed air in water, with which it turns red, as it does with other acids.

1549 Inaccuracy of the common teſts.

The great ſenſibility of this teſt would leave very little reaſon to ſearch for any other, were it always an exact teſt of the point of ſaturation of acids and alkalies; but, from the following fact, this appears to Mr Watt to be dubious. A mixture of phlogiſticated nitrous acid with an alkali will appear to be acid by the teſt of litmus, when other teſts, ſuch as the infuſion of the petals of the ſcarlet roſe, of the blue iris, of violets, and of other flowers, will ſhow the ſame liquor to be alkaline, by turning green ſo evidently as to leave no room to doubt.

When Mr Watt made this diſcovery, the ſcarlet roſes,

ſes, and ſeveral other flowers, whoſe petals change their colour by acids and alkalies, were in flower. Having ſtained paper with their juices, he found that it was not affected by the phlogiſticated nitrous acid, excepting in ſo far as it acted the part of a neutralizing acid; but he found alſo, that, paper ſtained in this manner was much leſs eaſily effected than litmus was; and that, in a ſhort time, it loſt much of the ſenſibility which it poſſeſſed at firſt; and having occaſion in winter to repeat ſome experiments in which the phlogiſticated nitrous acid was concerned, he found his ſtained paper almoſt uſeleſs. Searching, therefore, for ſome other vegetables which might ſerve for a teſt at all ſeaſons of the year, he found the red cabbage to anſwer his purpoſe better than any other; having both more ſenſibility with regard to acids than litmus, being naturally blue, and turning green with alkalies, and red with acids; to all which is joined the advantage of its being no farther affected by the phlogiſticated acid of nitre than as it acts as a real acid.

1550 Red cabbage anſwers the purpoſe beſt.

1551 How to prepare it for uſe.

To prepare this teſt, Mr Watt recommends to take the freſheſt leaves of the cabbage; to cut out the large ſtems, and mince the thin parts of the leaves very ſmall; then to digeſt them in water at about the heat of 120 degrees for a few hours, when they will yield blue liquor; which, if uſed immediately as a teſt, will be found to poſſeſs great ſenſibility: but as in this ſtate it is very apt to turn putrid, ſome of the following methods muſt be uſed for preſerving it.

1. After having minced the leaves, ſpread them on paper, and dry them in a gentle heat; when perfectly dry, put them up in glaſs bottles well corked; and, when you want to uſe them, acidulate ſome water with vitriolic acid, and digeſt or infuſe the dry leaves in it, until they give out their colour; then ſtrain the liquor through a cloth, and add to it a quantity of fine whiting or chalk, ſtirring it frequently, until it becomes of a true blue colour, neither inclining to green nor purple; when you perceive that it has acquired this colour, filter it immediately; otherwiſe it will become greeniſh by ſtanding longer on the whiting. This liquor will depoſit a ſmall quantity of gypſum, and, by the addition of a little ſpirit of wine, will keep good for ſome days; but will then become ſomewhat putrid and reddiſh. If too much ſpirit is added, it deſtroys the colour. If the liquor is wanted to keep longer, it may be neutralized by a fixed alkali inſtead of chalk.

2. As thus the liquor cannot be long preſerved without requiring to be neutralized afreſh juſt before it is uſed; and as the putrid fermentation which it undergoes, and perhaps the alkalies or ſpirit of wine mixed with it, ſeem to leſſen its ſenſibility; in order to preſerve its virtues while kept in a liquid ſtate, ſome freſh leaves of the cabbage, minced as above directed, may be infuſed in a mixture of vitriolic acid and water, of about the degree of acidity of vinegar; and it may be neutralized, as it is wanted, either by means of chalk, or of the fixed or volatile alkali. It muſt be obſerved, however, that if the liquor has an exceſs of alkali, it will ſoon loſe its colour, and become yellow; from which ſtate it cannot be reſtored; care ſhould therefore be taken to bring it very exactly to a blue, and not to let it verge towards a green.

3. In this manner, Mr Watt prepared a red infuſion of violets; which, on being neutralized, formed a very ſenſible teſt, though he did not know how long theſe properties would be preſerved; but he is of opinion that the coloured infuſions of other vegetables may be preſerved in the ſame manner by the antiſeptic power of the vitriolic acid, in ſuch a manner as to loſe little of their original ſenſibility. Paper freſh ſtained with theſe teſts, in their neutral ſtate, has ſufficient ſenſibility for many experiments; but the alum and glue which enter into the preparation of writing paper, ſeem, in ſome degree, to fix the colour; and paper which is not ſized becomes ſomewhat tranſparent when wetted; which renders ſmall changes of colour imperceptible. Where accuracy is required, therefore, the teſt ſhould be uſed in a liquid taſte.

1552 Various other teſts.

4. Our author has found that the infuſion of red cabbage, as well as of various flowers in water, acidulated by means of vitriolic acid, are apt to turn mouldy in the ſummer ſeaſon, and likewiſe that the moulding is prevented by an addition of ſpirit of wine. He has not been able to aſcertain the quantity of ſpirit neceſſary for this purpoſe, but adds it by little and little at a time until the proceſs of moulding is ſtopped.—Very ſenſible teſts are afforded by the petals of the ſcarlet roſe, and of the pink coloured lychnis treated in the abovementioned manner.

XX. *Volatile Alkali.*

1553 Volatile alkali prepared from nitrous acid and tin.

Mr Higgins claims the firſt diſcovery of the conſtituent parts of volatile alkali, or at leaſt of an experiment leading to it. "About the latter end of March 1785 (ſays he), I found that nitrous acid poured on tin filings, and immediately mixed with fixed vegetable alkali, generated volatile alkali in great abundance: ſo ſingular a fact did not fail of deeply impreſſing my mind, though at the time I could not account for it. About a fortnight after, I mentioned the circumſtance to Dr Brockleſby. He told me he was going to meet ſome philoſophical gentlemen at Sir Joſeph Banks's, and deſired I would generate ſome alkali to exhibit before them: accordingly I did; and had the pleaſure of accompanying him thither. The December following I mentioned the fact to Dr Caulet, and likewiſe the copious generation of volatile alkali from Pruſſian blue, vegetable alkali, and water; on which we agreed to make a ſet of experiments upon the ſubject. At preſent I ſhall only give an account of the following, which drew our particular attention. Into a glaſs cylinder, made for the purpoſe, we charged three parts of alkaline air, and to this added one part of dephlogiſticated air; we paſſed the electrical ſpark repeatedly in it, without apparently effecting the ſmalleſt change. When it had received about 100 ſtrong ſhocks, a ſmall quantity of moiſture appeared on the ſides of the glaſs, and the braſs conductors ſeemed to be corroded; when we had paſſed 60 more ſhocks in it, the quantity of moiſture ſeemed to increaſe, and acquire a greeniſh colour, though at this time the column of air ſuffered no diminution. On examining the air, it burned with a languid greeniſh flame, from which we inferred that the dephlogiſticated air was totally condenſed: it ſtill retained an alkaline ſmell; and the alkaline part was not readily abſorbed by water.

1555 Effects of the electric ſpark on it.

Pruſſian blue.

“From Mr Cavendiſh's famous diſcovery of the conſtituent parts of water we could readily account for the loſs of the dephlogiſticated air in this experiment; but the quantity of water was more than we could expect from this: therefore water muſt have been precipitated from the decompoſed alkali; for volatile alkali, from its great attraction to water, muſt keep ſome in ſolution even in its aeriform ſtate. From the above circumſtances it might be expected, that a contraction of the column of air ſhould take place; but it muſt be conſidered, that the union took place gradually in proportion as the alkali was decompoſed; and that, in this caſe, the expanſion muſt equal the condenſation. During the ſpring of 1786 I had often an opportunity of mentioning different facts to Dr Auſtin relating to volatile alkali, who at that time was too much engaged to pay attention to the ſubject. In the end of Auguſt 1787, he gave me an account of a ſet of experiments which he had made, and which actually proved, that volatile alkali conſiſts of light inflammable and phlogiſticated airs; not knowing at that time what Meſſrs Houſman and Berthollet had done. Without depreciating the merit of theſe two gentlemen, Dr Auſtin has an equal claim to the diſcovery, laying aſide priority; as his experiments are as deciſive as theirs. Dr Prieſtley made the firſt ſtep towards our knowledge of volatile alkali.”

1556 True compoſition of volatile alkali.

XXI. *PRUSSIAN BLUE.*

1557 Woulfe's teſt for mineral waters.

THE acid of this ſubſtance, as far as it contains an acid, is ſuppoſed to be that of phoſphorus. Mr Woulfe propoſed a teſt of this kind for diſcovering iron in mineral waters, which, he obſerved, would not be affected by acids; but the lixivium deſcribed by him had the bad property of letting fall the Pruſſian blue it contains in a few weeks. The precipitate of copper, however, treated again with alkali, retained this property upwards of nine months. The volatile alkali, he obſerves, is diſſolved by the Pruſſian acid; and the cryſtals depoſited are rendered blue by the colouring matter, though the colour at firſt is loſt by the union of the alkali with the ſubſtance already made. The metals were precipitated by this teſt of the following colours: Gold of a browniſh yellow, the precipitate afterwards becoming of a full yellow; platina of a deep blue, but when quite pure, of a yellow colour, turning ſlightly green. Silver in the nitrous acid was precipitated of a whitiſh colour; copper from all the different acids was precipitated of a deep brown colour, the liquid remaining greeniſh; green vitriol let fall a deep blue powder, leaving a colourleſs lixivium; ſugar of lead and muriated tin gave a white powder; nitrated mercury a white or yellowiſh precipitate; the Illfeld manganeſe a browniſh, but that from Devonſhire a blue, which firſt became aſh-coloured and then reddiſh. Nitrated biſmuth afforded a white precipitate, and the lixivium was ſlightly green: muriated antimony yielded a white precipitate, with a yellowiſh lixivium: vitriolated zinc a whitiſh: cobalt in aqua-regia a reddiſh white powder: the precipitate of arſenic and the different earths was commonly white.

1558 Effect of it on various metallic ſolutions.

XXIII. *NEW CHEMICAL NOMENCLATURES.*

New chemical nomenclatures.

1. *Of that propoſed in 1787 by Meſſrs Morveau, Berthollet, Fourcroy, and Lavoiſier.*

WHEN this nomenclature was firſt publiſhed, M. Lavoiſier informs us, that ſome blame was thrown upon the authors for changing the language, which had received the ſanction of their maſters, and been adopted by them. In anſwer to this, however, he urges, that Meſſrs Bergman and Macquer had expreſſed a wiſh for ſome reformation in the chemical language. Mr Bergman had even written to M. Morveau on the ſubject in the following terms. “Show no favour to any improper denomination: Thoſe who are already poſſeſſed of knowledge, cannot be deprived of it by new terms; thoſe who have their knowledge to acquire, will be enabled by your improvement on the language of the ſcience to acquire it ſooner.”

1559 Bergman's letter to Morveau on this ſubject.

1560 Lavoiſier's explanation of the new nomenclature.

The following is M. Lavoiſiers explanation of the principles on which his new language is compoſed. “Acids conſiſt of two ſubſtances, belonging to that order which comprehends ſuch as appear to us to be ſimple ſubſtances. The one of theſe is the principle of acidity, and common to all acids; from it therefore ſhould the name of the claſs and genus be borrowed: The other, which is peculiar to each acid, and diſtinguiſhes them from one another, ſhould ſupply the ſpecific name. But in moſt of the acids, the two conſtituent principles, the acidifying and the acidifyed, may exiſt in different proportion, forming different degrees of equilibrium or ſaturation; this is obſerved of the *ſulphuric* and *ſulphureous* acid. Theſe two ſtates of the ſame acid we have expreſſed by varying the termination of the ſpecific name.

“Metallic ſubſtances, after being expoſed to the compound action of air and fire, loſe their metallic luſtre, gain an increaſe of weight, and aſſume an earthy appearance. In this ſtate they are, like acids, compound bodies, conſiſting of one principle common to them all, and another peculiar to each of them. We have therefore in like manner claſſed them under a generic name, derived from the principle which is common to them all. The name which we have adopted is *Oxide*: The peculiar names of the metals from which they are formed, ſerve to diſtinguiſh theſe compounds from one another.

“Combſtuible ſubſtances, which, in acids and metallic oxides, exiſt as ſpecific and peculiar principles, are capable of becoming, in their turn, the common principle of a great number of ſubſtances. Combinations of ſulphur, were long the only compounds of this ſort known: but of late the experiments of Meſſrs Vandermonde, Monge, and Berthollet, have ſhown that coal combines with iron and perhaps with various other metals; and that the reſult of its combination with iron are, according to the proportions, ſteel, plumbago, &c. It is alſo known from the experiments of M. Pelletier, that phoſphorus combines with many metallic ſubſtances. We have therefore arranged theſe different combinations together under generic names, formed from the name of the common ſubſtance, with a termination indicating this analogy; and have diſtinguiſhed them from each other by ſpecific names derived from the names of the peculiar ſubſtances.

"It was found ſomewhat more difficult to form a nomenclature for the compounds of thoſe three ſimple ſubſtances; becauſe they are ſo very numerous, and ſtill more, becauſe it is impoſſible to expreſs the nature of their conſtituent principles, without uſing more compound names. In bodies belonging to this claſs, ſuch as neutral ſalts for inſtance, we had to conſider, 1. the acidifying principle common to them all; 2. the acidifiable principle which peculiarizes the acid; 3. the ſaline, earthy, or metallic baſe, which determines the particular ſpecies of the ſalt. We have derived the name of each claſs of ſalts from that of the acidifiable principle, common to all the individuals of the claſs; and have then diſtinguiſhed each ſpecies by the name of the *ſaline*, *earthy*, or *metallic* baſe peculiar to it.

"As ſalt, conſiſting of any three principles, may, without loſing any of theſe principles, paſs through different ſtates by the variation of their proportions; our nomenclature would have been defective without expreſſions for theſe different ſtates. We have expreſſed them chiefly by a change of termination, making all names of ſalts in the ſame ſtate to end with the ſame termination."

2. *Nomenclature by M. Wiegleb.*

1562 Mr Wiegleb's nomenclature.

In Wiegleb's General Syſtem of Chemiſtry tranſlated by Hopſon, we have another nomenclature formed on different principles. In this he gives to fixed vegetable alkali the name of *Spodium*, from the Greek word σποδος *(aſhes)*. The mineral alkali he calls *natrum*, the name by which it was anciently diſtinguiſhed; and the volatile alkali *ammonium*, from ſal ammoniac which contains it in great quantity. The compound ſalts may be diſtinguiſhed into double, triple, and quadruple; though, in the ſcheme given in the work, the firſt diviſion is omitted, as tending only to create confuſion. The irregular ſalts, conſiſting of thoſe which are triple and quadruple, are admitted. Such as are imperfect by reaſon of an exceſs of acid, he ſays, are beſt denominated by converting the adjective, expreſſive of the baſe, into a participle; a practice which, on many occaſions, though countenanced by the authority of a late eminent writer, ſeems aukward and ſtiff. The exceſs of acid is denominated by the word *hyperoxys*, and a defect of it by *hypoxys*. Hence his denominations are formed in the following manner.

Salts with exceſs of acid. Cream of tartar, or *tartarus ſpodatus*, or *tartaroxys ſpodicus*. Acid vitriolated tartar, or vitriolum ſpodatum, *vitrioloxys ſpodicus*.

The ſalts which are imperfect from a defect of acid have their denominations by mentioning the baſe before the acid, and expreſſing the former ſubſtantively, the latter adjectively. Thus,

Salt of tartar, aerated vegetable alkali, ſpodium aerocraticum,	Oxyſpodium, aerocraticum.
Aerated volatile alkali, ammoniacum aerocraticum,	Oxyammonium aerocraticum.
Chalk, or calx aerocratica,	Oxycalcitis aerocraticus.
Borax, or natrum boracicum.	Oxynatrum boracicum.

With reſpect to other terms, Mr Wiegleb expreſſes the acid with which any baſe is combined, by the termination *cratia*, from the Greek κρατος *(robur)*, added to it; excepting only thoſe with the nitrous and muriatic acids: and theſe (for what reaſon does not appear) he calls *Aponitra* and *Epimuriæ*. His genera of ſalts are as follow.

1. Vitriols *(Sulphurocratia)*. 2. Nitres *(Aponitra)*. 3. Murias *(Epimuriæ)*. 4. Boraxes. 5. Fluoricrates. 6. Arſenicrates. 7. Barylithicrates, (thoſe with acid of tungſten). 8. Molybdænocrates. 9. Photocrates, (with acid of phoſphorus). 10. Electrocrates. 11. Oxycrates, (with the acetous acid); or *epoxycrates*, with the aerated acid). 12. Tartars; or, with the acid changed by fire, *pyro-tartars*. 13. Oxalidicrates. 14. Cecidocrates (with the acid of galls). 15. Citriocrates. 16. Melicrates (with the acid of apples). 17. Benzicrates. 18. Xylocrates. 19. Gummicrates. 20. Camphoricrates. 21. Aerocrates. 22. Galacticrates. 23. Gala-melicrates (with acid of ſugar of milk). 24. Myrmecicrates. 25. Cyanocrates (with the colouring matter of Pruſſian blue). 26. Steatocrates. 27. Bombycicrates. 28. Zoolithocrates, (with acid of calculus).

On the ſubject of nomenclatures it is obvious to remark, that whatever may be the defects of the old one, we are ready to be involved in much greater difficulties by the introduction of a new one. Or ſuppoſing a new language to be adopted, where would be the ſecurity for its permanence? That which appears moſt ſpecious at one period, may ſtill be ſuperſeded by the refinements of another; and colourable pretenſions would never be wanting to ſucceſſive innovators. Hence a continual fluctuation, and an endleſs vocabulary. As the nomenclature firſt abovementioned, however, has attracted no ſmall degree of attention, we ſhall here ſubjoin a ſcheme of it, as well for the ſatisfaction of our readers in general, as for the gratification of thoſe in particular who may have imbibed the doctrines of its authors.

[Follows *The Whole-ſheet Table.*]

A TABLE, EXHIBITING THE CHEMICAL NOMENCLATURE,

Propoſed by Meſſieurs De MORVEAU, LAVOISIER, BERTHOLLET, and De FOURCROY, in May 1787.

		I. SUBSTANCES THAT HAVE NOT BEEN YET DECOMPOSED.		II. THE SAME SUBSTANCES REDUCED INTO THE STATE OF GAS BY THE ADDITION OF CALORIC.		III. THE SAME SUBSTANCES COMBINED WITH OXIGENE.		IV. THE SAME SUBSTANCES IN AN OXIGENATED GAZEOUS STATE.		V. THESE OXIGENATED SUBSTANCES NEUTRALIZED BY THE ADDITION OF BASES.		VI. THE SAME PRIMARY SUBSTANCES COMBINED WITH OTHER SUBSTANCES BUT NOT ACIDIFIED.		
		NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	
1		Light.	—	—	—	—	—	—	—	—	—	—	—	1
2		Caloric.	*Latent heat, or matter of heat.*	—	—	—	—	—	—	—	—	—	—	2
3		Oxigene.	*The baſe of vital air.*	Oxigenous gas. N B It appears that light contributes to the reduction of oxigene into a gazeous ſtate.	*Dephlogiſticated or vital air.*	—	—	—	—	—	—	—	—	3
4		Hydrogene.	*The baſe of inflammable gas.*	Hydrogenous gas.	*Inflammable gas.*	Water.	*Water.*	—	—	—	—	—	—	4
5	ACIDIFIABLE BASES.	Azote, *or* the radical principle of the nitric acid.	*The baſe of phlogiſticated air, or of atmoſpheric mephitis.*	Azotic gas.	*Phlogiſticated air, or atmoſpheric mephitis.*	The baſe of nitrous gas. Nitric acid. *With an exceſs of azote.* Nitrous acid.	*The baſe of nitrous gas.* *White nitrous acid.* *Fuming nitrous acid.*	Nitrous gas. Nitrous acid gas.	—	Nitrate of potaſh. of ſoda, &c. Nitrite of potaſh.	*Common nitre.* *Cubic nitre.*	—	—	5
6		Carbone, *or* the radical principle of the carbonic acid.	*Pure coal.*	—	—	Carbonic acid.	*Fixed air, or cretaceous acid.*	Carbonic acid gas.	*Fixed air, mephitic air.*	Carbonate { of lime. of potaſh, &c of iron, &c.	*Chalk.* *Effervescent alkalies.* *Ruſt of iron, &c.*	Carbure of iron.	*Plumbago.*	6
7		Sulphur, *or* the radical principle of the ſulphuric acid.	—	—	—	Sulphuric acid. *With leſs oxigene,* Sulphureous acid.	*Vitriolic acid.* *Sulphureous acid.*	Sulphureous acid gas.	*Sulphureous acid gas.*	Sulphate { of potaſh. of ſoda. of lime. of aluminous earth. of barytes. of iron, &c. Sulphite of potaſh, &c.	*Vitriolated tartar.* *Glauber ſalt.* *Selenite.* *Alum.* *Ponderous ſpar.* *Vitriol of iron, &c.* *Stahl's ſulphureous ſalt.*	Sulphure { of iron. of antimo. of lead. Sulph. hydrogen. gas. Sulphure of potaſh. Sulphure of ſoda. Alkaline ſulphures with metals ſuſpended in them. Alkaline ſulphure with carbonaceous matters ſuſpended in it.	*Factitious iron pyrites.* *Antimony.* *Galena.* *Hepatic gas.* *Alkaline livers of ſulphur.* *Metallic livers of ſulphur.* *Liver of ſulphur with carbonaceous matters ſuſpended in it.*	7
8		Phoſphore *or* the radical principle of the phoſphoric acid.	—	—	—	Phoſphoric acid. *With a ſmaller proportion of oxigene,* Phoſphorous acid.	*Phoſphoric acid.* *Fuming or volatile phoſphoric acid.*	—	—	Phoſphate of ſoda. Calcareous phoſphate. Superſaturated phoſphate of ſoda. Phoſphite of potaſh, &c	*Phoſphoric ſalt with a baſe of natrum.* *Earth of bones.* *Haupt's ſal perlatum.*	Phoſphoriſed hydrogenous gas. Phoſphure of iron.	*Phoſphoric gas.* *Syderite.*	8
9		Radical principle of the muriatic acid.	—	—	—	Muriatic acid *With an exceſs of oxigene,* Oxigenated muriatic acid.	*Marine acid.* *Dephlogiſticated marine acid.*	Muriatic acid gas. Oxigenated muriatic acid gas.	*Marine acid gas.* *Dephlogiſticated marine acid gas.*	Muriate of potaſh Muriate of ſoda. Calcareous muriate, &c Ammoniacal muriate. Oxigenated muriate of ſoda, &c.	*Febrifuge ſalt of ſylvius.* *Marine ſalt.* *Calcareous marine ſalt.* *Sal ammoniac.*	—	—	9
10		Radical principle of the boracic acid.	—	—	—	Boracic acid.	*Sedative ſalt.*	—	—	Borate [illegible] ſaturated with ſoda, [illegible] Borate of ſoda, &c. *ſoda ſaturated with the acid.*	*Common borax.*	—	—	10
11		Radical principle of the fluor acid.	—	—	—	Fluoric acid.	*Acid of ſpar.*	Fluoric acid gas.	*Spathoſe gas.*	Fluate of lime, &c.	*Fluor ſpar.*	—	—	11
12		Radical principle of the ſuccinic acid.	—	—	—	Succinic acid.	*Volatile ſalt of amber.*	—	—	Succinate of ſoda, &c.	—	—	—	12
13		Radical principle of the acetic acid.	—	—	—	Acetous acid. *With more oxigene,* Acetic acid.	*Diſtilled vinegar.* *Radical vinegar.*	—	—	Acetite { of potaſh. of ſoda. of lime. of ammoniac of lead. of copper. Acetate of ſoda, &c.	*Terra foliata tartari.* *Mineral terra foliata.* *Calcareous acetous ſalt.* *Spirit of Mindererus.* *Saccharum ſaturni.* *Verdigris.*	—	—	13
14		Radical principle of the tartareous acid.	—	—	—	Tartareous acid.	—	—	—	Acidulous tartarite of potaſh. Tartarite of potaſh. Tartarite of ſoda, &c.	*Cream of tartar.* *Vegetable ſalt.* *Salt of Seignette.*	—	—	14
15		Radical principle of the pyro-tartareous acid.	—	—	—	Pyro-tartareous acid.	*Empyreumatic tartareous acid, or ſpirit of tartar.*	—	—	Pyro-tartarite of lime. Pyro-tartarite of iron, &c.	—	—	—	15
16		Radical principle of the oxalic acid.	—	—	—	Oxalic acid.	*Saccharine acid.*	—	—	Acidulous oxalate of potaſh. Oxalate of lime. of ſoda, &c.	*Salt of ſorrel.*	—	—	16
17		Radical principle of the gallic acid.	—	—	—	Gallic acid.	*Aſtringent principle.*	—	—	Gallate of ſoda. of magneſia. of iron, &c.		—	—	17
18		Radical principle of the citric acid.	—	—	—	Citric acid.	*Lemon juice.*	—	—	Citrate of potaſh. of lead, &c.	*Terra foliata with lemon juice.*	—	—	18
19		Radical principle of the malic acid.	—	—	—	Malic acid.	*Acid of apples.*	—	—	Malate of lime, &c.	—	—	—	19
20		Radical principle of the benzoic acid.	—	—	—	Benzoic acid.	*Flowers of benzoin.*	—	—	Alluminous benzoate. Benzoate of iron, &c.	—	—	—	20
21		Radical principle of the pyro-ligneous acid.	—	—	—	Pyro-ligneous acid.	*Spirit of wood.*	—	—	Pyro-lignite of lime. Pyro-lignite of zinc, &c	—	—	—	21
22		Radical principle of the pyro-mucous acid.	—	—	—	Pyro-mucous acid.	*Spirit of honey, ſugar, &c.*	—	—	Pyro-mucite of magne. Ammoniacal, &c. pyro mucite.	—	—	—	22
23		Radical principle of the camphoric acid.	—	—	—	Camphoric acid	—	—	—	Camphorate of ſoda, &c.	—	—	—	23
24		Radical principle of the lactic acid.	—	—	—	Lactic acid.	*Acid of milk.*	—	—	Lactate of lime, &c.	—	—	—	24
25		Radical principle of the ſaccho-lactic acid.	—	—	—	Saccho-lactic acid.	*Acid of ſugar of milk.*	—	—	Saccho-lactate of iron, &c.	—	—	—	25
26		Radical principle of the formic acid.	—	—	—	Formic acid.	*Acid of ants.*	—	—	Ammoniacal, &c. formiate.	*Spirit of magnanimity.*	—	—	26
27		Radical principle of the Pruſſic acid.	—	—	—	Pruſſic acid.	*Colouring matter of Pruſſian blue.*	—	—	Pruſſiate of potaſh, &c. Pruſſiate of iron, &c.	*Phlogiſticated alkali, or Pruſſian alkali.* *Pruſſian blue.*	—	—	27
28		Radical principle of the ſebacic acid.	—	—	—	Sebacic acid.	*Acid of greaſe.*	—	—	Sebate of lime, &c.	—	—	—	28
29		Radical principle of the lithic acid.	—	—	—	Lithic acid.	*Stone in the bladder.*	—	—	Lithiate of ſoda, &c.	—	—	—	29
30		Radical principle of the bombic acid.	—	—	—	Bombic acid.	*Acid of the ſilk-worm.*	—	—	Bombiate of iron, &c.	—	—	—	30
								OXIDES WITH VARIOUS BASES. *						
31	METALLIC SUBSTANCES.	Arſenic.	*Regulus of arſenic.*	—	—	Oxide of arſenic.	*White arſenic, or calx of arſenic.*	Yellow Red } ſulphurated oxide of arſenic. Arſen. oxide of potaſh	*Orpiment.* *Realgar.* *Liver of arſenic.*	Arſeniate of potaſh, &c Arſeniate of copper.	—	Alloy of arſenic and tin.	*Arſenicated tin.*	31
32		Molybdæna.	—	—	—	Oxide of molybdæna. Molybdic acid.	*Calx of molybdæna.*	Sulph. of molybdæna	*Molybdæna.*	Molybdate.	—	Alloy, &c.	—	32
33		Tungſten.	—	—	—	Oxide of tungſten. Tunſtic acid.	*Yellow calx of tungſten.*	—	—	Calcareous tunſtate.	*Swediſh tungſten.*	Alloy, &c.	—	33
34		Manganeſe.	*Regulus of manganeſe.*	—	—	White Black Vitreous } oxide of manganeſe	*Manganeſe.*	—	—	—	—	Alloy of manganeſe and iron.	—	34
35		Nickel.	—	—	—	Oxide of nickel.	*Calx of nickel.*	—	—	—	—	Alloy of nickel, &c.	—	35
36		Cobalt.	*Regulus of cobalt.*	—	—	Grey Vitreous } oxide of cobalt.	*Calx of cobalt.*	Alkaline cobaltic oxides.	*Precipitates of cobalt again diſſolved by alkalies.*	—	—	Alloy, &c.	—	36
37		Biſmuth.	—	—	—	White Yellow Vitreous } oxide of biſmuth.	*Magiſtery of biſmuth, or white paint.* *Yellow calx of biſmuth.* *Glaſs of biſmuth.*	Sulphurated oxide of biſmuth.	*Biſmuth precipitated by liver of ſulphur.*	—	—	Alloy, &c.	—	37
38		Antimony.	*Regulus of antimony.*	—	—	Oxide of antimony { by the nitrous acid, by the muriatic acid, ſublimated. vitreous.	*Diaphoretic antimony.* *Powder of Algaretti.* *Flowers or ſnow of antimony.* *Glaſs of regulus of antimony.*	Grey Red Orange Vitreous } Sulphurated oxide of antimony. Alkaline oxide of antimony.	*Grey calx of antimony.* *Kermes mineral.* *Golden ſulphur.* *Glaſs and liver of antimony.* *Rotrou's ſolvent.*	—	—	Alloy, &c.	—	38
39		Zinc.	—	—	—	Oxide of zinc. Sublimated oxide of zinc.	*Calx of zinc.* *Flowers of zinc, pompholix, &c.*	Sulphurated oxide of zinc.	*Precipitate of zinc by liver of ſulphur or factitious blende.*	—	—	Alloy, &c.	—	39
40		Iron.	—	—	—	Black Red } oxide of iron.	*Martial æthiops,* *Aſtringent ſaffron of Mars.*	Sulphurated oxide of iron.	—	—	—	Alloy, &c.	—	40
41		Tin.	—	—	—	White oxide of tin.	*Calx, or putty of tin.*	Yellow ſulphurated oxide of tin.	*Aurum muſivum.*	—	—	Alloy, &c.	—	41
42		Lead.	—	—	—	White Yellow Red Vitreous } oxide of lead.	*Ceruſe, or white lead.* *Maſſicot.* *Minium.* *Litharge.*	Sulphurated oxide of lead.	—	—	—	Alloy, &c.	—	42
43		Copper.	—	—	—	Red Green Blue } oxide of copper.	*Brown calx of copper.* *Green calx of copper, or verdigris.* *Mountain blue.*	Ammoniacal oxide of copper.	—	—	—	Alloy, &c.	—	43
44		Mercury.	—	—	—	Blackiſh Yellow Red } mercurial oxide.	*Æthiops per ſe.* *Turbith mineral.* *Precipitate per ſe.*	Black Red } ſulphurated oxide of mercury.	*Æthiops mineral.* *Cinnabar.*	—	—	Alloy, *or* amalgam of, &c.	—	44
45		Silver.	—	—	—	Oxide of ſilver.	*Calx of ſilver.*	Sulphurated oxide of ſilver.	—	—	—	Alloy, &c.	—	45
46		Platina.	—	—	—	Oxide of platina.	*Calx of platina.*	—	—	—	—	Alloy of platina & gold	—	46
47		Gold.	—	—	—	Oxide of gold.	*Calx of gold.*	—	—	—	—	Alloy, &c.	—	47
48	EARTHS.	Siliceous earth.	*Vitrifiable earth, quartz, &c.*	—	—	—	—	—	—	—	—	—	—	48
49		Aluminous earth.	*Clay, or earth of alum.*	—	—	—	—	—	—	—	—	—	—	49
		Barytes.	*Terra ponderoſa.*	—	—	—	—	—	—	—	—	—	—	50
50		Lime.	*Calcareous earth.*	—	—	—	—	—	—	—	—	—	—	51
51		Magneſia.	—	—	—	—	—	—	—	—	—	—	—	52
52	ALKALIES.	Potaſh.	*Vegetable fixed alkali of tartar, &c.*	—	—	—	—	—	—	—	—	—	—	53
53				—	—	—	—			—	—			
54		Soda.	*Mineral alkali, marine alkali, natrum.*	—	—	—	—	—	—	—	—	—	—	54
55		Ammoniac.	*Fluor, or cauſtic volatile alkali.*	Ammoniacal gas.	*Alkaline gas.*	—	—	—	—	—	—	—	—	55

* As the ſubſtances in the lower part of this col. cannot be reduced into a gazeous ſtate, and not only they, but ſeveral of thoſe in the upper part; we have therefore changed at this place the title of the column, and ſubſtituted another, which expreſſes the peculiar combinations of the metals

DENOMINATIONS newly appropriated to ſeveral Subſtances, which are more compound in their Nature, yet enter into new Combinations without being decompoſed.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
New Names.	Mucous matter.	Glutinous matter, or gluten.	Sugar.	Starch.	Fixed oil.	Volatile oil.	The aroma, or aromatous principle.	Reſin.	Extractive matter.	Extracto-reſinous matter. { in which the extractive matter predominates.	Reſinous extractive matter. { in which the reſin predominates.	Feculum	Alcohol, or ſpirit of wine.	Alcohol { of potaſh. of guaiacum. of ſcammoneum. of myrrh, &c.	Nitrous Gallic Muriatic } alcohol.	Sulphuric Muriatic Acetic, &c. } ether.	Alkaline Earthy Acid Metallic } ſoaps. Saponula of turpentine, &c.
Ancient names.	*Mucilage.*	*Glutinous matter.*	*Saccharine matter.*	*Amylaceous matter.*	*Fat oil.*	*Eſſential oil.*	*Spiritus rector.*	*Reſin.*	*Extractive matter.*			*Feculum.*	*Spirit of wine.*	*Alkaline tincture.* *Tincture of guaiacum* *—— ſcammonium.* *—— myrrh, &c.*	*Dulcified ſpirit of wine.* *Tincture of nut-galls.* *Dulcified marine acid.*	*Ether of Frobenius.* *Marine ether.* *Acetous ether, &c.*	*Alkaline earthy, &c. ſoaps.* *Combinations of volatile oils with baſes.*

A TABLE, EXHIBITING THE CHEMICAL NOMENCLATURE,

Propoſed by Meſſieurs De MORVEAU, LAVOISIER, BERTHOLLET, and De FOURCROY, in May 1787.

		I. SUBSTANCES THAT HAVE NOT BEEN YET DECOMPOSED.		II. THE SAME SUBSTANCES REDUCED INTO THE STATE OF GAS BY THE ADDITION OF CALORIC.		III. THE SAME SUBSTANCES COMBINED WITH OXIGENE.		IV. THE SAME SUBSTANCES IN AN OXIGENATED GAZEOUS STATE.		V. THESE OXIGENATED SUBSTANCES NEUTRALIZED BY EHE ADDITION OF BASES.		VI. THE SAME PRIMARY SUBSTANCES COMBINED WITH OTHER SUBSTANCES BUT NOT AICIDIFIED.		
		NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	NAMES NEWLY INVENTED OR ADOPTED.	ANCIENT NAMES.	
1		Light. - -	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	1
2		Caloric. - -	*Latent heat*, or *matter of heat.*	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	2
3		Oxigene. - -	*The baſe of vital air.*	Oxigenous gas. *N.B* It appears that light contributes to the reduction of oxigene into a gazeous ſtate.	*Dephlogiſticated* or *vital air.*	— —	— —	— —	— —	— —	— —	— —	— —	3
4		Hydrogene. - -	*The baſe of inflammable gas.*	Hydrogenous gas.	*Inflammable gas.*	Water. -	*Water.*	— —	— —	— —	— —	— —	— —	4
5		Azote, *or* the radical principle of the nitric acid. -	*The baſe of phlogiſticated air*, or *of atmoſpheric mephitis.*	Azotic gas.	*Phlogiſticated air*, or *atmoſpheric mephitis.*	The baſe of nitrous gas. Nitric acid. - *With an exceſs of azote.* Nitrous acid.	*The baſe of nitrous gas.* *White nitrous acid.* *Fuming nitrous acid.*	Nitrous gas. Nitrous acid gas.	— —	Nitrate of potaſh. of ſoda, &c. Nitrite of potaſh.	*Common nitre.* *Cubic nitre.*	— —	— —	5
6		Carbone, *or* the radical principle of the carbonic acid.	*Pure coal.*	— —	— —	Carbonic acid.	*Fixed air*, or *cretaceous acid.*	Carbonic acid gas.	*Fixed air, mephitic air.*	Carbonate. of lime. of potaſh,&c of iron, &c.	*Chalk.* *Effervescent alkalies.* *Ruſt of iron, &c.*	Carbure of iron.	*Plumbago.*	6
7		Sulphur, *or* the radical principle of the ſulphuric acid.	— —	— —	— —	Sulphuric acid.	*Vitriolic acid.*			Sulphate of potaſh. of ſoda. of lime. of aluminous earth. of barytes. of iron, &c.	*Vitriolated tartar.* *Glauber ſalt.* *Selenite.* *Alum.* *Ponderous ſpar.* *Vitriol of iron, &c.*	Sulphure of iron. of antimo. of lead. Sulph. hydrogen. gas. Sulphure of potaſh. Sulphure of ſoda. Alkaline ſulphures with metals ſuſpended in them.	*Factitious iron pyrites.* *Antimony.* *Galena.* *Hepatic gas.* *Alkaline livers of ſulphur.* *Metallic livers of ſulphur.*	7
						With leſs oxigene, Sulphureous acid.	*Sulphureous acid.*	Sulphureous acid gas.	*Sulphureous acid gas.*	Sulphite of potaſh, &c.	*Stahl's ſulphureous ſalt.*	Alkaline ſulphure with carbonaceous matters ſuſpended in it.	*Liver of ſulphur with carbonaceous matters ſuſpended in it.*	
8		Phoſphore *or* the radical principle of the phoſphoric acid.	— —	— —	— —	Phoſphoric acid.	*Phoſphoric acid.*	— —	— —	Phoſphate of ſoda. Calcareous phoſphate. Superſaturated phoſphate of ſoda.	*Phoſphoric ſalt with a baſe of natrum.* *Earth of bones.* *Haupt's ſal perlatum.*	Phoſphoriſed hydrogenous gas. Phoſphure of iron.	*Phoſphoric gas.* *Syderite.*	8
						With a ſmaller proportion of oxigene, Phoſphorous acid.	*Fuming* or *volatile phoſphoric acid.*			Phoſphite of potaſh,&c				
9		Radical principle of the muriatic acid.	— —	— —	— —	Muriatic acid	*Marine acid.*	Muriatic acid gas.	*Marine acid gas.*	Muriate of potaſh Muriate of ſoda. Calcareous muriate,&c Ammoniacal muriate.	*Febrifuge ſalt of ſylvius.* *Marine ſalt.* *Calcareous marine ſalt.* *Sal ammoniac.*	— —	— —	9
						With an exceſs of oxigene, Oxigenated muriatic acid.	*Dephlogiſticated marine acid.*	Oxigenated muriatic acid gas.	*Dephlogiſticated marine acid gas.*	Oxigenated muriate of ſoda, &c.				
10		Radical principle of the boracic acid.	— —	— —	— —	Boracic acid.	*Sedative ſalt.*	— —	— —	Borate ſuperſaturated with ſoda, *or* borax Borate of ſoda, &c. *ſoda ſaturated with the acid.*	*Common borax.*	— —	— —	10
11		Radical principle of the fluor acid.	— —	— —	— —	Fluoric acid.	*Acid of ſpar.*	Fluoric acid gas.	*Spathoſe gas.*	Fluate of lime, &c.	*Fluor ſpar.*	— —	— —	11
12		Radical principle of the ſuccinic acid.	— —	— —	— —	Succinic acid.	*Volatile ſalt of amber.*	— —	— —	Succinate of ſoda, &c.	— —	— —	— —	12
13	ACIDIFIABLE BASES.	Radical principle of the acetic acid.	— —	— —	— —	Acetous acid.	*Diſtilled vinegar.*	— —	— —	Acetite of potaſh. of ſoda. of lime. of ammoniac of lead. of copper.	*Terra foliata tartari.* *Mineral terra foliata.* *Calcareous acetous ſalt.* *Spirit of Mindererus.* *Saccharum ſaturni.* *Verdigris.*	— —	— —	13
						With more oxigene, Acetic acid.	*Radical vinegar.*			Acetate of ſoda, &c.				
14		Radical principle of the tartareous acid.	— —	— —	— —	Tartareous acid.	— —	— —	— —	Acidulous tartarite of potaſh. Tartarite of potaſh. Tartarite of ſoda, &c.	*Cream of tartar.* *Vegetable ſalt.* *Salt of Seignette.*	— —	— —	14
15		Radical principle of the pyro-tartareous acid.	— —	— —	— —	Pyro-tartareous acid.	*Empyreumatic tartareous acid*, or *ſpirit of tartar.*	— —	— —	Pyro-tartarite of lime. Pyro-tartarite of iron, &c.	— —	— —	— —	15
16		Radical principle of the oxalic acid.	— —	— —	— —	Oxalic acid. -	*Saccharine acid.*	— —	— —	Acidulous oxalate of potaſh. Oxalate of lime. of ſoda, &c.	*Salt of ſorrel.*	— —	— —	16
17		Radical principle of the gallic acid.	— —	— —	— —	Gallic acid. -	*Aſtringent principle.*	— —	— —	Gallate of ſoda. of magneſia. of iron, &c.		— —	— —	17
18		Radical principle of the citric acid.	— —	— —	— —	Citric acid. -	*Lemon juice.*	— —	— —	Citrate of potaſh. of lead, &c.	*Terra foliata with lemon juice.*	— —	— —	18
19		Radical principle of the malic acid.	— —	— —	— —	Malic acid. -	*Acid of apples.*	— —	— —	Malate of lime, &c.	— —	— —	— —	19
20		Radical principle of the benzoic acid.	— —	— —	— —	Benzoic acid. -	*Flowers of benzoin.*	— —	— —	Alluminous benzoate. Benzoate of iron, &c.	— —	— —	— —	20
21		Radical principle of the pyro-ligneous acid.	— —	— —	— —	Pyro-ligneous acid.	*Spirit of wood.*	— —	— —	Pyro-lignite of lime. Pyro-lignite of zinc,&c	— —	— —	— —	21
22		Radical principle of the pyro-mucous acid.	— —	— —	— —	Pyro-mucous acid.	*Spirit of honey, ſugar, &c.*	— —	— —	Pyro-mucite of magne. Ammoniacal, &c. pyro mucite.	— —	— —	— —	22
23		Radical principle of the camphoric acid.	— —	— —	— —	Camphoric acid.	— —	— —	— —	Camphorate of ſoda, &c.	— —	— —	— —	23
24		Radical principle of the lactic acid.	— —	— —	— —	Lactic acid. -	*Acid of milk.*	— —	— —	Lactate of lime, &c.	— —	— —	— —	24
25		Radical principle of the ſaccho-lactic acid.	— —	— —	— —	Saccho-lactic acid.	*Acid of ſugar of milk.*	— —	— —	Saccho-lactate of iron, &c.	— —	— —	— —	25
26		Radical principle of the formic acid.	— —	— —	— —	Formic acid. -	*Acid of ants.*	— —	— —	Ammoniacal, &c. formiate.	*Spirit of magnanimity.*	— —	— —	26
27		Radical principle of	—				*Colouring matter of Pruſ-*				*Phlogiſticated alkali, or*			

		the formic acid.								miate.				
27		Radical principle of the Pruſſic acid.	— —	— —	— —	Pruſſic acid.	*Colouring matter of Pruſſian blue.*	— —	— —	Pruſſiate of potaſh, &c. Pruſſiate of iron, &c.	*Phlogiſticated alkali,* or *Pruſſian alkali.* *Pruſſian blue.*	— —	— —	27
28		Radical principle of the ſebacic acid.	— —	— —	— —	Sebacic acid.	*Acid of greaſe.*	— —	— —	Sebate of lime, &c.	— —	— —	— —	28
29		Radical principle of the lithic acid.	— —	— —	— —	Lithic acid.	*Stone in the bladder:*	— —	— —	Lithiate of ſoda, &c.	— —	— —	— —	29
30		Radical principle of the bombic acid.	— —	— —	— —	Bombic acid.	*Acid of the ſilk-worm.*	— —	— —	Bombiate of iron, &c.	— —	— —	— —	30
								OXIDES WITH VARIOUS BASES. *						
31	METALLIC SUBSTANCES.	Arſenic.	*Regulus of arſenic.*	— —	— —	Oxide of arſenic.	*White arſenic,* or *calx of arſenic.*	Yellow Red ſulphurated oxide of arſenic: Arſen. oxide of potaſh	*Orpiment.* *Realgar.* *Liver of arſenic.*	Arſeniate of potaſh, &c Arſeniate of copper.	— — — —	Alloy of arſenic and tin.	*Arſenicated tin.*	31
32		Molybdæna.	— —	— —	— —	Oxide of molybdæna. Molybdic acid.	*Calx of molybdæna.*	Sulph. of molybdæna	*Molybdæna.*	Molybdate.	— —	Alloy, &c.	— —	32
33		Tungſten.	— —	— —	— —	Oxide of tungſten. Tunſtic acid.	*Yellow calx of tungſten.*	— —	— —	Calcareous tunſtate.	*Swediſh tungſten:*	Alloy, &c.	— —	33
34		Manganeſe.	*Regulus of manganeſe.*	— —	— —	White Black Vitreous oxide of manganeſe	*Manganeſe.*	— —	— —	— —	— —	Alloy of manganeſe and iron.	— —	34
35		Nickel.	— —	— —	— —	Oxide of nickel.	*Calx of nickel.*	— —	— —	— —	— —	Alloy of nickel, &c.	— —	35
36		Cobalt.	*Regulus of cobalt.*	— —	— —	Grey Vitreous oxide of cobalt.	*Calx of cobalt.*	Alkaline cobaltic oxides.	*Precipitates of cobalt again diſſolved by alkalies.*	— —	— —	Alloy, &c.	— —	36
37		Biſmuth.	— —	— —	— —	White Yellow Vitreous oxide of biſmuth.	*Magiſtery of biſmuth,* or *white paint.* *Yellow calx of biſmuth.* *Glaſs of biſmuth.*	Sulphurated oxide of biſmuth.	*Biſmuth precipitated by liver of ſulphur.*	— —	— —	Alloy, &c.	— —	37
38		Antimony.	*Regulus of antimony.*	— —	— —	Oxide of antimony by the nitrous acid, by the muriatic acid, ſublimated. vitreous.	*Diaphoretic antimony.* *Powder of Algarotti.* *Flowers* or *ſnow of antimony.* *Glaſs of regulus of antimony.*	Grey Red Orange Vitreous Sulphurated oxide of antimony- Alkaline oxide of antimony.	*Grey calx of antimony.* *Kermes mineral.* *Golden ſulphur.* *Glaſs and liver of antimony.* *Rotrou's ſolvent.*	— —	— —	Alloy, &c.	— —	38
39		Zinc.	— —	— —	— —	Oxide of zinc. Sublimated oxide of zinc.	*Calx of zinc.* *Flowers of zinc, pompholix,* &c.	Sulphurated oxide of zinc.	*Precipitate of zinc by liver of ſulphur* or *factitious blende.*	— —	— —	Alloy, &c.	— —	39
40		Iron.	— —	— —	— —	Black Red oxide of iron.	*Martial æthiops,* *Aſtringent ſaffron of Mars.*	Sulphurated oxide of iron.	— —	— —	— —	Alloy, &c.	— —	40
41		Tin.	— —	— —	— —	White oxide of tin.	*Calx,* or *putty of tin.*	Yellow ſulphurated oxide of tin.	*Aurum maſſivum.*	— —	— —	Alloy, &c.	— —	41
42		Lead.	— —	— —	— —	White Yellow Red Vitreous oxide of lead.	*Ceruſe,* or *white lead.* *Maſſicot.* *Minium.* *Litharge.*	Sulphurated oxide of lead.	— —	— —	— —	Alloy, &c.	— —	42
43		Copper.	— —	— —	— —	Red Green Blue oxide of copper.	*Brown calx of copper.* *Green calx of copper, or verdigris.* *Mountain blue.*	Ammoniacal oxide of copper.	— —	— —	— —	Alloy, &c.	— —	43
44		Mercury.	— —	— —	— —	Blackiſh Yellow Red mercurial oxide.	*Æthiops* per ſe. *Turbith mineral.* *Precipitate* per ſe.	Black Red ſulphurated oxide of mercury.	*Æthiops mineral.* *Cinnabar.*	— —	— —	Alloy, *or* amalgam of, &c.	— —	44
45		Silver.	— —	— —	— —	Oxide of ſilver.	*Calx of ſilver.*	Sulphurated oxide of ſilver.	— —	— —	— —	Alloy, &c.	— —	45
46		Platina.	— —	— —	— —	Oxide of platina.	*Calx of platina.*	— —	— —	— —	— —	Alloy of platina & gold	— —	46
47		Gold.	— —	— —	— —	Oxide of gold.	*Calx of gold.*	— —	— —	— —	— —	Alloy, &c.	— —	47
48	EARTHS.	Siliceous earth.	*Vitrifiable earth, quartz, &c.*	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	48
49		Aluminous earth.	*Clay,* or *earth of alum.*	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	49
		Barytes.	*Terra ponderoſa.*	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	50
50		Lime.	*Calcareous earth.*	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	51
51		Magneſia.	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	52
52 53	ALKALIES.	Potaſh.	*Vegetable fixed alkali of tartar, &c.*	— — — —	— — — —	— —	— —	— —	— —	— —	— —	— —	— —	53
54		Soda.	*Mineral alkali, marine alkali, natrum.*	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	54
55		Ammoniac.	*Fluor,* or *cauſtic volatile alkali.*	Ammoniacal gas.	*Alkaline gas.*	— —	— —	— —	— —	— —	— —	— —	— —	55

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* As the ſubſtances in the lower part of this col. cannot be reduced into a gazeous ſtate, and not only they, but ſeveral of thoſe in the upper part; we have therefore changed at this place the title of the column, and ſubſtituted another, which expreſſes the peculiar combinations of the metals

DENOMINATIONS newly appropriated to ſeveral Subſtances, which are more compound in their Nature, yet enter into new Combinations without being decompoſed.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
New Names.	Mucous matter.	Glutinous matter, *or* gluen.	Sugar.	Starch.	Fixed oil.	Volatile oil.	The aroma, *or* aromatous principle.	Reſin.	Extractive matter.	Extracto-reſinous matter. in which the extractive matter predominates.	Reſinous extractive matter. in which the reſin predominates.	Feculum	Alcohol, *or* ſpirit of wine.	Alcohol of potaſh. of guaiacum. of ſcammoneum. of myrrh, &c.	Nitrous Gallic Muriatic alcohol.	Sulphuric Muriatic Acetic, &c. ether.	Alkaline Earthy Acid Metallic ſoaps. Saponula of turpentine, &c.
Ancient names.	*Mucilage.*	*Glutinous matter.*	*Saccharine matter.*	*Amylaceous matter.*	*Fat oil.*	*Eſſential oil.*	*Spiritus rector.*	*Reſin.*	*Extractive matter.*			*Feculum.*	*Spirit of wine,*	*Alkaline tincture.* *Tincture of guaiacum* ———— *ſcammonium.* ———— *myrrh,* *&c.*	*Dulcified ſpirit of wine.* *Tincture of nut-galls.* *Dulcified marine acid.*	*Ether of Frobenius* *Marine ether.* *Acetous ether, &c*	*Alkaline earthy, &c. ſoaps.* *Combinations of volatile oils with baſes.*

TABLE, ſhowing the Manner in which Natural Bodies, conſidered in a Chemical View, may be divided into Claſſes; with their ſeveral Subdiviſions; their Properties defined; and the Manner in which they are obtained, pointed out.

NATURAL BODIES, conſidered as the Objects of Chemiſtry, may be divided into the following Claſſes, viz. 1. Salts. 2. Earths. 3. Metals. 4. Inflammables. 5. Waters. 6. Airs.

I. SALTS.

These are ſoluble in water, ſapid, and not inflammable. They are either Acids or Alkalies.

I. *Acids* are diſtinguiſhed by turning ſyrup of violets red, or forming with alkalies neutral ſalts; and are ſuppoſed to conſiſt of dephlogiſticated air condenſed, as their acidifying principle. The different acids yet known are,

1. *Vitriolic, fixed.* The moſt ponderous of all fluids next to mercury, the moſt fixed in the fire, and the moſt powerful as a ſolvent of all the acids. Obtained chiefly from ſulphur by inflammation.

2. *Vitriolic, volatile.* Obtained alſo from ſulphur by inflammation; air being admitted during the proceſs. It acts leſs powerfully as a ſolvent than when in its fixed ſtate.

3. *Nitrous* or *Aquafortis:* a volatile fluid, generally met with of a reddiſh colour, and emitting noxious fumes, when in its concentrated ſtate; though this is found not to be eſſential to it, but owing to a mixture of phlogiſton. In its pure ſtate it is almoſt as colourleſs as water, and ſmokes very little. It is next in ſtrength to the vitriolic acid, and obtained chiefly from nitre. It conſiſts of dephlogiſticated and phlogiſticated air condenſed, and may be obtained by taking the electric ſpark for a long time in a mixture of theſe. By uniting with ſome metals it appears to be converted into volatile alkali.

4. *Muriatic,* or *ſpirit of ſea-ſalt.* A volatile fluid, generally of a fine yellow colour; though this alſo is owing to the admixture of foreign ſubſtances, generally of iron. Inferior in power to the former, and obtained from ſea-ſalt. Naturally this acid ſeems to be in an aerial ſtate, but eaſily contracts an union with water. On mixture with manganeſe, it is wholly converted into a yellow, and almoſt incondenſible vapour, called *dephlogiſticated ſpirit of ſalt;* but which, on mixture with inflammable air, recompoſes the marine acid.

5. *Fluor acid.* Obtained from a ſpecies of ſpar: has little acid power, but is remarkable for its property of corroding glaſs.

6. *Acid of borax,* or *ſedative ſalt.* Obtained from borax in the form of ſcaly cryſtals; found alſo naturally in ſome waters in Italy, and in certain minerals in other countries.

7. *Acetous acid.* Obtained by allowing any fermentable liquor to proceed in the fermentation till paſt the vinous ſtate. It is much leſs corroſive, and leſs powerful as a ſolvent, than the vitriolic, nitrous, or marine acids.

8. *Acid of tartar.* Procured from the hard ſubſtance called *tartar,* depoſited on the ſides of wine veſſels.

9. *Acid of ſugar.* Found naturally in the juice of ſorrel, and procured artificially by means of nitrous acid from ſugar and a great variety of other ſubſtances. Aſſumes a dry form.

10. *Acid of phoſphorus.* Obtained artificially from urine, and in large quantity from calcined bones; found naturally in ſome kinds of lead-ore; and in vaſt quantities in Spain united with calcareous earth. Aſſumes a ſolid form, and melts into glaſs.

11. *Acid of ants.* Procured from the animal from which it takes its name, by expreſſion or diſtillation, in a fluid form.

12. *Acid of amber.* Obtained in a ſolid form from amber.

13. *Acid of arſenic.* Obtained from that ſubſtance by means of nitrous acid. Is extremely fixed in the fire.

14. *Acid of molybdæna.* Procured from that ſubſtance by means of nitrous acid. Reſembles a fine white earth.

15. *Acid of lapis ponderoſus, tungſten,* or *wolfram.* Obtained as an acid, *per ſe,* from this ſubſtance by Mr Scheele; but its real acidity is denied by other chemiſts. Is in the form of a yellow powder.

16. *Acid of milk.* Obtained in a fluid form from that liquor.

17. *Acid of ſugar of milk.* Obtained in form of a white powder, by means of nitrous acid, from ſugar of milk.

18. *Lithiſiac acid* Obtained in a ſolid form from human calculus, by means of nitrous acid.

19. *Acid of benzoin.* Obtained in a ſolid form from that gum by ſublimation or lixiviation with quicklime.

20. *Acid of lemons.* Obtained from the juice of that fruit by cryſtallization.

21. *Sebaceous acid,* or *acid of fat.* Obtained in a fluid ſtate from ſuet by diſtillation.

22. *Acid of citrons.* Obtained in a fluid ſtate from the juice of that and other fruits.

23. *Acid of apples.* Obtained in a fluid ſtate from the juice of apples and other fruits.

24. *Acid of ſorrel.* Obtained in a ſolid form from the juice of that plant; the ſame with acid of ſugar.

II. *Alkalies.* Theſe turn ſyrup of violets green, and with acids form neutral ſalts. They are,

1. *Fixed vegetable,* or *Pot-aſh.* Always obtained from the aſhes of burnt vegetables. A deliqueſcent ſalt.

2. *Fixed foſſile.* A ſolid cryſtalline ſalt, ſometimes found native, as the natrum of Egypt; and ſometimes by burning ſea-weed as kelp.

3. *Volatile.* Obtained from ſal ammoniac, from the ſoot of burning bodies, and from the putrefactive fermentation. It is naturally in the ſtate of an inviſible and elaſtic vapour, conſtituting a ſpecies of aerial fluid, and conſiſts of phlogiſticated and inflammable air.

Acids, by their union with other bodies, form

Neutral Salts.	*Earthy Salts.*	*Metallic Salts.*	*Essential Salts.*
Theſe are always compoſed of an acid and an alkali, and are of many different kinds, as may be ſeen in the following table.	Compoſed of an acid joined to an earthy baſis, as alum and gypſum. See the following table.	Formed of an acid and metal. The principal of theſe are vitriols; the others may be ſeen in the following table.	Obtained from vegetables, and contain an acid joined with the juices of the plant in a particular manner not to be imitated by art. To theſe belong ſugar, manna, honey, and others of that ſort.

II. EARTHS.

II. EARTHS.

These are ſolid bodies, not ſoluble in water, nor inflammable; and if fuſed in the fire, never reſume their earthy form again, but take that of glaſs. They are divided into *abſorbent*, *cryſtalline*, and *argillaceous*.

I. *Absorbent Earths* are capable of being united with acids, and are either calcareous, or not calcareous.

a, The calcareous abſorbent earths are,

1. *Limeſtone*, or *marble*. This is of infinite variety as to colour and texture. Marble is the hardeſt and fineſt. Thoſe kinds of limeſtone which feel unctuous to the touch, are generally impregnated with clay: thoſe that feel gritty, or where the lime is hard and weighty, contain ſand; this is the beſt for building; the other for manure.
2. *Chalk*. A white, friable, ſoft ſubſtance. This is much more free of heterogeneous matters than any limeſtone, and is eaſily calcined into quicklime. It is probably nothing elſe than limeſtone ſuddenly concreted without being cryſtallized.

3 *Sea ſhells*, are likewiſe a calcareous earth, and yield a very fine quicklime. Theſe are uſed in medicine.

4. *Terra ponderoſa*. A fine white earth ſometimes found combined with fixed air, but more commonly with the vitriolic acid; and forming with it a very heavy compound, named *ſpathum ponderoſum*. It is found in mines and veins of rocks.

b, The abſorbent earths which cannot be reduced into quicklime are,

1. *Magneſia alba*. A white earth, uſually found combined with the vitriolic acid, and forming bitter purging ſalt. It is likewiſe obtained from the mother-ley of nitre, the aſhes of burnt vegetables, *&c.*
2. *Earth of alum*. A particular kind of abſorbent earth, found in many places mixed with ſulphureous pyrites, as in Yorkſhire, &c. Clay of any kind may by a particular proceſs be converted into this earth.
3. *Earth of animals*. This is obtained by the calcination of animal ſubſtances, and by precipitation in the proceſs for making acid of milk. It can hardly be converted into glaſs; and is therefore uſed as a baſis for white enamels, &c. It is ſaid to conſiſt of the phoſphoric acid united to calcareous earth.

II *Crystalline or Vitrescent Earths*, are hard, and ſtrike fire with ſteel; may be calcined in the fire; but are not ſoluble in acids. Of this kind are,

1. *Sand* and *Flint*; found plentifully every where. With alkaline ſubſtances they are eaſily changed into glaſs; and hence are termed *vitreſcent*.
2. *Precious ſtones* of all kinds are likewiſe referable to this claſs; but they are of a much greater degree of hardneſs and tranſparency than the others.

III. *Argillaceous Earths* are digſtinguiſhed by acquiring a very hard conſiſtence when formed into a paſte with water, and expoſed to a conſiderable degree of heat; not ſoluble in acids. They are,

1. *Common clay*. It is of many different colours; but chiefly red, yellow, or white. The pureſt is that which burns white in the fire.
2. *Medical boles*. Theſe are of different ſorts; but are only a purer kind of clay, ſometimes mixed with a little iron or other matters.
3. *Lapis nephriticus*, or *ſteatite*. Theſe are indurated clays, found in various parts. They are at firſt ſoft and readily cut; but turn extremely hard in the air. Many other varieties of theſe earths might be mentioned; but as they do not differ in their chemical properties ſo much as in their external appearance, and being all mixed with one another, they more properly belong to the natural hiſtorian than the chemiſt.

III. METALLIC SUBSTANCES.

These are bodies of a hard and ſolid texture; fuſible in the fire, and reſuming their proper form afterwards; not miſcible with water, nor inflammable. They are divided into *Metals and Semimetals*.

I. *Metals* are malleable; and the ſpecies are,

1. *Gold*. The moſt ponderous and fixed in the fire of all bodies except platina, and the moſt ductile of any. It has a yellow colour, and is more commonly found in its metallic ſtate than any other metal. It has no proper ore; but is found in ores of ſilver, and almoſt all ſands contain ſome of it.
2. *Silver* is next to gold in malleability and ductility; but leſs fixed in the fire than either it or platina. It is ſometimes found in its native ſtate; but moſt commonly in that of an ore with ſulphur, ſometimes with arſenic, and aſſuming different appearances.
3. *Platina*. A white metal of a greater ſpecific gravity than gold, and altogether as fixed in the fire; the moſt difficult to be melted of all known ſubſtances; reſiſting the teſts which have uſually been applied for diſcovering the purity of gold, ſuppoſed from hence to be the *ſmiris* of the ancients. Found in South America.
4. *Copper*. Of a reddiſh colour, hard and ſonorous; admits of being extended greatly under the hammer, either hot or cold. Is difficult of fuſion. It is generally found in the ſtate of an ore with ſulphur. There are a great variety of ores of it, extremely beautiful, blue, red, green, and yellow.
5. *Iron*. A grey-coloured metal, extremely ductile when hot; the lighteſt of them all except tin. It is the only metal certainly known to admit of being welded; though platina is likewiſe ſaid to poſſeſs ſome ſhare of this property. It is likewiſe the only one capable of being tempered by cooling. It is found almoſt every where; and its ores are infinitely various.
6. *Tin*. A white ſoft metal, the lighteſt of the whole, and very ductile. The ores of it are generally arſenical, and aſſume a cryſtalline appearance; their colour being moſt uſually of a dark brown, and ſometimes very beautiful.

7. *Lead.* A metal of a dull bluiſh colour, exceedingly ſoft and malleable, and very weighty. Seldom found in its metallic ſtate, but uſually in an ore with ſulphur or arſenic; but ſeldom with ſulphur alone. The principal ores of it are the cubic, called *galena* and the glaſſy, called *ſpar*.

8. *Mercury or quickſilver*; formerly accounted a ſemimetal, on account of its fluidity, but now reckoned among the moſt perfect metals. It is a white, opaque, metallic body; fluid, except in a very intenſe degree of cold; very heavy, and eaſily volatilized by heat. Sometimes found in its fluid form, but uſually in a beautiful red ore with ſulphur, called *cinnabar*.

II. *Semimetals* are brittle, and do not ſtretch under the hammer. They are,

1. *Zinc.* A bluiſh white ſubſtance of a fibrous texture, conſiderably hard and ſonorous, with a ſmall degree of ductility; eaſily fuſed and volatilized. Its principal ore is lapis calaminaris.
2. *Biſmuth* or *tin-glaſs*. A white ponderous, hard, brittle and ſonorous body, of a plated texture; eaſily fuſed and vitrified. It is only reduced to an ore by arſenic. Its appearance much the ſame with regulus of antimony.
3. *Antimony.* A blackiſh ſubſtance, of a fibrous needle-like texture; hard, brittle, and of a conſiderable weight; not difficult of fuſion, and eaſily convertible into glaſs. Its only ore is with ſulphur, which is the crude antimony.
4. *Arſenic.* A bright, ſparkling, whitiſh-coloured ſemimetal; of a plated texture; very brittle, and extremely volatile. It is generally found in the ores of others metals.
5. *Cobalt.* A brittle ſemimetal fuſible in a moderate heat, and eaſily convertible into a beautiful blue glaſs, called *ſmalt*. It is always obtained from an arſenical ore, likewiſe called *cobalt*.
6. *Nickel.* A reddiſh white ſubſtance, of a cloſe texture, and very bright; eaſily melted, but very difficult to vitriſy.

IV. INFLAMMABLE SUBSTANCES,

Are thoſe which continue to burn of themſelves when once ſet on fire. They are divided into *oils*, *ſulphur* or *brimſtone*, *alcohol* or *ardent ſpirits* and *charcoal*.

I. *Oils* are thickiſh, viſcous fluids, not miſcible with water. Divided into *animal*, *vegetable*, and *foſſile*.

a, *b*, The animal and vegetable oils are,

1. *Expreſſed.* Theſe are of a mild and bland taſte, inodorous, and not ſoluble in alcohol. They are obtained by expreſſion, as oil of olives, rape-ſeed, almonds, &c. Animal fats are of the ſame nature, as is alſo wax.
2. *Eſſential.* Theſe are always obtained by diſtillation, poſſeſs the taſte and flavour of the ſubject from whence they are drawn, and are ſoluble in alcohol. Of this kind are oil of cloves, ſpike, &c. The oil of ants is an example in the animal kingdom.
3. *Empyreumatic.* Theſe are obtained by a conſiderable degree of heat, and poſſeſs an acrid taſte and burnt-like flavour, as oil of hartſhorn. They are ſoluble in ſpirit of wine.

c. *Foſſile oils.* Theſe are found in the earth in their native ſtate; and are called, when pure, *naphtha*; which is of an acrid taſte, and extremely volatile, not miſcible with alcohol. A great many inflammable foſſils contain this, as bitumens, pit-coal, &c.

II. *Sulphur or Brimstone.* This is a dry friable ſubſtance, not miſcible with water. It is found in many mineral ſubſtances, metallic ores, &c. but is for the moſt part met with in pyrites. Great quantities of it are found in the neighbourhood of volcanoes.

III. *Alcohol or Ardent Spirits.* This is a fluid of an acrid and volatile nature, miſcible with water; obtained from fermented vegetable juices by diſtillation; as from the juice of the grape, malt-liquors, rice, &c.

IV. *Charcoal.* The reſiduum of moſt inflammable matters after undergoing diſtillation with a ſtrong fire. A black ſubſtance, acted upon with difficulty by acids; ſoluble in hepar-ſulphuris, and entirely diſſipable into inflammable air by a very violent heat. Of great uſe as fuel, and eſſentially neceſſary in metallurgy and other arts.

V. WATER.

A colourleſs inſipid fluid well known. It is either *ſimple* or *mineral*.

I. *Simple*, or *pure-rain-water*, as it called, though the moſt homogeneous fluid of this kind with which we are acquainted, is not perfectly pure, but always contains a portion of mucilaginous matter, which can never be perfectly ſeparated. It is ſuppoſed to conſiſt of dephlogiſticated and inflammable air condenſed.

II. *Mineral waters* are theſe ſpring-waters impregnated with ſaline ſubſtances; the diverſity of which is exceeding great; but they all agree in having an acid joined with them. The moſt common ſorts are impregnated with iron and ſulphur.

VI. AIR.

An inviſible and permanently elaſtic fluid, is of the following kinds: *Dephlogiſticated*, *phlogiſticated*, *fixed* or *fixable*, *inflammable*, *nitrous*, *vitriolic acid air*, *marine acid air*, *dephlogiſticated marine acid*, *alkaline air*, *hepatic air*, *atmoſpherical air*.

1. *Dephlogiſticated.* An elaſtic fluid naturally extricated in the proceſs of vegetation; artificially procured from nitre, minium, mangaueſe, water, &c. eminently capable of ſupporting flame and animal life. One of the component parts of our atmoſphere.

2. *Phlogiſticated.* Produced in great quantities during the putrefactive fermentation; obtained alſo in the calcination of metals and other phlogiſtic proceſſes. Deſtroys animal life, and extinguiſhes flame, but is very friendly to vegetation. Is another of the component parts of our atmoſphere.
3. *Fixed*, or *fixable.* Has its name from the property of adhering to certain bodies, and fixing itſelf in them. Conſiſts of dephlogiſticated air united to charcoal. Is obtained by fermentation, and in all phlogiſtic proceſſes. Manifeſts the properties of an acid: extinguiſhes flame, and deſtroys animal life.
4. *Inflammable.* Conſiſts wholly of charcoal and a little water rarefied by heat; is remarkable for being the lighteſt of all gravitating ſubſtances. Is produced naturally in mines, and from putrid waters; artificially procured from certain metallic ſolutions, by paſſing the ſteam of water over red-hot iron; by diſtilling wood, pit-coal, &c. with a ſtrong heat; or by expoſing charcoal to the heat of a burning lens *in vacuo.* It extinguiſhes flame unleſs it be mixed with a certain proportion of atmoſpherical or dephlogiſticated air; in which caſe it explodes violently, deſtroys animal life, but is friendly to vegetation.
5. *Nitrous.* Procured artificially in diſſolving metallic or other ſubſtances in the nitrous acid. On mixture with dephlogiſticated air both the fluids loſe their elaſticity, and a ſmall quantity of nitrous acid is produced. It inſtantly kills animals, and extinguiſhes flame. By union with ſome metals is converted into volatile alkali. In ſome caſes it may be made to ſupport flame, and even animal life. Its property of condenſing along with phlogiſticated air renders it a teſt of the ſalubrity of the atmoſphere.
6. *Vitriolic acid air.* The ſame with volatile or ſulphureous vitriolic acid.
7. *Marine acid air.* The ſame with marine acid reduced into vapour, and deprived of moſt of its water.
8. *Dephlogiſticated marine acid.* Suppoſed by ſome to be the marine acid deprived of its phlogiſtion; by others to be the ſame acid with an addition of pure air. It deſtroys many kinds of colours; whitens linen, and with inflammable air regenerates common marine acid.
9. *Alkaline air.* The ſame with pure volatile alkali; is formed by an union of phlogiſticated and inflammable air.
10. *Hepatic air.* Produced from the decompoſition of liver of ſulphur by acids, or in the common atmoſphere. It is inflammable, but does not burn with exploſion.
11. *Atmoſpherical air.* Compoſed of dephlogiſticated and phlogiſticated air; and thus ſupports both animal life and vegetation.

TABLE, ſhowing the ſeveral Combinations that the SIMPLE CHEMICAL ELEMENTARY BODIES admit of with one another; the Compound reſulting from that Mixture; and the Manner in which the Union is effected: With ſome Account of the principal Uſes to which theſe are applied in Arts or Manufactures.

N. B. This mark*, put above any word, denotes that there is ſome difficulty in the proceſs, or that the union is not very complete.

VITRIOLIC ACID may be combined with the following ſubſtances, viz.

ACIDS.		NITROUS ACID. A mixture which readily inflames oils. By ſolution, generating heat.
		MURIATIC, VEGETABLE, and all other ACIDS yet known. By ſolution, generating heat. But theſe mixtures are applied to no particular uſe in medicine or arts.
ALKALIES.	VEGETABLE.	*Vitriolated tartar.* By ſolution and cryſtallization, or double elective attraction from a great variety of bodies.
		Nitrum vitriolatum. A vitriolated tartar, obtained by diſtilling from nitre with the vitriolic acid.
		Sal polychreſtum. By deflagrating nitre with ſulphur. There are many other kinds of vitriolated tartar, known formerly by different names, and ſuppoſed to be poſſeſſed of particular properties, but they are now neglected.
	FOSSILE.	*Glauber's ſalt.* By ſolution and cryſtallization. Much uſed in medicine as a gentle purgative.
	VOLATILE.	*Secrêt ammoniac.* By ſolution. Formerly ſuppoſed a moſt powerful menſtruum for metals, &c. but without any juſt foundation.
EARTHS.	CALCAREOUS EARTHS.	A corroded calx. By ſimple corroſion. This when perfectly edulcorated with water is found to be a true gypſum.
		Selenites. By precipitation from a very dilute ſolution of chalk in the nitrous acid, by means of the vitriolic acid.
		Terra ponderoſa. With this it unites in preference to alkalies, forming a very heavy and inſoluble ſubſtance called *ſpathum ponderoſum.*
		Gypſum or *Paris-plaſter.* Often found in a native ſtate. May be artificially formed by precipitating from a ſolution of chalk in a very concentrated nitrous acid. Uſed as a cement: for taking impreſſions from medals, &c.
		Talc aſbeſtos, &c. A native production which connot be perfectly imitated by art. Uſed for holding objects in microſcopes, making incombuſtible cloth, &c.
	MAGNESIA.	*Epſom*, or *magneſia Glauber's ſalt.* By ſolution and cryſtallization. Much uſed in medicine for the ſame purpoſes as real Glauber's ſalt.

EARTHS.

- Earth of Alum. *Alum.* By ſolution, cryſtallization, &c. Uſed by dyers as a preparatory for taking on the colours, papermakers, goldſmiths, &c.
- Earth of Animals, Osteocella, &c. By ſolution. The mixtures of theſe are not applied to any particular uſe.
- Clay*. *Alum.* By digeſting pure clay for ſome time in this acid, and expoſing it for ſome time to the air, an alum is produced; and if the clay is precipitated from this aluminous concrete, it is found to be a pure earth of alum, ſoluble in all acids.
- Flint. A thickiſh coagulum. By digeſting the liquor ſilices in the vitriolic acid.

METALS.

- Gold*. Imperfectly. By a particular proceſs after being ſeparated from aqua-regia.
- Silver*. By ſolution, after it has been precipitated from the nitrous acid by alkalies. The fumes which ariſe in this ſolution are inflammable.
- Copper. *Blue vitriol.* This is ſometimes a native production, but in this way it is never pure. It is artificially prepared by ſolution in a very concentrated acid, and cryſtallizing it.
- Iron.
  - *Green vitriol* or *copperas.* Obtained at large by particular proceſs from pyrites; or by ſolution, &c. in a diluted acid. This is the baſis of all black dyes, ink, &c. as it ſtrikes a black colour with vegetable aſtringents.
  - *Salt of ſteel.* By calcining the cryſtals of green vitriol till they are converted into a white powder.
  - *Colcothar of vitriol.* By continuing the calcination till it aſſumes a brown colour.
- Lead.
  - *Saturnus vitriolicus.* A ſolution in a boiling heat, but is again precipitated when cold.
  - An indiſſoluble concrete. By precipitation from the nitrous acid.
- Tin. *Jupiter corroſivus.* By a boiling heat in a concentrated acid.
- Mercury.
  - *Ignis Gehenne*, or infernalis of Paracelſus. By a boiling heat, and repeated coctions with freſh acid when it is evaporated.
  - *Turpeth mineral*, or mercurius precipitatus flavus. By evaporating to dryneſs, and then waſhing with water.

SEMIMETALS.

- Antimony*. *A metallic ſalt.* By elective attraction from butter of antimony.
- Zinc. *White vitriol.* Often found in its native ſtate. Artificially made by ſolution and cryſtallization in a diluted acid. Uſed by painters for drying.
- Bismuth. A corroded calx. By ſolution in a concentrated acid.
- Arsenic - - - By ditto.
- Cobalt. A roſe-coloured mixture. By ſolution. If this is precipitated by a fixed alkali, and again diſſolved, the liquor appears of a beautiful red.

OILS.

- Expressed. A blackiſh gummy-like maſs. By ſolution, generating a conſiderable heat. Native gums are ſuppoſed to owe their origin to a mixture of this kind.
- Essential. A dark-coloured reſinous maſs. A great heat and violent effervеſcence being produced by this mixture. Native reſins ſuppoſed the ſame.
- Empyreumatic. Little known. By ſolution.
- Fossile. A ſubſtance reſembling amber. By ſolution.

SULPHUR*. Here there is no proper union of ſubſtances; but if ſulphur is boiled in this acid, it becomes leſs inflammable and more fixed than any ordinary ſulphur.

ALCOHOL.

- *Vitriolic ether.* By careful ſolution and diſtillation, the ether being ſeparated by the addition of water.
- *Spiritus vitrioli dulcis.* By ſolution and diſtillation.
- *Oleum dulce.* By continuing the heat after the ether has ariſen.
- *Oleum anodynum minerale.* By rediſtilling the reſiduum of the laſt with alcohol. A medicine much celebrated by Hoffman.
- *Sulphur.* By puſhing the heat after the oil comes over. It is to be obſerved that this is produced in every combination of this acid with inflammables or metals.

WATER. An acidulated water. Sometimes, though ſeldom, found iſſuing along with native ſprings. Applied to no particular uſe.

NITROUS ACID may be combined with the following Subſtances, viz.

ACIDS.

- Vitriolic, as above.
- Muriatic. *Aqua-regia.* By ſolution. This is the only proper menſtruum for gold; and it is a ſolution of tin in this menſtruum which is the baſis of the ſcarlet dye.
- Vegetable, and all others. By ditto. Theſe compounds have no particular names, nor are applied to any particular uſes in medicine or arts.

ALKALIES.

- Vegetable. *Common nitre.* A native production. Made artificially by ſolution and cryſtallization. This deflagrates with oily or metallic bodies, and is the foundation of gun-powder.
- Fossile. *Cubic nitre.* By ſolution.
- Volatile. *Nitrous ammoniac.* By ſolution. This differs from all the other ammonical ſalts, by being ſoluble in alcohol.

EARTHS.

- Calcareous.
  - *Deliqueſcent cryſtals.* By ditto and cryſtallization.
  - *Baldwin's phoſphorus.* By ditto and evaporating to dryneſs.
- Earth of Alum, and all other abſorbent earths. By ſolution. The compounds have no names nor any remarkable properties hitherto diſcovered.
- Crystalline Earths*. By ſolution after precipitation from the liquor ſilices.

METALS.	GOLD*.	*Slightly impregnated.* By a boiling heat in cloſe veſſels, after the ordinary method of ſeparating ſilver from gold by the nitrous acid. It ſpontaneouſly ſubſides in the air.
	SILVER.	*A fluid ſolution.* By ſolution. This when diluted with water ſtains hair and bones black; as alſo marble, agate, jaſper, &c. of different colours.
		Sal metallorum. By ſolution and cryſtallization.
		Catharticum lunare, *lunar cauſtic*, or *lapis infernalis*. By inſpiſſating the ſolution to dryneſs.
	COPPER.	A green-coloured ſolution. By ſolution.
	IRON.	A greeniſh ſolution, if a diluted acid is employed; if otherwiſe, it is of a yellowiſh colour: evaporated to dryneſs, it deliquates in the air.
	LEAD.	A yellow ſolution. By diſſolving in a diluted acid. If much water is added, the metal is precipitated.
		Saturni fulminans. By inſpiſſating the ſolution. This explodes when put upon the fire with greater force than nitre, and has been propoſed to be uſed as an ingredient in gun-powder to augment its force.
	TIN.	A ſolution or corroded calx. By a careful ſolution without heat it remains ſuſpended; if otherwiſe, it falls down in form of a calx. This is commonly ſuppoſed to be the compoſition uſed in dyeing ſcarlet; but by miſtake: for it is a ſolution of tin in aqua-regia that communicates that fine colour to cochineal. The ſame ſolution is the baſis of the powder which tinges glaſs of a ruby colour. It is the precipitate of gold from aqua-regia by means of tin.
	MERCURY.	A limpid ſolution, intenſely corroſive. By ſolution.
		Red precipitate. By evaporating the ſolution to dryneſs, and then calcining till it becomes red.
		Mercurius corroſivus fuſus. By precipitating from the nitrous acid by fixed alkali.
		White precipitate - By ditto with the volatile alkali.
SEMIMETALS.	BISMUTH.	A greeniſh ſolution. By uſing a concentrated acid. This might be applied in ſome caſes in the art of dyeing; but is not yet come into general uſe.
		Magiſtery of biſmuth. By precipitating from the ſolution by means of water. This has been employed as a coſmetic, but is inefficacious and unſafe. If mixed with pomatum, this ſtains hair of a dark colour without injuring it.
	ZINC.	A corroded ſolution. By the ordinary means.
	ANTIMONY.	A colourleſs calx. By ſimple corroſion.
		Bezoardic mineral. By diſtilling from butter of antimony, after having added the nitrous acid.
		Antimonium diaphoreticum. By adding nitre to crude antimony, and deflagrating.
		Ceruſa antimonii. By deflagrating regulus of antimony with nitre.
	COBALT.	A red liquor. By ſolution either in its calcined or metallic ſtate.
		Roſe-coloured cryſtals. By adding muriatic acid, and allowing it to cryſtallize.
		Green ſympathetic ink. By diſſolving theſe cryſtals in water. The ſolution is red when cold, and green when warm; when wrote with, it diſappears when dry; but when held to the fire it becomes green; and again diſappears when cold.
	NICKEL.	A green-coloured liquor. By ſolution.
OILS.	EXPRESSED.	A thick bituminous-like ſubſtance. Upon the mixture a conſiderable degree of heat is generated, and ſometimes, though very ſeldom, actual flame is produced.
	ESSENTIAL.	Ditto. A more violent heat is generated upon the mixture with theſe oils than any other, and with many of them an actual flame is produced.
	EMPYREUMATIC.	This mixture has no name, nor is it applied to any remarkable uſe in arts.
	FOSSILE.	Ditto.
ALCOHOL.		*Nitrous ether.* By digeſting; the ether ariſing to the ſurface.
		Spiritus nitri dulcis. By digeſting a little, and then diſtilling.
WATER.		*Acidulated water.* By ſolution.

The MURIATIC ACID *may be combined with the following Subſtances.* viz.

ACIDS.	VITRIOLIC and NITROUS.	As in the former part of this Table.
	VEGETABLE, and all others yet known.	By ſolution: but as none of theſe mixtures are applied to any particular purpoſe, we take no notice of them.
ALKALIES.	VEGETABLE.	*Digeſtive ſalt.* By ſolution and cryſtallization.
	FOSSILE.	*Common ſalt.* Commonly obtained by evaporating ſea-water to dryneſs; or artificially made by mixing the acid and alkali, and cryſtallizing.
		Sal gem. A native foſſile ſalt, found in mines in Poland, Spain, &c. of the ſame nature as common ſalt, but more pure.
	VOLATILE.	*Common ammoniac.* Obtained at large by a particular proceſs from ſoot. Artificially made by mixing the acid and alkali, and cryſtallizing.
EARTHS.	CALCAREOUS.	*Liquid ſhell.* By ſolution. A ſubſtance whoſe effects in medicine have been greatly extolled.
		Ol. calcis per deliquium. By evaporating liquid ſhell to dryneſs. It naturally deliqueſces.
		Fixed ammoniac. By ſolution and cryſtallization. This ſometimes appears luminous in the dark when ſtruck with a hammer.
	OSTEOCELLA, MAGNESIA, and other abſorbents.	By ſolution: but the properties or uſes of theſe are not known.

METALS.	Gold*.	*A yellow liquor.* By boiling a calx of gold (in whatever way obtained) in this acid. It does not act upon it in its metallic ſtate.
	Silver*.	*A fluid ſolution.* By diſſolving the ore of ſilver in this acid. It does not act upon pure metallic ſilver.
		Luna cornea. By elective attraction from the nitrous acid.
	Platina*.	A fluid ſolution. With difficulty effected, after having been precipitated from aqua-regia by alkalies.
	Copper.	*A green deliqueſcent inflammable ſalt.* By ſolution and inſpiſſating to dryneſs.
	Iron.	*Tinctura martis aurea.* By ſolution. The iron is in ſome meaſure rendered volatile by the operation.
	Lead.	A limpid ſolution. By a boiling heat, and frequent cohobations with freſh acid.
		Cornea Saturni. By precipitation from the nitrous acid.
	Tin*.	A corroded powder. By ſimple corroſion.
		Butter of tin. By diſtilling from corroſive ſublimate.
	Mercury*.	A colourleſs cryſtalline maſs, extremely acrid. By corroſion, employing the fumes of a very concentrated acid.
		Mercur. corroſiv. albus. By precipitation from the nitrous acid.
		Corroſive ſublimate. By ſubliming from ſal ammoniac, common ſalt, or many other bodies.
		Mercurius dulcis. By reſubliming corroſive ſublimate with more quickſilver.
		Mercurial panacea. By ſubliming corr. ſub. nine times, and digeſting for ſome time in ſpirit of wine.
SEMIMETALS.	Bismuth*.	A ſolution very ſlightly impregnated. By employing a very concentrated acid.
	Zinc.	A ſolution of a very ſlight yellow colour.
	Arsenic*.	*Butter of arſenic.* By diſtilling corroſive ſublimate with arſenic; the arſenic uniting with the acid, and leaving the mercury.
	Cobalt.	A reddiſh ſolution. By the ordinary means. It becomes green by a gentle heat.
	Nickel.	A green ſolution. By the ordinary means.
OILS*.		By ſolution. The union here is but imperfect, nor have they any particular name.
ALCOHOL.		*Spiritus ſalis dulcis.* By digeſtion, and afterwards diſtilling. The acid here is never totally dulcified.
WATER.		*Acidulated water.* Generating heat by mixture.

VINEGAR may be combined with the following Subſtances, viz.

ACIDS.	Vitriolic, Nitrous, and Muriatic,	as in the above table. It likewiſe unites with all other acids, generating heat; but the properties or uſes of theſe are not known.
ALKALIES.	Vegetable.	*Regenerated tartar.* By ſolution and cryſtallization.
	Fossile.	*Polychreſt of Rochelle.* By ditto.
	Volatile.	*Spiritus Mindereri* By ſolution.
EARTHS.	Calcareous Earth.	*Earthy ſalts.* Not known in medicine or arts.
	Magnesia.	*Dr Black's purging ſalt.* By ſolution. It unites with all the other abſorbent earths; but the properties of theſe mixts are unknown.
METALS.	Copper.	*Verdegris.* By ſolution and cryſtallization; or at large, by ſtratifying copper-plates with the huſks of the grape.
	Iron.	*Sal martis aperiens.* By ſolution and cryſtallization.
	Lead.	*Ceruſe.* By expoſing, in certain circumſtances, thin plates of lead to the fumes of vinegar.
		Saccharum Saturni. By ſolution and cryſtallization.
	Tin*.	This is not properly diſſolved; but the acid is evidently impregnated. By the ordinary means of ſolution.
	Mercury*.	*A fluid ſolution.* By employing a precipitate of mercury from the nitrous acid by alkalies.
		A red calx. By long digeſtion with fluid mercury.
SEMIMETALS.	Zinc.	A colourleſs ſolution of a ſweetiſh taſte. By digeſting for ſome time.
	Antimony*.	*Vinum benedictum.* This it not a proper ſolution of the metal, but the acid is impregnated with an emetic quality.
	Arsenic.	*Vinum arſenicum.* By ditto. A curious phoſphoric liquor.
	Bismuth.	An auſtere ſtyptic liquor. By ſtrong coction.
OILS*.		The union here is imperfect, nor have any of them obtained particular names.
ALCOHOL.		A mixture much uſed for anointing ſprains, &c.
WATER.		*Acidulated water.*

ACID of TARTAR may be combined with the following ſubſtances, viz.

ALKALIES.	Vegetable.	Cream of tartar with exceſs of acid.
		Soluble tartar, when completely ſaturated.
ALKALIES.	Fossile.	Rochelle ſalt.
	Volatile.	A ſalt very difficult of ſolution with exceſs of acid.
		A beautiful and ſoluble ſalt when perfectly ſaturated.

EARTH.	Calcareous.	An indiſſoluble ſelenite.
METALS.	Copper.	A fine green colour for painting.
	Iron.	A green aſtringent liquid. Chalybeated tartar.
SEMIMETAL.	Regulus of Antimony.	Emetic tartar.

ACID of URINE may be combined with the following ſubſtances, viz.

ACIDS of all kinds.		The nature of theſe not known.
ALKALI.	Fixed Vegetable.	A ſalt not eaſily cryſtallized, the nature of which is not known.
	Fossile.	A fine cryſtallized ſalt uſed in medicine.
	Volatile.	A glaſs-like ſaline ſubſtance called *microcoſmic ſalt*. The acid is always found in this ſtate by evaporating urine.
VITRESCENT EARTHS.		A glaſs of different ſorts. By fuſion.
METALS.	Lead.	An inflammable malleable maſs. By calcining the dry ſalt with lead.
	Tin.	A maſs reſembling zinc; and inflammable. By ditto.
	Iron.	A true *phoſphorus*. By ditto. A bluiſh ſolution. By employing a watery ſolution of the acid.
	Copper.	A corroded powder, or green ſolution. By a boiling heat in a watery ſolution of the acid.
	Mercury.	A ſemi-opaque maſs. By fuſion with the acid, in its ſolid form.
SEMIMETALS.	Zinc.	A corroded powder, ſoluble in water. By ſolution in the acid in a watery ſituation. A true *phoſphorus*. By fuſion with the dry acid.
	Antimony.	A ſolution in the ordinary way. A brilliant ſtriated maſs. By fuſion with the dry acid.
	Bismuth.	A mixture but little changed in appearance from ordinary biſmuth. By fuſion.
	Arsenic.	A whitiſh ſemitranſparent deliqueſcent maſs. By fuſion.
	Cobalt.	A reddiſh tincture. By ſolution.
OILS.		*Baldwin's phoſphorus*. By diſtilling with ſubſtances that contain oils or inflammable matter.

FLUOR ACID, may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable.	A gelatinous ſaline maſs which cannot be cryſtallized. Great part of it is alſo diſſipated by evaporation to dryneſs.
	Fossile.	A ſubſtance ſimilar to the foregoing.
	Volatile.	Lets fall a quantity of ſiliceous earth, and forms a cryſtallizable ammoniacal ſalt.
EARTHS.	Lime Magnesia. Earth of Alum.	A gelatinous matter.
	Siliceous Earth.	After long ſtanding, cryſtals of quartz.
METALS.	Silver Quicksilver.	The calces of theſe metals partially diſſolved; but the properties of the ſolution unknown
	Copper.	The calx eaſily ſoluble, and affording blue cryſtals; the metal only partially ſo.
	Iron.	Diſſolved with violence with the emiſſion of inflammable vapours into an uncryſtallizable liquor.

ACID of SUGAR may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable.	A ſalt ſcarce capable of cryſtallization when perfectly neutral.
	Fossile.	A ſalt difficultly ſoluble in water.
	Volatile.	An ammoniacal ſalt ſhooting into quadrangular priſms.
EARTHS.	Lime.	A kind of ſelenite from which the acid cannot be ſeparated by a burning heat.
	Terra Ponderosa.	A ſalt formed into angular cryſtals, ſcarce ſoluble in water.
	Magnesia.	A white powder inſoluble without an exceſs of acid.
	Earth of Alum.	A yellow pellucid maſs incapable of cryſtallization, and liquefying in the air.
METALS.	Gold. Silver. Platina. Quicksilver.	The calces of all theſe metals diſſolved, but the nitre of the ſolutions unknown.
	Iron.	Diſſolved in great quantity, and forming a yellow priſmatic ſalt eaſily ſoluble in water.
SEMIMETAL.	Cobalt.	A yellow-coloured ſalt forming a ſympathetic ink with ſea-ſalt.
INFLAMMABLES.	Alcohol.	An ether which cannot eaſily be ſet on fire unleſs previouſly heated, and burning with a blue flame.

ACID of BORAX or SEDATIVE SALT may be combined with the following Subſtances, viz.

ALKALIES.	Fossle.	*Borax*. A native ſubſtance, which may be imitated by art. It is of great uſe in promoting the fuſion of metals and earths.
	Volatile.	An ammoniacal ſalt ſhooting into ſmall cryſtals, and melting by an intenſe heat into a greyiſh-coloured glaſs.
EARTHS.	Magnesia.	A ſalt cryſtallizable in vinegar and acid of ants. Decompoſed by other acids and ſpirit of wine.
	Earth of Alum.	In certain proportions a ſalt difficult of ſolution; in others a hard maſs reſembling pumice-ſtone, yet partially ſoluble in water.

METAL.	Iron.	An amber-coloured ſolution yielding cryſtals of a yellow colour.
SEMIMETAL.	Arsenic.	A cryſtallizable compound ſhooting into pointed ramifications, or forming a greyiſh, white, or yellow powder.
ALCOHOL.		A ſolution with a conſiderable heat, which burns with a green flame.
WATER.		A ſolution in a conſiderable heat. The other mixtures with this acid not known.

ACID of AMBER may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable.	A tranſparent and cryſtallizable ſalt, but deliqueſcent.
	Fossile.	A cryſtallizable ſalt not deliqueſcent.
	Volatile.	An ammoniacal ſalt ſhooting into acicular cryſtals.
EARTHS.	Lime	A cryſtallizable ſalt, difficult of ſolution and not deliqueſcent. Decompoſed by common ſal ammoniac.
	Magnesia.	A gummy deliqueſcent ſaline maſs, not cryſtallizable.
	Earth of Alum.	A priſmatic ſalt incapable of decompoſition by alkalies.
METALS.	Silver.	A ſalt ſhooting into thin oblong cryſtals obtained from the precipitate; but no ſolution of the perfect metal.
	Copper.	A cryſtallizable ſalt of a green colour.
	Iron.	A cryſtallizable ſalt of a brown colour.
	Tin.	A cryſtallizable ſalt from the precipitate, ſcarce to be decompoſed by alkalies.
	Lead.	A cryſtallizable ſalt from the precipitate.
SEMIMETALS.	Zinc.	A cryſtallizable ſalt.
	Bismuth.	A cryſtallizable ſalt from the precipitate, not to be decompoſed by alkalies.
	Regulus of Antimony.	A ſolution of the precipitate.

ACID of ANTS may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable.	A cryſtallizable ſalt, deliqueſcent in the air.
	Fossile.	A ſalt of a ſimilar nature.
	Volatile.	An ammoniacal liquor, cryſtallizable with difficulty.
EARTHS.	Chalk or Coral.	A cryſtallizable ſalt which does not deliquate.
	Magnesia.	A ſaline liquor ſcarcely cryſtallizable.
	Terra Ponderosa.	A cryſtallizable ſalt which does not deliqueſce.
	Earth of Alum.	Unites with difficulty, and ſcarcely to the point of ſaturation. The nature of the compound not known.
METALS.	Silver*.	By ſolution. The calx of ſilver precipitated from aquafortis by alkalies; but does not act upon it in its metallic ſtate.
	Copper.	Beautiful green cryſtals. By diſſolving and cryſtallizing calcined copper. It acts ſlowly upon it in its metallic ſtate.
	Iron.	A cryſtallizable ſalt. It diſſolves this metal with great facility.
	Lead*.	A ſalt reſembling ſaccharum ſaturni. By diſſolving the red calx of lead. But it does not act upon it in its metallic ſtate.
SEMIMETAL.	Zinc.	Elegant cryſtals. By the ordinary means.

The effects of this acid upon other bodies, or the uſes to which theſe combinations might be applied, are not yet ſufficiently known.

ACID of ARSENIC may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable.	A ponderous ſalt ſhooting into fine cryſtals by ſuperſaturation with acid.
	Fossile.	A ſalt cryſtallizable when perfectly neutral.
	Volatile.	A peculiar kind of ammoniacal ſalt parting with the alkali, and decompoſing ſome of it in a ſtrong fire.
EARTHS.	Chalk.	A cryſtallizable ſalt ſcarcely ſoluble.
	Magnesia.	A gelatinous maſs which cannot be cryſtallized.
	Terra Ponderosa.	An inſoluble white powder.
METALS.	Copper.	A green-coloured ſolution.
	Iron.	A very thick gelatinous ſolution.
	Lead.	A ſolution which cannot be cryſtallized.
	Tin.	A gelatinous ſolution in the moiſt way. A mixture taking fire in cloſe veſſels in the dry way.
SEMIMETALS.	Zinc.	A ſolution in the moiſt way, and in the dry, a mixture taking fire in cloſe veſſels.
	Bismuth.	A partial ſolution.
	Regulus of Antimony.	A partial ſolution.
	Cobalt.	A partial ſolution of a red colour.
	Manganese.	A partial ſolution in its natural ſtate. When the mangaueſe is phlogiſticated, a cryſtallizable ſalt may be obtained.
INFLAMMABLES.	Charcoal.	A mixture taking fire and ſubliming when heated in cloſe veſſels.
	Oil of Turpentine, &c.	A thick black ſubſtance after ſome days digeſtion.
	Sulphur.	A red ſublimate.

ACID of MOLYBDÆNA may be united with the following Subſtances, viz.

ALKALI.	Fixed Vegetable. A cryſtallizable ſalt.
	Volatile. A neutral ſalt, the nature of which is unknown.

ACID of MILK may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable. A deliqueſcent ſalt ſoluble in alcohol.
	Fossile. A ſalt of a ſimilar nature.
	Volatile. A deliqueſcent ſalt parting with much of the alkali by heat.
EARTHS.	Calcareous and Argillaceous. Deliqueſcent ſalts.
	Magnesia. A ſalt more eaſily cryſtallized, but deliqueſcent.
METALS.	Copper. A blue ſolution, which cannot be cryſtallized.
	Iron. A brown ſolution, with the emiſſion of inflammable air, yielding no cryſtals.
	Lead. An aſtringent ſweetiſh ſolution, which does not cryſtallize.
SEMIMETAL.	Zinc. A cryſtallizable ſalt, with the emiſſion of inflammable air during the ſolution.

ACID of SUGAR of MILK may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable. A ſalt very difficult of ſolution.
	Fossile. A ſalt more eaſily ſoluble.
	Volatile. A peculiar kind of ammoniac.
EARTHS.	Absorbent and Argillaceous. Inſoluble ſalts.

ACID of APPLES may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable, Fossile, and Volatile. Deliqueſcent ſalts.
EARTHS.	Calcareous. A ſalt difficult of ſolution unleſs the acid prevail.
	Magnesia. A deliqueſcent ſalt.
	Earth of Alum. A ſalt very difficult of ſolution.
METAL.	Iron. A brown ſolution, which does not cryſtallize.
SEMIMETAL.	Zinc. A fine cryſtallizable ſalt.

ACID of FAT may be combined with the following Subſtances, viz.

ALKALIES.	Fixed, Vegetable, and Fossile. Neutral ſalts of a particular nature.
	Volatile. A concrete volatile ſalt.
EARTHS.	Calcareous. A cryſtallizable ſalt of a brown colour.
	Magnesia. Earth of Alum. A gummy maſs, which refuſes to cryſtallize.
METALS.	Silver. A ſolution of the calx.
	Platina. The calx copiouſly diſſolved, and even the perfect metal attacked by diſtillation to dryneſs.
	Copper. A green ſolution, which cannot be cryſtallized.
	Iron. A cryſtallizable ſalt, which does not deliquate.
	Lead. An aſtringent ſolution of the red calx called *minium*.
	Tin. A ſolution in ſmall quantity.
	Mercury. A ſolution by being twice diſtilled from the metal.
SEMIMETALS.	Zinc. Diſſolved in its metalline ſtate.
	Bismuth. A ſolution of precipitate.
	Regulus of Antimony. A cryſtallizable ſalt, which does not deliquate.
	Manganese. A perfect and clear ſolution.

ACID of BENZOIN may be combined with the following Subſtances, viz.

ALKALIES.	Fixed Vegetable. A ſalt ſhooting into pointed feathery cryſtals.
	Fossile. A ſalt procurable in larger cryſtals.
	Volatile. A deliqueſcent ſalt ſcarce cryſtallizable.
EARTHS.	Calcareous. A cryſtallizable ſalt not eaſily ſoluble.
	Magnesia. A cryſtallizable ſalt eaſily ſoluble.

The FIXED ALKALI, whether Vegetable or Fossile, can be united with the following Bodies; but the Vegetable is beſt known.

ACIDS:	Vitriolic, Nitrous, Muriatic, Vegetable; and acid of Urine, of Amber, of Ants, of Borax, &c. as in the former part of this Table.
ALKALIES	of all ſorts. The uſes of theſe mixtures are not known.
EARTHS.	Crystalline. *Liquor ſilicum.* By fuſion with twice their weight of alkali. *Glaſs.* By fuſion with a much ſmaller proportion of alkali. This is the compoſition of cryſtal glaſs, and all others commonly uſed.
	Absorbents. Argillaceous, and all kinds of earths. *Glaſs.* By fuſion; differing in quality according to the nature of the ingredients. Glaſs is likwiſe produced with it in fuſion with metals.
METALS.	Gold*. After having precipitated it from aqua-regia, it diſſolves it if the alkali has been calcined with animal ſubſtances.
	Silver*. After having precipitated it from the nitrous acid, it diſſolves it if the alkali has been calcined in contact with the flame.

METALS.
- Tin. A corroded powder. By the ordinary means of ſolution.
- Copper. By ditto.
- Lead. A fluid ſolution. By ditto. This ſtains hair black.
- Iron*. A blood-coloured ſolution. By dropping a ſolution of iron in the nitrous acid, into an alkaline lixivium.
- Mercury*. A fluid ſolution. After precipitating it from acids; if the alkali is in too large proportions, it then diſſolves it, eſpecially if the alkali has been calcined in contact with the flame.

SEMIMETALS.
- Zinc*. By ſolution, after having precipitated it from the nitrous acid.
- Bismuth*. By ſolution, after having precipitated it from the nitrous acid.
- Antimony.
  - *Kermes mineral.* By diſſolving antimony in an alkaline lixivium, filtering, and allowing it to ſtand in a cool place till it precipitates.
  - *Golden ſulphur of antimony.* By diſſolving a crude antimony in an alkaline lixivium, and precipitating by an acid.
  - *Hepar antimonii.* By deflagrating crude antimony with nitre.
  - *Crocus metallorum.* Is hepar antimonii pulveriſed and edulcorated with water.
  - *Diaphoretic antimony.* By deflagrating regulus of antimony with nitre.
  - *Antimoniated nitre.* By diſſolving diaphoretic antimony in water, and allowing it to cryſtallize.
  - *Magiſtery of antimony.* By precipitating a ſolution of diaphoretic antimony by adding vinegar.
  - *Regulus antimonii medicinalis.* By fuſing crude antimony with alkali. This is not properly a compound of alkali and antimony, but of another kind. But as it is a term much uſed, it was proper to explain it.
- Arsenic*. A metallic arſenical ſalt. By a particular elective attraction from regulus of antimony and nitre.

OILS.
- Expressed. *Soap.* The beſt hard ſoap is made of olive-oil and foſſile alkali. The ordinary white ſoap of this country is made of tallow and potaſh; black ſoap with whale-oil and potaſh.
- Essential. *Saponaceous maſs.* Beſt made by pouring ſpirit of wine upon cauſtic alkali and then oil, digeſting and ſhaking.
- Empyreumatic. This mixture diſſolves gold when precipitated from aqua regia; and is the baſis of the fine colour called *Pruſſian blue;* and has various other properties, as yet but little known.
- Fossile. This has no name, nor are the properties well known; but from ſome obſervations that have been made on native ſoapy waters, it is probable that it would keep linen much longer white than any other kind of ſoap.

SULPHUR.
- *Hepar ſulphuris.* By injecting alkalies upon melted ſulphur.
- *Lac ſulphuris.* By diſſolving ſulphur in an alkaline lixivium, and precipitating by an acid.

WATER. *Alkaline lixivium,* when cauſtic, or even the ordinary ſolution of mild alkali, is a fluid of great power in waſhing, bleaching, &c.

AIR. Fixed. *Mild alkali.* This is the general ſtate in which alkalies are found; but if they are rendered cauſtic by means of quick-lime or otherwiſe, they again abſorb it from the air, or from many other bodies, by elective attraction. When perfectly mild, this alkali may be made to aſſume a cryſtalline form.

The VOLATILE ALKALI, or SPIRIT of SAL AMMONIAC, can be united with theſe Bodies, viz.

ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable; of Urine, of Amber, of Ants, &c.

ALKALI, as above.

METALS.
- Gold*.
  - *Aurum fulminans.* A powder obtained by precipitating it from aqua regia by volatile alkalies.
  - A liquid ſolution. By adding a large proportion of alkali after it has been precipitated from aqua regia. This depoſites the gold when long expoſed to the air. The curious vegetation called *arbor Dianæ* is formed by adding mercury to this ſolution. A violently fulminating powder obtained by digeſtion.
- Silver*. A ſolution. After it has been precipitated from the nitrous acid. A fulminating powder by digeſtion.
- Platina*. By ſolution, after having precipitated it from aqua regia.
- Copper.
  - A blue-coloured ſolution. By the ordinary means. This when evaporated to dryneſs, and mixed with tallow, tinges the flame green.
  - Sapphire-coloured cryſtals. By cryſtallizing the ſolution.
  - *Venus fulminans.* By evaporating the ſolution to dryneſs.
  - *Aqua cerulea ſapphirina.* By mixing ſal ammoniac, quick-lime, and thin plates of copper, with water, and allowing them to remain a night.
- Iron. By ordinary ſolution.
- Lead. By ditto.
- Tin. The mixts that are produced by theſe metals are little known.

SEMIMETALS.
- Bismuth*. By ſolution, after having precipitated it from the nitrous acid.
- Antimony.
- Cobalt. A reddiſh liquor. By ſolution.
- Nickel. A blue liquor. By ditto.

OILS.
- Expressed. Has no name. By ſolution.
- Essential. *Sal volatile oleoſum.* By ditto with ſome difficulty, unleſs the alkali is in a cauſtic ſtate.
- Empyreumatic. A pungent oily ſubſtance, of great power in medicine. The principal one of this kind in uſe is ſpirit of hartſhorn.
- Fossile. A particular kind of ſoapy ſubſtance.

SULPHUR. Smoking ſpirit of ſulphur. By diſtilling ſal ammoniac, quick-lime, and ſulphur.

ALCOHOL*. By diſtilling alcohol from volatile alkalies, it acquires a cauſtic fiery taſte ; but the union is not complete.

WATER. This ſolution might be of uſe in waſhing or bleaching ; but, unleſs in particular caſes, would be too expenſive. It coagulates with alcohol.

AIR. Fixed Mild volatile alkali. The uſual ſtate in which it is found ; nor has any method yet been diſcovered of rendering it ſolid but in this ſtate.

EXPRESSED OILS *may be combined with the following Subſtances*, viz.

ACIDS : Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, as in the foregoing part of this Table.

ALKALIES : Fixed and Volatile, as above.

CALCAREOUS EARTHS. A kind of plaſter. By mixture when in a cauſtic ſtate.

METALS.
- Tin*. Ditto. By ſolution when the tin is in the ſtate of a calx.
- Lead*. Ditto. By boiling the calx of lead in oils. This is uſed for cements in water-works. The common white paint is a mixture of this leſs perfect.

SEMIMETALS. Zinc*. Ditto. By ditto.

OILS : Eſſential, Empyreumatic, and Foſſile. By mixture but their uſes are not much known.

SULPHUR, *Balſam of Sulphur*. By ſolution in a boiling heat.

ALCOHOL. After expreſſed oils are freed from ſoap or plaſters, they are ſoluble in alcohol ; but not in their ordinary ſtate.

ESSENTIAL OILS *may be combined with the following Subſtances*, viz.

ACIDS : Vitriolic, Nitrous, &c. as above.

ALKALIES : Fixed and Volatile, as above.

METALS.
- Copper. By ſolution.
- Lead. By ditto.

OILS of all kinds. By ſolution or mixture.

SULPHUR. A balſam of ſulphur. By ſolution, imperfectly ; better by adding eſſential oils to the ſolution made by expreſſed oils or hepar ſulphuris.

ALCOHOL.
- Imperfect mixture. By ſolution.
- Aromatic waters. By diſtillation.

WATER. Diſtilled water of the ſhops. By diſtilling recent vegetable ſubſtances with water.

EMPYREUMATIC OILS *may be combined with the following Subſtances*, viz.

ACIDS : Vitriolic and Nitrous, as above.

ALKALIES : Fixed and Volatile, as above.

OILS of all kinds. By mixture.

ALCOHOL. By ſolution. By repeated diſtillations the oils are rendered much more ſubtile.

FOSSILE OILS *may be combined with the following Subſtances*, viz.

ACIDS : Vitriolic and Nitrous, as above.

ALKALIES : Fixed and Volatile, as above.

OILS of all kinds. By mixture.

SULPHUR. With ſome difficulty, by ſolution.

ALCOHOL. - - - By ditto.

SULPHUR *may be combined with the following, Subſtances*, viz.

ACID* : Vitriolic ; with the phenomena above deſcribed.

ALKALIES : Fixed and Volatile, as above.

METALS.
- Silver. A maſs of red-like colour. By adding ſulphur to red-hot ſilver, and fuſing ; found alſo with it in the ſtate of an ore.
- Lead. A ſparkling friable maſs, hardly fuſible. By deflagrating ſulphur with lead. This in a native ſtate forms the ore of lead called *galena*.
- Copper. A Black brittle maſs, eaſily fuſed. By adding ſulphur to red-hot copper, or ſtratifying with ſulphur and fuſing. Naturally in ſome yellow pyrites.
- Iron.
  - A ſpungy-like droſs, eaſily fuſible. By putting ſulphur to red-hot iron. This is alſo found naturally in the common yellow or brown pyrites.
  - A fulminating compound. By mixing filings of iron with ſulphur, moiſtening them with water, and preſſing them hard, they in a few hours burſt out into flame. This compoſition has been employed for imitating earthquakes.
  - *Crocus martis*. By deflagrating with iron.
  - *Crocus martis aperiens*. By calcining the crocus martis in the fire till it aſſumes a red appearance.
  - *Crocus martis aſtringens*. By puſhing the heat ſtill further.
- Tin. A dark-coloured maſs, reſembling antimony. By fuſion.
- Mercury.
  - *Ethiops mineral*. By heating flowers of ſulphur, and pouring the mercury upon it, and ſtirring it well. Its natural ore is called *cinnabar*.
  - *Factitious cinnabar*. By applying the mercury and ſulphur to each other in their pure ſtate, and ſubliming.
  - *Cinnabar of antimony*. By ſubliming corroſive ſublimate and crude antimony ; or the reſiduum, after diſtilling butter of antimony.

SEMIMETALS.
- BISMUTH. A faint greyiſh maſs, reſembling antimony. By fuſion. If in its metalline ſtate, the ſulphur ſeparates in the cold ; but not ſo if the calx has been employed.
- ANTIMONY. *Crude antimony.* By fuſion.
- ZINC*. A very brittle, dark-coloured, ſhining ſubſtance. With ſome difficulty, by keeping it long in a moderate fire, and covering it ſeveral times with ſulphur, and keeping it conſtantly ſtirred.
- ARSENIC.
  - *Yellow arſenic.* By fuſing it with $\frac{1}{10}$th its weight of ſulphur.
  - *Red arſenic.* By ditto with $\frac{1}{5}$th its weight of ſulphur.
  - *Ruby of ſulphur,* or arſenic, or golden ſulphur. By ſubliming when the proportions are equal.
  - *Orpiment.* A natural production; not perfectly imitable by art; compoſed of ſulphur and arſenic. Much uſed as a yellow paint.
- NICKEL. A compound; compact and hard as lead ; of a bright metallic appearance ; internally yellow. By fuſion.

OILS : Expreſſed, Eſſential, and Foſſile, as above.

WATER. *Gas ſylveſtre.* By receiving the fumes of burning ſulphur in water. This ought rather to be called a union of the volatile vitriolic acid with water.

ALCOHOL may be combined with the following Subſtances, viz.

ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, and of Borax, as above.

ALKALI* : Volatile, as above.

METALLIC calces, in ſome particular caſes.

OILS : Expreſſed, Eſſential, Empyreumatic, and Foſſile, as above.

WATER. By ſolution.

GOLD may be combined with the following Subſtances, viz.

ACIDS : Vitriolic*, Nitrous*, and Muriatic*. In the circumſtances and with the phenomena above deſcribed.

ALKALIES : Fixed*, and Volatile*, as above.

METALS.
- SILVER. By fuſion. And the ſame is to be underſtood of all the combinations of metals, unleſs particularly ſpecified.
- PLATINA. Ductile, and of a duſky colour. This has been employed to debaſe gold, as it is of the ſame ſpecific gravity, and is not diſcoverable by the uſual teſts for diſcovering the purity of gold.
- LEAD. A very brittle maſs. Gold is rendered pale by the leaſt admixture with this.
- TIN. A brittle maſs when the tin is added in conſiderable quantity ; but the former accounts of this have been exaggerated.
- COPPER. Paler and harder than pure gold. This mixture is uſed in all our coins, the copper being called the *alloy*.
- IRON. Silver-coloured, hard and brittle ; very eaſily fuſed.
- MERCURY. Soft like a paſte called an *amalgamum*. By ſolution ; it being in this caſe called *amalgamation* ; and the ſame is to be underſtood of the ſolution of any other metal in quickſilver.

SEMIMETALS.
- ZINC. A bright and whitiſh compound, admitting of a fine poliſh, and not ſubject to tarniſh ; for which qualities it has been propoſed as proper for analyſing ſpecula for teleſcopes.
- ARSENIC. Brittle; and the gold is thus rendered a little volatile.
- ANTIMONY. A fine powder for ſtaining glaſs of a red colour. By calcination.
- BISMUTH*. A brittle whitiſh regulus ; volatile in the fire.
- COBALT.
- NICKEL. White and brittle.

SILVER may be combined with the following Subſtances, viz.

ACIDS : Vitriolic*, Nitrous*, Muriatic*, Vegetable*, and Acid of Ants*, as above.

ALKALIES : Fixed* and Volatile*, as above.

CRYSTALLINE EARTHS and other vitreous matters. A fine yellow opake glaſs. The fineſt yellow paint for porcelain is procured from glaſs mixed with ſilver.

METALS.
- GOLD, as above.
- PLATINA. Pretty pure and malleable. Difficult of fuſion ; and in part ſeparates when cold.
- LEAD. Very brittle.
- TIN. Extremely brittle, as much ſo as glaſs.
- COPPER. Harder than ſilver alone. Uſed in ſmall proportions as alloy in coins.
- IRON. A hard whitiſh compound.
- MERCURY*. By amalgamation with ſilver-leaf, or calx of ſilver precipitated by copper, but not by ſalts. This is uſed for ſilverizing on other metals, in the ſame way as the amalgamum of gold.

SEMIMETALS.
- ZINC. Hard, ſomewhat malleable, and of a white colour.
- ANTIMONY. A brittle maſs.
- BISMUTH. A white ſemi-malleable body.
- ARSENIC. Brittle ; the ſilver being rendered in part volatile.
- COBALT.

SULPHUR, as above.

LEAD may be combined with the following Subſtances, viz.

ACIDS : Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Ants, as above.

ALKALIES : Fixed and Volatile, as above.

CRYSTALLINE EARTHS. A thin glaſs. By fuſion in a moderate heat.

METALS.
- GOLD and Silver, as above.
- PLATINA. Of a leafy or fibrous texture, and purpliſh or blue colour when expoſed to the air. If a large proportion of platina is uſed, it ſeparates in the cold.
- TIN. A little harder than either of the metals, and eaſily fuſed : hence it is uſed as a ſolder for lead ; and it forms the principal ingredients of pewter. If the fire is long continued, the tin floats on the ſurface.
- Copper*. Brittle and granulated, like tempered iron or ſteel when broke. By throwing pieces of copper into melted lead. The union here is very ſlight.
- IRON*. An opaque browniſh glaſs. By a great degree of heat if the iron has been previouſly reduced to the ſtate of a calx ; but never in its metallic ſtate.
- MERCURY*. By amalgamation. Effected only in a melting heat, unleſs ſome biſmuth has been previouſly united with the mercury.

SEMIMETALS.
- ZINC. Hard and brittle. By pouring zinc on melted lead. If the zinc is firſt melted, and the lead injected upon it, it then deflagrates.
- ANTIMONY*.
- BISMUTH. A grey-coloured ſemi-malleable body, eaſily fuſed ; and thence uſed as a ſolder for lead or tin.
- ARSENIC.
  - A grey-coloured brittle maſs, eaſily fuſed, and extremely volatile.
  - A hyacinth-coloured glaſs. By fuſion in a conſiderable heat. This glaſs is eaſily fuſed ; and is a much more powerful flux than pure glaſs of lead.
- COBALT. The nature of this compound is not known.
- NICKEL. A brittle metallic body.

OILS : Expreſſed* and Eſſential, as above.

SULPHUR, as above.

TIN may be combined with the following Subſtances, viz.

ACIDS : Vitriolic*, Nitrous*, Muriatic, Vegetable*, of Urine, as above.

ALKALIES : Fixed and Volatile, as above.

CRYSTALLINE EARTHS or other vitreous matters. An opaque white vitreous maſs, which forms the baſis of white enamels.

METALS.
- GOLD, Silver, and Lead, as above.
- PLATINA. A coarſe hard metal which tarniſhes in the air.
- COPPER. A brittle maſs. When the copper is in ſmall proportions, it is firmer and harder than pure tin. This, in right proportions with a little zinc, forms bell-metal.
- IRON. A white brittle compound. By heating filings of iron red-hot, and pouring melted tin upon them. A metal reſembling the fineſt ſilver is made of iron, tin, and a certain proportion of arſenic.
- MERCURY. This amalganium forms foils for mirrors ; and forms the yellow pigment called *aurum moſaicum.* By being ſublimed with ſulphur and ſal ammoniac.

SEMIMETALS.
- ZINC. Hard and brittle. When the zinc is in ſmall proportions, it forms a very fine kind of pewter.
- ANTIMONY* *Regulus veneris.* By elective attraction from copper and crude antimony.
- BISMUTH. Bright, hard, and ſonorous, when a ſmall proportion of biſmuth is uſed. This is very eaſily fuſed, and employed as a ſolder.
- ARSENIC. A ſubſtance in external appearance reſembling zinc.
- COBALT. By fuſion.
- NICKEL. A brittle metallic maſs.

OIL : Expreſſed*, as above.

SULPHUR, as above.

COPPER may be combined with the following Subſtances, viz.

ACIDS : Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.

ALKALIES : Fixed, and Volatile, as above.

METALS.
- GOLD, Silver, Lead*, and Tin, as above.
- PLATINA. A white and hard compound, which does not tarniſh ſo ſoon as pure copper, and admits of a fine poliſh.
- IRON. Harder and paler than copper. Eaſily fuſed.
- MERCURY*. A curious amalgam. Soft at firſt, but afterwards brittle. By triturating mercury with verdigris, common ſalt, vinegar, and water.

SEMIMETALS.
- ZINC.
  - *Braſs.* Commonly made by cementation with calamine. The larger the proportion of zinc, the paler, harder, and more brittle is the braſs.
  - *Prince's metal, pinchbeck,* and other metals reſembling gold. By employing zinc in ſubſtance in ſmall proportions. The beſt pinchbeck about 1-4th of zinc.
  - *Spelter.* A native ſubſtance, found in Cornwall, conſiſting of zinc and copper, and uſed as a ſolder.
- ANTIMONY. By fuſion.
- BISMUTH. A paliſh brittle maſs. Somewhat reſembling ſilver.
- ARSENIC. *White copper.* By pouring arſenic, fuſed with nitre, upon copper in fuſion. If too large a proportion of arſenic is uſed, it makes the compound black and apt to tarniſh.
- COBALT. White and brittle.
- NICKEL. White and brittle, and apt to tarniſh.

OILS : Eſſential, as above.

SULPHUR, as above.

IRON may be combined with the following Subſtances, viz.

ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.

ALKALIES: Fixed*, and Volatile, as above.

VITRESCENT EARTHS. A tranſparent glaſs. In general blackiſh; but ſometimes yellow, green, or blue. The colour is influenced by the degree of heat as well as nature of the ingredients.

METALS.
- Gold, Silver*, Lead*, Tin, and Copper, as above.
- Platina. With caſt iron it forms a compound remarkably hard, ſomewhat ductile, and ſuſceptible of a fine poliſh.

SEMIMETALS.
- Zinc. A white ſubſtance reſembling ſilver.
- Antimony. The magnetic quality of the iron is totally deſtroyed in this compound.
- Bismuth. In a ſtrong heat, this emitteth flames.
- Arsenic. A whitiſh, hard, and brittle compound. By fuſing with ſoap or tartar. A metal reſembling fine ſteel is made by fuſing caſt iron with a little arſenic and glaſs.
- Cobalt. A compound remarkably ductile. By fuſion in a moderate heat.
- Nickel. A brittle maſs.

SULPHUR, as above.

MERCURY may be combined with the following Subſtances, viz.

ACIDS: Vitriolic, Nitrious, Muriatic, Vegetable*, of Urine, as above.

ALKALI: Fixed*, as above.

METALS.
- Gold, Silver*, Lead*, Tin, and Copper, as above.
- Platina. The compound reſulting from this mixture is not known.

SEMIMETALS.
- Zinc. An amalgam. Soft or hard, according to the proportions employed.
- Antimony. By melting the regulus, and pouring it upon boiling mercury. By frequently diſtilling from this amalgam, the mercury is rendered much more pure, and then is called *animated mercury.*
- Bismuth. A ſilverizing for iron. By putting this amalgam upon iron, and evaporating the mercury. It has much the appearance of ſilver.
- Cobalt. By mixing firſt with nickel, and then adding mercury.

SULPHUR, as above.

ZINC may be combined with the following Subſtances, viz.

ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.

METALS.
- Gold, Silver, Lead, Tin, Copper, and Iron, as above.
- Platina A hard ſubſtance.
- Mercury, as above.

SEMIMETALS.
- Antimony. This mixture is applied to no particular uſe.
- Arsenic. A black and friable maſs.
- Cobalt. The particular nature and properties of this mixt is not known.

OIL: Expreſſed*, as above.

SULPHUR*, as above.

ANTIMONY may be combined with the following Subſtances, viz.

ACIDS: Vitriolic*, Nitrous, Vegetable*, and Urinous. With the phenomena, and by the means above deſcribed.

ALKALIES: Fixed and Volatile, as above.

VITREOUS EARTHS. A thin penetrating glaſs; which is a powerful flux of metals.

METALS.
- Gold, Silver, Lead, Tin*, Copper, and Iron, as above.
- Ptatina. A hard maſs.
- Mercury, and Zinc, as above.

SEMIMETALS.
- Bismuth. A maſs reſembling regulus of Antimony.
- Arsenic. The nature and qualities of this mixt are not known.
- Cobalt. Nature unknown.
- Nickel. Ditto.

SULPHUR, as above.

BISMUTH may be combined with the following Subſtances, viz.

ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, and Urinous; with the phenomena, *&c.* above deſcribed.

ALKALIES: Fixed*, and Volatile*, as above.

VITREOUS MATTERS. A yellow glaſs. The ore of Biſmuth affords with theſe a blue glaſs; but this is probably owing to ſome mixture of Cobalt with it.

METALS.
- Gold, Silver, Lead, Tin, Copper, and Iron, as above.
- Platina. This mixture changes its colour much on being expoſed to the air.
- Mercury, as above.

SEMIMETALS.
- Antimony, as above.
- Arsenic. Nature not known
- Cobalt*. By mixing firſt with with nickel or regulus of antimony, and then adding cobalt; but it cannot be united by itſelf.
- Nickel. This mixt is not known.

SULPHUR, as above.

ARSENIC may be combined with the following Subſtances, viz.

ACIDS: Vitriolic, Muriatic*, Vegetable*, and Urinous; with the phenomena, *&c.* abovementioned.

ALKALIES : Fixed, and Volatile ; with the phenomena, and by the means mentioned above.

VITREOUS MATTERS. A glaſs which greatly promotes the fuſion of other ſubſtances. The arſenic muſt firſt be prepared by diſſolving and precipitating from alkalies.

METALS. { Gold, Silver, Lead, Tin, Copper, and Iron, as above.
Platina.

SEMIMETALS. { Zinc, Antimony, and Biſmuth, as above.
Cobalt.
Nickel. The phenomena attending theſe mixtures have not been as yet particularly obſerved.

SULPHUR, as above.

PLATINA may be combined with the following Subſtances, viz.

ACIDS : Muriatic*; with the phenomena, *&c.* mentioned above.

ALKALI : Volatile, as above.

METALS : Gold, Silver, Mercury, Tin, Copper, and Iron, as above.

SEMIMETALS. { Zinc, Biſmuth, and Arſenic, as above.
Cobalt.
Nickel. The phenomena attending theſe mixtures not yet obſerved.

COBALT may be combined with the following Subſtances, viz.

ACIDS : Vitriolic, Nitrous, Muriatic, and Urinous ; with the phenomena, *&c.* as above deſcribed.

ALKALI : Volatile, as above.

EARTHS. Calx of Flint. { *Saffre.* By mixing calcined cobalt with calx of flint, and moiſtening them with water, and preſſing them cloſe in wooden tubs.
Smalt. By vitrifying theſe with the addition of a little potaſh.

METALS : Gold, Silver, Platina, Mercury*, Lead, Tin, Copper, and Iron, as above.

SEMIMETALS. { Zinc, Antimony, Biſmuth*, and Arſenic, as above.
Nickel. The properties of this compound not known.

NICKEL may be combined with the following Subſtances, viz.

ACIDS : Nitrous, and Muriatic ; with the phenomena, *&c.* as mentioned above.

ALKALI : Volatile, as above.

METALS : Gold, Platina, Lead, Tin, Copper, and Iron, as above.

SEMIMETALS : Antimony, Biſmuth, Arſenic, and Cobalt, as above.

SULPHUR, as above.

ABSORBENT EARTHS may be combined with the following Subſtances, viz.

ACIDS : Vitriolic, Nitrous, Muriatic, and Vegetable ; with the phenomena, and by the aſſiſtances abovementioned.

ALKALIES : Fixed as above.

EARTHS. { Crystaline. By this mixture they are both much eaſier melted into glaſs than by themſelves, but not without the addition of ſome alkali.
Argillaceous. This mixture eaſily runs into a glaſs without any addition.

WATER. *Lime-water.* By ſolution. It is ſometimes found flowing out of the earth in ſprings ; and as it always quits the water when expoſed to the air, it is there depoſed on the banks of the ſtreams, forming the ſtony incruſtations called *petrifications :* And filtering through the pores of the earth, and dropping through the roofs of ſubterraneous caves, it forms the curious incruſtations found hanging from the roof of ſuch places ; ſometimes aſſuming forms ſtupenduouſly magnificent.

AIR. Fixt. *Lime-ſtone.* It is from the quality that quick-lime has of abſorbing its air, again with it reſuming its ſtony conſiſtence, that it is fitted for a cement in building ; and the great hardneſs of the cements in old buildings is owing to the air being more perfectly united with theſe than in newer works.

CRYSTALLINE or VITRESCENT EARTHS may be combined with the following Subſtances, viz.

ACIDS : Vitriolic*, and Nitrous*; with the phenomena, *&c.* as abovementioned.

ALKALI : Fixed, as above.

ABSORBENT EARTHS : as above.

ARGILLACEOUS EARTHS. A maſs running into glaſs in a moderate heat.

METALS : Lead, Tin, Copper, and Iron, as above.

WATER. Although this is not ſoluble in water by any operation that we are acquainted with ; yet, from its cryſtalline form, it is probable that it has been once ſuſpended ; and certainly it is ſo at this day in thoſe petrifying ſprings whoſe incruſtations are of the cryſtalline ſort.

SEMIMETALS : Antimony, Biſmuth, Arſenic, and Cobalt, as above.

ARGILLACEOUS EARTH may be combined with Abſorbent and Cryſtalline Earths, as above. With water it only unites into a paſte of a mechanical nature.

INDEX.

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Argonauts,

and

Some late experiments of Dr Prieſtley, have ſhown, that though nitrous acid is produced from the decompoſition of dephlogiſticated and phlogiſticated air, by taking the electric ſpark in the mixture, it is likewiſe produced by the more rapid decompoſition of combuſtion, when inflammable air is made uſe of inſtead of the phlogiſticated kind. In this caſe, though phlogiſticated air ſhould happen to exiſt in the mixture, it is not in the leaſt affected by the proceſs, but remains after the combuſtion of the others, juſt as it was; nay, the Doctor obſerves, that by the addition of phlogiſticated air, the quantity of nitrous acid produced is ſo far from being augmented, that it is much diminiſhed. The acid in theſe proceſſes always appears to be extremely volatile, inſomuch that ſome part of it conſtantly eſcapes. No liquor at all was condenſed when the exploſions were made in quick ſucceſſion, even though the veſſel never became hotter than the hand. In another proceſs, the atmoſpheric air was perfectly excluded, while the pureſt dephlogiſticated air was produced from one of the materials employed, viz. precipitate *per ſe*. In this experiment he found, that a conſiderable quantity of fixed air was produced, and that the water became acid by the abſorption of it. He concludes, therefore, on the whole, that a mixture of dephlogiſticated and inflammable air always produces an acid by combuſtion; but that, when they are in their naſcent ſtate, the aerial acid is generated; when both are completely formed previous to the experiment, the nitrous acid appears.

M. Pelletier has now diſcovered a method of uniting phoſphorus, without any decompoſition, with all the metals, though he cautions againſt the danger with which the proceſs is attended. Gold is phoſphorated by mixing half an ounce of its calx with an ounce of phoſphoric glaſs and about a grain of powdered charcoal; the whole is then put into a crucible, the compoſition covered with a little powdered charcoal, and a degree of heat ſufficient to fuſe the gold applied. A great many phoſphoric vapours ariſe, but part are detained, and unite with the gold which is left at the bottom of the crucible. The metal by this operation loſes its colour, becomes whitiſh, breaks under the hammer, and has a cryſtalline appearance. By continuing the fire a long time the phoſphorus would be entirely diſſipated. The quantity of phoſphoric glaſs and charcoal juſt mentioned is ſufficient to phoſphorate a whole ounce of platina. By an hour's calcination in a crucible, the metal is converted into a blackiſh maſs reſembling ſilver, weighing upwards of an ounce, and of which the lower part conſiſts of cubical cryſtals. Notwithſtanding this change, however, the quantity of phoſphorus united with the platina is very inconſiderable; for from 12 ounces of the metal, and as much phoſphoric glaſs, only 12 ounces and five grains of the phoſphorated metallic maſs was obtained. It was very brittle, but of conſiderable hardneſs; was not attracted by the magnet, and by expoſure to a ſtrong fire parted with the phoſphorus it had been combined with. He obſerves, that all the metals loſe their malleability by combination with phoſphorus, excepting tin and lead; and the reſiduum of the matter which has once phoſphorated a metal, will ſerve again for the ſame purpoſe.

Though the acid of tartar has been commonly ſuppoſed a product of the vinous fermentation, yet late experiments have ſhown that this is not the caſe. It has been found not only in the juice of the grape, but in that of tamarinds, the berries of the *rhus coriaria*, and the leaves of the *rumex acetoſa*. In theſe it is generally combined with the vegetable fixed alkali, or with calcareous earth. Hermbſtadt has found it combined with calcareous earth in the juice of the roots of the *triticum repens*, the *leontodon-taxaracum*, and *China-bark*. By the aſſiſtance of nitrous acid he obtained it alſo from the juice of grapes, mulberries, apples, pears, oranges, ſtrawberries, and plums; alſo from honey, ſugar, gum arabic, manna, ſpirit of wine, beech-wood, and the root of black hellebore. In theſe caſes, where the nitrous acid is made uſe of, however, it may juſtly be ſuppoſed that the acid of tartar is partly at leaſt produced from it. In Scheele's proceſs for procuring the pure acid of tartar by means of calcareous earth, it is adviſable to make uſe of quicklime rather than chalk, as by this double the quantity of tartar will be decompoſed. An hundred parts of pure tartar contain about 23 of vegetable alkali, 43 parts of acid employed to ſaturate that alkali, and 34 of ſuperabundant acid. By uſing oyſter-ſhells well prepared by boiling and powdering, the cryſtals of the acid may be obtained very white and pure. Some chemiſts have imagined that the vegetable alkali, does not exiſt ready formed in tartar, but that it is produced by fire or mineral acids. In proof of this M. Machi offers the following experiments. On an ounce of cream of tartar were poured 10 ounces of boiling water, and the mixture allowed to remain in a jar covered with paper and parchment in which a ſmall hole was made with a pin. At the end of three months it was conſiderably diminiſhed; and contained a quantity of thick, tough, yellow, mucilaginous matter, which neither efferveſced with acids nor alkalies, and, when burnt, the aſhes were found to contain only a very ſmall quantity of alkali. The experiment was repeated by Mr Corvinus with ſome variation. He kept a ſolution of cream of tartar in a heat between 10° and 30° of Reaumur's ſcale; removing the ſaline pellicles which formed on the ſurface as faſt as they appeared, and rediſſolving them in water By continuing the digeſtion for ſeveral months, the liquor became at laſt evidently alkaline: and he thus obtained 216 grains of a brown alkali from two ounces of cream of tartar. Mr Berthollet expoſed for nine months, to the heat of his laboratory, a ſolution of two ounces of cream of tartar in eight ounces of water; taking care to replace the water which evaporated, but without removing the cruſts which formed upon the ſurface. At the end of this time he found that the liquor was no longer acid, but began to turn the ſyrup of violets green. In 18 months it became ſtrongly alkaline; and left, when evaporated, an oily reſiduum which efferveſced with acids, and weighed 468 grains. On treating in the ſame manner a ſolution of terra foliata tartari, the liquor began to change the ſyrup of violets green in two months, and in four the decompoſition ſeemed to be complete. At the end of a year he filtered and evaporated the liquor to dryneſs, by which proceſs he obtained 432 grains of fixed alkali. The ſame quantity of terra foliata tartari decompoſed immediately by diſtillation, yielded only 36 grains more of alkali. Solution of ſalt of wood ſorrel ſuffered no decompoſition by a ſimilar treatment for two years. The latter he obſerved to be a much more powerful antiſceptic than tartar; for which reaſon it ſeems to reſiſt decompoſition in a proportionable degree. He ſuppoſes oil to be the principal cauſe of the deſtruction of theſe acids; and the obvious deficiency of oil in the ſaccharine acid, in compariſon with tartar, ſeems to be the cauſe of the want of capacity in it to undergo the decompoſition juſt mentioned. A remarkable circumſtance attends this ſpontaneous decompoſition, viz. that no air is either abſorbed or emitted during the whole proceſs. It is alſo worth notice, that in combining acid of tartar with fixed alkalies, the ſalt ſuperſaturated with acid or cream of tartar is always formed in preference to the other called *ſoluble tartar*. Thus if to a ſaturated ſolution of alkali with cream of tartar we add another of pure tartareous acid, a white ſpongy matter will be precipitated to the bottom; which, on examination, is found to be a true tartar. Any other acid added to the ſolution of tartariſed tartar will in like manner produce a precipitation of tartar, by engaging a part of the alkali with which it was combined; and if the acid of tartar be added to a ſolution of any neutral ſalt containing the vegetable fixed alkali, as vitriolated tartar, ſalt of Sylvius, and nitre, a ſimilar precipitation of tartar will enſue. Hence the acid of tartar may be employed as a teſt to diſcover the preſence of the vegetable fixed alkali, and to diſtinguiſh it from the mineral, which has not that effect. Bergman indeed obſerves, that Rochelle ſalt will do the ſame thing; but it muſt be remembered that this is prepared with crude tartar, which contains a portion of vegetable alkali, and not with the pure acid.

The following is a liſt of the Vegetables from which the induſtry of the modern chemiſts has procured different acids, with the names of the diſcoverers.

1 *Agave Americana.* The juice exſuding from the calyx of this plant yields acid of tartar and apples. Mr *Hoffman of Weimar.*

2 *Aloes.* Acid of ſugar and apples. Mr *Scheele.*

3 *Apples.* A peculiar acid called by the name of the fruit. By nitrous acid that of tartar is procured. Mr *Scheele* and Mr *Hermbſtadt.*

4 *Barberry.* Acid of apples, and of tartar. By treatment with nitrous acid it yields acid of ſugar. *Scheele* and *Hermbſtadt.*—Hoffman denies that it contains any native acid of tartar. By treating it with ſpirit of wine and manganeſe he obtained an ether.

5 *Bilberry* (*Vaccinium myrtillus*). Equal parts of the acids of citrons and apples. *Scheele.*

6 *Bramble* (*Rubus chamæmorus*). The ſame with the foregoing. *Scheele.*

7 *Camphor.* A peculiar kind of cryſtallizable acid. *M. Koſegarten.*

8 *Cherries*, Equal parts of acids of citrons and apples. Saccharine acid by treatment with ſpirit of nitre. *Scheele, Hermbſtadt*, and *Weſtrumb*—Hermbſtadt ſays that he found acid of tartar alſo.

9 *Citrons* and *lemons.* A particular kind of cryſtallizable acid. *Scheele*

10 *Coffee.* The infuſion evaporated and treated with ſpirit of nitre. Acids of ſugar and apples. *Scheele.*

11 *Corks.* A yellow acid by repeated abſtractions of ſpirit of nitre. With ſome of the alkalies and earths this acid forms cryſtallizable ſalts which do not deliquate, though others do. That with fixed vegetable alkali forms needle-like cryſtals, ſoluble in water, vitriolic, nitrous, or marine acids, but not in vinegar or ſpirit of wine. Like the ſaccharine acid it has a ſtrong affinity to calcareous earth, which it ſeparates from lime-water, and forms a greyiſh ſaline powder, ſoluble in marine acid, but not in water, nor even in its own acid. It exhibits ſome appearances with metals, which deſerve farther examination. *Brugnatelli.*

12 *Cranberry.* (*Vaccinium oxycoccos*). Acid of citrons. *Scheele.*

13 *Currants, red* and *white.* Acids of citrons and apples. *Weſtrumb.* Hermbſtadt ſays that they contain acid of tartar.

14 *Elder berries.* Acid of apples. *Scheele.*

15 *Galls.* A peculiar kind of acid. *Scheele*—Mr Kier obſerves, that from other aſtringent matters, eſpecially thoſe uſed in dyeing, it is probable that ſimilar acids might be obtained. Mr Morveau has obtained from galls a reſin which he ſuppoſes to be their acidifiable baſe; and which, along with pure air, forms the acid of galls. When purified, this acid is ſaid to make a fine and durable ink.

16 *Geraninum acidum.* Small acid cryſtals *Cartheuſer.* Said by Hermbſtadt to be the acid of ſugar.

17 *Gooſeberries.* Acid of apples. *Scheele.*—Hermbſtadt ſays that they contain the acid of tartar alſo.

18 *Grapes.* Their juice well known to contain the acid of tartar partially combined with fixed alkali.

19 *Graſs-roots.* Saline cryſtals from the extract of the juice after three months ſtanding. Theſe were ſoluble in water, and gave an earthy precipitate on mixture with fixed alkali. On abſtracting the nitrous acid from them, and adding a ſolution of calcareous earth in vinegar, a precipitate fell, which was found to conſiſt of acid of tartar ſaturated with lime. *Hermbſtadt.*

20 *Gum Arabic.* Acid of ſugar and apples. *Scheele.*

21 *Gum tragacanth.* Acids of ſugar of milk, apples, and ſugar.

22 *Haw* (*Cratægus aria*). Equal parts of acids of citrons and apples.

23 *Honey.* An acid liquor by diſtillation; and with ſpirit of nitre, the acid of ſugar. The diſtilled acid has been ſaid to diſſolve gold.

24 *Lemons.* An acid the ſame with that of citrons.

25 *Leontodon taraxacum.* Acid of tartar by treatment with ſpirit of nitre.

26 *Manna.* Acid of ſugar by treatment with ſpirit of nitre.

27 *Mulberries.* Acid of tartar. *Hermbſtadt.* A cryſtallizable acid ſalt by evaporating the juice. *Angelus Sala.*

28 *Oil of olives.* A ſalt which ſublimed and cryſtallized, by repeated and copious abſtractions of the nitrous acid. *Weſtrumb.*

29 *Peruvian bark.* Acid of apples and ſugar, by treating the extract with nitrous acid. *Scheele.*

30 *Prunus ſpinoſa et domeſtica.* Acid of apples. *Scheele.*

31 *Prunus padus.* Acid of citrons. *Scheele.*

32 *Poppy.* Acids of ſugar and apples, by treating the juice with nitrous acid. *Scheele.*

33 *Raſpberries.* Acids of apples and citrons. *Scheele.* Acid of tartar by ſaturating the juice with chalk, and then ſeparating the earthy baſis by means of vitriolic acid. *Hermbſtadt.*

34 *Rhapontic.* Acid of tartar by cryſtallizing the juice; of ſugar by treating it with nitrous acid. *Bindheim.*

35 *Rhubarb.* Acids of ſugar and apples by treating the infuſion with nitrous acid. If a pound of Indian rhubarb be infuſed in hot water, a powder ſubſides, which by waſhing becomes white, weighing then about nine drachms, and is found to conſiſt of calcareous earth united with the acid of ſugar. *Scheele.*

36 *Ribes cynoſbati.* Acid of citrons or lemons. *Scheele.*

37 *Salep.* Acids of ſugar and apples by treatment with nitrous acid. *Scheele.*

38 *Service* (*Sorbus aucuparia*). Acid of apples. *Scheele.*

39 *Solanum dulcamara.* Acid of citrons. *Scheele.*

40 *Sorrel* (*Rumex acetoſa*). Cryſtals of tartar by evaporating and cryſtallizing the juice; and pure acid of tartar by ſaturating the acid with chalk, and then expelling it by means of the vitriolic. *Hermbſtadt.* Other chemiſts, however, have certainly found it to contain the acid of ſugar partly neutralized with álkali, and which is capable of being cryſtallized. This is generally known under the name of *ſalt of wood-ſorrel*, and is manufactured in conſiderable quantities in Thuringia, Suabia, Switzerland, and the Hartz. It is prepared from this plant as well as the *oxalis acetoſella.* The plants are bruiſed in ſtone or wooden mortars; the juice is ſqueezed through linen; and when cleared by ſettling, is to be boiled to a proper conſiſtence, and clarified with the whites of eggs, or with blood. It is to be ſtrained whilſt hot, and then kept in a cold cellar. In a few weeks cryſtals will be formed, from which the remaining liquor muſt be poured off, and by further evaporation will yield more ſalt. Savary obtained only two ounces, and a half of ſalt from 25 pounds of the juice.

41 *Strawberries.* Equal parts of the acids of apples and citrons. *Scheele.*

42 *Sugar.* See the article.

43 *Sumach* (*Rhus coriaria*). Cryſtals of tartar. Profeſſor *Tromſdorf* and *Son.*

44 *Tamarinds.* Acid of tartar, tartar itſelf, with a mucilaginous and ſaccharine matter. *Weſtrumb.*

45 *Vaccinium vitis idæa.* Acid of citrons. *Scheele.*

46 *Wood and bark of the birch tree.* From 55 ounces of the wood were obtained 17 ounces of rectified acid, which when freed from an amber-coloured oil was to the ſpecific gravity of water as 49 to 48, and of ſuch ſtrength that one ounce of it required 23 of lime-water for its ſaturation. *Chemiſts of Dijon.*—By allowing the acid diſtilled from the bark to remain at reſt for three months, much of its oil was ſeparated; by ſaturation with fixed alkali a dark-coloured neutral ſalt was obtained, which was purified by fuſion and ſubſequent filtration and evaporation. On ſubjecting

CHEMNITZ, (Martin) a famous Lutheran divine, the diſciple of Melancthon, was born at Britzen in Brandenburgh, in 1522. He was employed in ſeveral important negociations by the princes of the ſame communion; and died in 1589. His principal work is the Examen of the Council of Trent, in Latin.

CHEMOSH. See CHAMOS.

CHEMOSIS, a diſeaſe of the eyes, proceeding from an inflammation; wherein the white of the eye ſwells above the black, and overtops it to ſuch a degree, that there appears a ſort of gap between them. Others define it to be an elevation of the membrane which ſurrounds the eye, and is called the *white;* being an affection of the eye, like white-fleſh.

CHENOPODIUM, GOOSE-FOOT, or *Wild Orach:* A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 20th order *Holoraceæ*. The calyx is pentaphyllous and pentagonal; no corolla; one ſeed lenticular, ſuperior. There are 18 ſpecies, 13 of which are natives of Britain. The moſt remarkable are the following: 1. The bonus henricus, or common Engliſh mercury, found growing naturally in ſhady lanes in many places in Britain. It has large triangular, arrow-pointed, entire leaves; upright, thick, ſtriated ſtalks garniſhed with triangular leaves, and terminated by cloſe ſpikes of apetalous yellowiſh-green flowers in June and July, which are ſucceeded by ripe ſeeds in Auguſt. 2. The ſcoparia, belvidere, or annual mock-cypreſs, which is of a beautiful pyramidal form reſembling a young cypreſs tree. 3. The botrys, or oak of Jeruſalem. 4. The ambroſoides, or oak of Cappadocia. All theſe are very eaſily propagated from ſeeds; and will thrive beſt in a rich light earth. Moſt of the ſpecies have an aromatic ſmell. A ſpecies which grows near the Mediterranean is uſed by the Egyptians in ſallads, on account of its ſaltiſh aromatic taſte. From the ſame plant kelp is made in other countries.—The firſt ſpecies, or Engliſh mercury, was formerly uſed as ſpinach; but is now diſuſed, as being greatly inferior to that herb. As an article of the materia medica, it is ranked among the emollient herbs, but rarely made uſe of in practice. The leaves are applied by the common people for healing ſlight wounds, cleanſing old ulcers, and other like purpoſes. The roots are given to ſheep that have a cough. Goats and ſheep are not fond of the herb; cows, horſes, and ſwine, refuſe it.—The ſecond ſpecies, or belvidere, is a plant much eſteemed in China. The following are the properties attributed to it in the Chineſe Herbal. After having ſaid that it is about the end of March or beginning of April that the belvidere ſprings up from the earth; that its ſuckers or ſhoots riſe to the height of eight or nine inches, in ſhape of a child's fiſt half ſhut; that it afterwards extends itſelf, and ſends forth a number of branches loaded with leaves like thoſe of flax; and that, as it grows, its branches arrange themſelves naturally in the form of a beautiful pyramid; it adds, that its leaves, yet tender, abound with juice, and have a very agreeable taſte; that it may be eaten as a ſallad with vinegar, to which a little ginger has been added; that being prepared like other leguminous plants, and baked with meat, it gives it an agreeable and pleaſing flavour: that, when in its full beauty, its leaves become hard and unfit for the table; but that nouriſhment is then found in its root, which ſerves as a reſource in times of famine and ſcarcity. When the belvidere has attained to its natural ſize, the Chineſe ſeparate its principal ſtalk from the reſt, and put it into a ley of aſhes, which cleans and ſoftens it, and frees it from all impurities of the bark. After this bath, it is expoſed to the ſun; and when dry it is baked and ſeaſoned. With regard to the root, which has ſomething of a violet-colour, they ſtrip off the ſkin by filaments, which may be boiled and eaten: but what is particularly ſought after, is the root itſelf; of which, when reduced to powder, they collect only what remains in the bottom of the veſſel, and form it into ſmall loaves that are baked by being held over the ſteam of boiling water. People of a delicate taſte will ſcarcely be tempted to admit this diſh at their tables; but is it not uſeful to point out to the poor peaſants, that in caſes of neceſſity, they may always have recourſe, without danger, to this ruſtic food? In ſuch caſes, they will be indebted to the Chineſe for having made the firſt trial, which, for the moſt part is, dangerous. The Chineſe Herbal cites the example of four mountaineers, who having lived on nothing but the leaves, roots, and ſtalks, of the belvidere, with which their country abounded, had nevertheleſs enjoyed perfect health to a very great age.

CHEPELIO, an iſland in the bay of Panama and province of Darien, in South America, ſituated about three leagues from the city of Panama, which it ſupplies with proviſions. W. Long. 81. N. Lat. 9.

CHEPSTOW, a market town of Monmouthſhire in England, ſeated on the river Wye near its mouth, in W. Long. 2. 40. N. Lat. 51. 40.

CHEQ, or CHERIF, the prince of Mecca, who is, as it were, high prieſt of the law, and ſovereign pontiff of all the Mahometans of whatever ſect or country they be. See CALIPH.

The grand ſignior, ſophis, moguls, khans of Tartary, &c. ſend him yearly preſents, eſpecially tapeſtry to cover Mahomet's tomb withal, together with a ſumptuous tent for himſelf, and vaſt ſums of money to provide for all the pilgrims during the 17 days of their devotion.

CHERASCO, a ſtrong and conſiderable town of Italy, in Piedmont, and capital of a territory of the ſame name, with a ſtrong citadel, belonging to the king of Sardinia, where he retired in 1706, during the ſiege of Turin. It is ſeated at the confluence of the rivers Sturia and Tanaro, upon a mountain. E. Long. 7. 55. N. Lat. 44. 35.

CHERBURG, a ſea-port town of France, in Normandy, with a harbour and Auguſtine abbey. It is remarkable for the ſea-fight between the Engliſh and French fleets in 1692, when the latter were beat, and upwards of twenty of their men of war burnt near Cape la Hogue. The Britiſh landed here in Auguſt 1758, and took the town, with the ſhips in the baſon, demoliſhed the fortifications, and ruined the other works which had been long carried on for enlarging the harbour and rendering it more ſafe and convenient. Within theſe few years it has been attempted again to improve the harbour, and rebuild the works; but after conſiderable progreſs had been made, a great part of them ſuddenly gave way, and the enterpriſe it is thought will not be again reſumed. E. Long 1. 38. N. Lat. 49. 38.

CHEREM, among the Jews, is uſed to ſignify a ſpecies of annihilation. See ANNIHILATION.

The Hebrew word *cherem*, ſignifies properly to *deſtroy, exterminate, devote*, or *anathematiſe.*

CHEREM is likewiſe ſometimes taken for that which is conſecrated, vowed, or offered to the Lord, ſo that it may no longer be employed in common or profane uſes. No devoted thing that a man ſhall devote unto the Lord, of all that he hath of man and beaſt, and of the field of his poſſeſſion, ſhould be ſold or redeemed; every devoted thing is moſt holy to the Lord: none devoted, which ſhall be devoted of men, ſhall be redeemed, but ſhall ſurely be put to death. There are ſome who aſſert that the perſons thus devoted were put to death; whereof Jephtha's daughter is a memorable example. Judges xi. 29. &c.

CHEREM is alſo uſed for a kind of excommunication in uſe among the Jews. See NIDDUI.

CHERESOUL, or CHAHRZUL, a town of Turkey in Aſia, capital of Curdiſtan, and the ſeat of a beglerbeg. E. Long. 45. 15. N. Lat. 36. 0.

CHERILUS, of Samos, a Greek poet, flouriſhed 479 years before Chriſt. He ſung the victory gained by the Athenians over Xerxes, and was rewarded with a piece of gold for every verſe. His poem had afterwards the honour of being rehearſed yearly with the works of Homer.

CHERLERIA, in botany: a genus of the trigynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophylleæ.* The calyx is pentaphyllous; there are five nectaria, bifid, and petal-like; the antheræ alternately barren; the capſule is trilocular and three-valved.

Plate cxxxviii. CHERLESQUIOR, in Turkiſh affairs, denotes a lieutenant-general of the grand ſignior's armies.

CHERMES, in zoology, a genus of inſects belonging to the order of inſecta hemiptera. The roſtrum is ſituated on the breaſt; the feelers are longer than the thorax; the four wings are deflected; the thorax is gibbous; and the feet are of the jumping kind. There are 17 ſpecies; and the trivial names are taken from the plants which they frequent, as the Chermes graminis, or graſs-bug; the chermes ulmi, or elm-bug, &c. The chermes ficus, or fig-tree bug, one of the largeſt of the genus, is brown above and greeniſh beneath. The antennæ, likewiſe brown, are large, hairy, and one third longer than the thorax. The feet are yellowiſh; the wings large, twice the length of the abdomen. They are placed ſo as to form together an acute roof. The membrane of which they conſiſt is thin and very tranſparent; but they have brown veins, ſtrongly marked, eſpecially towards the extremity. The roſtrum of this chermes is black, and takes its riſe from the lower part of the thorax, between the firſt and ſecond pair of feet. It is an inſect to be met with in great numbers upon the fig-tree. The larva has ſix feet. It is like the inſect, when provided with wings. Its form is oblong, and its motion ſlow.

The chryſalis differs from it by two flat buds that ſpring from the thorax and incloſe the wings, afterwards ſeen in the perfect inſect. Theſe chryſalids are frequently met with on plants; and the two plates of their thorax give them a broad uncouth appearance and a heavy look. When the little chryſalids are going to be metamorphoſed, they remain motionleſs under ſome leaves which they fix themſelves upon. Their ſkin then divides upon the head and thorax, and the perfect inſect comes forth with his wings, leaving the ſpoil of his chryſalis open and rent anteriorly upon the leaf. Theſe kind of ſloughs are often found beneath the leaves of the fig-tree. The perfect inſect is furniſhed with four wings, large in proportion to its body, veined, and placed in the form of a roof; and with them it flies. It has, moreover, the faculty of leaping pretty briſkly, by means of its hinder-legs, which play like a ſpring. When it is attempted to catch the chermes, it makes its eſcape rather by leaping than flying. Some of thoſe inſects have a manœuvre worthy of notice. Several ſpecies are provided at the extremity of their body with a ſmall ſharp-pointed implement, but which lies concealed, and that they draw out in order to depoſit their eggs, by making a puncture in the plant that ſuits them. By this method the fir-tree chermes produces that enormous ſcaly protuberance that is to be found at the ſummit of the branches of that tree, and which is formed by the extravaſation of the juices occaſioned by the punctures. The young larvæ ſhelter themſelves in cells contained in the tumor. The white down, under which the larva of the pine-chermes is found, ſeems to be produced much in the ſame manner. That of the box-tree chermes produces no tubercula like thoſe; but its punctures make the leaves of that tree bend and grow hollow in the ſhape of a cap, which by the union of thoſe inflected leaves produces at the extremity of the branches a kind of knobs, in which the larvæ of that inſect find ſhelter. The box-chermes, as well as ſome others, has yet another peculiarity, which is, that the larva and its chryſalis eject at the anus a white ſweet-taſted matter, that ſoftens under the touch, and is not unlike manna. This ſubſtance is found in ſmall white grains within the balls formed by the box-leaves, and a ſtring of the ſame matter is often ſeen depending from the anus of the inſect.

CHERMES Mineral. See KERMES.

CHERRY-ISLAND, an iſland in the northern ocean, lying between Norway and Greenland, in E. Long. 20. 5. N. Lat. 75. 0.

CHERRY-Tree, in botany. See PRUNUS.

CHERSO, an iſland in the gulph of Venice, with a town of the ſame name near Croatia, belonging to the Venetians. The air is good, but the ſoil ſtony; however, it abounds in wine, cattle, oil, and excellent honey. E. Long. 15. 5. N. Lat. 45. 8.

CHERSONESUS, among modern geographers, the ſame with a peninſula; or a continent almoſt encompaſſed round with the ſea, only joining to the main land by a narrow neck or iſthmus. The words is Greek, χερσονησος; of χερσος, *land*, and νησος, *iſland;* which ſignifies the ſame. In ancient geography, it was applied to ſeveral peninſulas; as the Cherſoneſus Aurea, Cimbrica, Taurica, and Thracia, now thought to be Malacca, Jutland, Crim Tartary, and Romania.

CHERT, PETROSILEX, *Lapis Corneus*, the *Hornſtein* of the Germans; a ſpecies of ſtone claſſed by Cronſtedt among the ſiliceous earths. It is of a coarſer texture than the common flint, as well as ſofter; for which reaſons it is not capable of ſuch a fine poliſh. It is ſemitranſparent at the edges, or when broken into very thin pieces. It is found of different colours, *viz.* white, whitiſh yellow, fleſh-coloured, and greeniſh. According to Mr Kirwan, it runs in veins through rocks, from whence its name is derived; its ſpecific gravity being from 2590 to 2700. In the fire it whitens and decrepitates like ſilex, but is generally fuſible *per ſe.* Mineral alkali does not totally diſſolve it in the dry way, but borax and microcoſmic ſalt do ſo without efferveſcence. Its appearance is duller and leſs tranſparent than common flint. The reddiſh petroſilex, uſed in the count de Lauragais's porcelain manufactory, and there called *feld-ſpat,* contained 72 *per cent.* of ſilex, 22 of argill, and 6 of calcareous earth.

Cronſtedt obſerves that there are not as yet any certain characters known by which the cherts and jaſpers may be diſtinguiſhed from one another, though they can eaſily be ſo by ſight; the cherts appearing of a fine ſparkling texture when broken; but the jaſper being grained, dull, and opaque, and having the appearance of a dry clay. The chert is alſo found forming larger or ſmaller veins, or in nodules like kernels in rocks; whereas the jaſper, on the contrary, ſometimes conſtitutes the principal part of the higheſt and moſt extended mountains. The chert is likewiſe found plentifully in the neighbourhood of ſcaly limeſtone, as flints are in the ſtrata of chalk.

The connection between theſe bodies is not yet diſcovered; but it is impoſſible to eſtabliſh any eſſential difference between them, from the circumſtance of flints and agates being generally found in ſingle, looſe, and irregular nodules, and hardly in rocks like the chert: for near Conſtantinople the agate ſtone runs in a vein acroſs the rock, of the ſame hardneſs, and as fine and tranſparent, as thoſe agates found in round nodules at Deux Ponts

CHERTZEY, a market town of Surrey in England, about ſeven miles weſt from Kingſton upon Thames. W. Long. 30′. N. Lat. 51. 25.

CHERUB, (plural, CHERUBIM); a celeſtial ſpirit, which in the hierarchy is placed next to the ſeraphim. See HIERARCHY.

The term *cherub,* in Hebrew, is ſometimes taken for a calf or ox. Ezekiel ſets down the face of a cherub as ſynonymous to the face of an ox. The word *cherub,* in Syriac and Chaldee, ſignifies to *till* or *plow,* which is the proper work of oxen. Cherub alſo ſignifies *ſtrong* and *powerful.* Grotius ſays, that the Cherubim were figures much like that of a calf. Bochart thinks likewiſe, that the cherubim were more like to the figure of an ox than to any thing beſides; and Spencer is of the ſame opinion. Laſtly, St John, in the Revelations, calls cherubim *beaſts.* Joſephus ſays the cherubim were extraordinary creatures of a figure unknown to mankind. Clemens of Alexandria believes, that the Egyptians imitated the cherubim of the Hebrews in the repreſentations of their ſphinxes and their hieroglyphical animals. All the ſeveral deſcriptions which the ſcripture gives us of cherubim differ from one another; but all agree in repreſenting them as a figure compoſed of various creatures, as a man, an ox, an eagle, and a lion. Such were the cherubim deſcribed by Ezekiel. Thoſe which Iſaiah ſaw, and are called *ſeraphim* by him, had the figure of a man with ſix wings; with two whereof they covered their faces, with two more they covered their feet, and with the two others they flew. Thoſe which Solomon placed in the temple of Jeruſalem are ſuppoſed to have been nearly of the ſame form. Thoſe which St John deſcribes in the Revelations were all eyes before and behind, and had each ſix wings. The firſt was in the form of a lion, the ſecond in that of a calf, the third of a man, and the fourth of an eagle. The figure of the cherubim was not always uniform, ſince they are differently deſcribed in the ſhapes of men, eagles, oxen, lions, and in a compoſition of all theſe figures put together. Moſes likewiſe calls theſe ſymbolical or hieroglyphical repreſentations, which were embroidered on the veils of the tabernacle, *cherubim* of coſtly work. Such were the ſymbolical figures which the Egyptians placed at the gates of their temples and the images of the generality of their gods, which were commonly nothing but ſtatues compoſed of men and animals.

CHERVIL, in botany. See CHÆROPHYLLUM.

CHESAPEAK, in America, one of the largeſt bays in the known world. Its entrance is between Cape Charles and Cape Henry in Virginia, 12 miles wide; and it extends 270 miles to the northward, dividing Virginia and Maryland. Through this extent it is from 7 to 18 miles broad, and generally about 9 fathoms deep; affording many commodious harbours, and a ſafe and eaſy navigation. It receives the waters of the Suſquehannah, Patomack, Rappahannock, York, and James rivers, which are all large and navigable.

CHESELDEN (William), an eminent anatomiſt and ſurgeon, was born at Burrow on the Hill, in the county of Leiceſter, England, deſcended from an ancient family in the county of Rutland, whoſe arms and pedigree are in Wright's "Hiſtory of Rutland." He received the rudiments of his profeſſional ſkill at Leiceſter; and married Deborah Knight, a citizen's daughter, by whom he had one daughter, Williamina Deborah. In 1713 he publiſhed his Anatomy of the Human Body, one volume, 8vo; and in 1723, A Treatiſe on the High Operation for the Stone. He was one of the earlieſt of his profeſſion who contributed by his writings to raiſe it to its preſent eminence. In the beginning of 1736, he was thus honourably mentioned by Mr Pope: "As ſoon as I had ſent my laſt letter, I received a moſt kind one from you, expreſſing great pain for my late illneſs at Mr Cheſelden's. I conclude you was eaſed of that friendly apprehenſion in a few days after you had diſpatched your's, for mine muſt have reached you then. I wondered a little at your quære, Who Cheſelden was? It ſhows that the trueſt merit does not travel ſo far any way as on the wings of poetry: he is the moſt noted and moſt deſerving man in the whole profeſſion of chirurgery; and has ſaved the lives of thouſands by his manner of cutting for the ſtone." He appears to have been on terms of the moſt intimate friendſhip with Mr Pope, who frequently in his Letters to Mr Richardſon, talks of dining with Mr Cheſelden, who then lived in or near Queen Square. In February 1737, Mr Cheſelden was appointed ſurgeon to Chelſea hoſpital. As a governor of the Foundling Hoſſpital, he ſent a benefaction of 50 l. to that charity, May 7, 1751, incloſed in a paper with the following lines:

> 'Tis what the happy to th' unhappy owe;
> For what man gives, the gods by him beſtow. Pope.

He died at Bath, April 11, 1752, of a diſorder ariſing from drinking ale after eating hot buns. Finding himſelf uneaſy, he ſent for a phyſician, who adviſed vomiting immediately; and if the advice had been taken, it was thought his life might have been ſaved. By his direction, he was buried at Chelſea.

CHESHIRE, a maritime county of England, bounded by Lancaſhire on the north; Shropſhire and part of Flintſhire, on the ſouth; Derbyſhire and Staffordſhire, on the eaſt and ſouth-eaſt; and Denbighſhire and part of Flintſhire, on the weſt and north-weſt. It extends in length about 44 miles, in breadth 25; and is ſuppoſed to contain 125,000 inhabitants. Both the air and ſoil in general are good. In many places of the country are peat-moſſes, in which are often found trunks of fir-trees, ſometimes ſeveral feet under ground, that are uſed by the inhabitants both for fuel and candles. Here alſo are many lakes and pools well ſtored with fiſh: beſides the rivers Merſee, Weaver, and Dee, which laſt falls into a creek of the Iriſh ſea near Cheſter. This county alſo abounds with wood: but what it is chiefly remarkable for, is its cheeſe, which has a peculiar flavour, generally thought not to be inferior to any in Europe; (ſee Cheese). The principal towns are, Cheſter the capital, Cholmondely, Namptwitch, &c.

William the Conqueror erected this county into a palatinate, or county-palatine, in favour of his nephew Hugh Lupus, to whom he granted the ſame ſovereignty and juriſdiction in it that he himſelf had in the reſt of the iſland. By virtue of this grant, the town of Cheſter enjoyed ſovereign juriſdiction within its own precincts; and that in ſo high a degree, that the earls held parliaments, conſiſting of their barons and tenants, which were not bound by the acts of the Engliſh parliament: but this exorbitant power of the palatinates was at laſt reduced by Henry VIII.; however, all caſes and crimes, except thoſe of error, foreign-plea, foreign-voucher, and high-treaſon, are ſtill heard and determined within the ſhire. The earls were anciently ſuperiors of the whole county, and all the landholders were mediately or immediately their vaſſals, and under the like ſovereign allegiance to them as they were to the kings of England; but the earldom was united to the crown by Edward III. ſince which time, the eldeſt ſons of kings of England have always been earls of Cheſter, as well as princes of Wales. Cheſhire ſends four members to parliament; two for the county, and two for the capital.

CHESNE (Andrew du), ſtyled the father of French hiſtory, was born in 1584. He wrote, 1. A hiſtory of the popes. 2. An hiſtory of England. 3. An inquiry into the antiquities of the towns of France. 4. An hiſtory of the cardinals. 5. A bibliotheca of the authors who have written the hiſtory and topography of France, &c. He was cruſhed to death by a cart, in going from Paris to his country-houſe at Verriere, in 1640.

CHESNUT-tree. See Fagus.

CHESS, an ingenious game performed with different pieces of wood, on a board divided into 64 ſquares or houſes; in which chance has ſo ſmall a ſhare, that it may be doubted whether a perſon ever loſt a game but by his own fault.

Each gameſter has eight dignified pieces, *viz.* a king, a queen, two biſhops, two knights, and two rooks, alſo eight pawns: all which, for diſtinction's ſake, are painted of two different colours, as white and black.

As to their diſpoſition on the board, the white king is to be placed on the fourth black houſe from the corner of the board, in the firſt and lower rank; and the black king is to be placed on the fourth white houſe on the oppoſite, or adverſary's end of the board. The queens are to be placed next to the kings, on houſes of their own colour. Next to the king and queen, on each hand, place the two biſhops; next to them, the two knights; and laſt of all, on the corners of the board, the two rooks. As to the pawns, they are placed, without diſtinction, on the ſecond rank of the houſe, one before each of the dignified pieces.

Having thus diſpoſed the men, the onſet is commonly begun by the pawns, which march ſtraight forward in their own file, one houſe at a time, except the firſt move, when it can advance two houſes, but never moves backwards: the manner of their taking the adverſary's men is ſide-ways, in the next houſe forwards; where having captivated the enemy, they move forward as before. The rook goes forward or croſs-ways through the whole file, and back again. The knight ſkips backward and forward to the next houſe, ſave one, of a different colour, with a ſidling march, or a ſlope, and thus kills his enemies that fall in his way, or guards his friends that may be expoſed on that ſide. The biſhop walks always in the ſame colour of the field that he is placed in at firſt, forward and backward, aſlope, or diagonally, as far as he liſts. The queen's walk is more univerſal, as ſhe takes all the ſteps of the before mentioned pieces, excepting that of the knight; and as to the king's motion, it is one houſe at a time, and that, either forward, backward, ſloping, or ſide-ways.

As to the value of the different pieces, next to the king is the queen, after her the rooks, then the biſhops, and laſt of the dignified pieces comes the knight. The difference of the worth of pawns, is not ſo great as that of noblemen; only, it muſt be obſerved, that the king's biſhop's pawn is the beſt in the field, and therefore the ſkilful gameſter will be careful of him. It ought alſo to be obſerved, that whereas any man may be taken, when he falls within the reach of any of the adverſary's pieces, it is otherwiſe with the king, who, in ſuch a caſe, is only to be ſaluted with the word *check*, warning him of his danger, out of which it is abſolutely neceſſary that he move; and, if it ſo happen that he cannot move without expoſing himſelf to the like inconveniency, it is check-mate, and the game is loſt. The rules of the game are,

1. In order to begin the game, the pawns muſt be moved before the pieces, and afterwards the pieces muſt be brought out to ſupport them. The king's, queen's and biſhop's pawns, ſhould be moved firſt, that the game may be well opened; the pieces muſt not be played out early in the game, becauſe the player may thereby

loſe his moves: but above all, the game ſhould be well arranged before the queen is played out. Uſeleſs checks ſhould alſo be avoided, unleſs ſome advantage is to be gained by them, becauſe the move may be loſt, if the adverſary can either take or drive the piece away.

2. If the game is crowded, the player will meet with obſtructions in moving his pieces; for which reaſon he ſhould exchange pieces or pawns, and caſtle (A) his king as ſoon as it is convenient, endeavouring at the ſame time to crowd the adverſary's game, which may be done by attacking his pieces with the pawns, if the adverſary ſhould move his pieces out too ſoon.

3. The men ſhould be ſo guarded by one another, that if a man ſhould be loſt, the player may have it in his power to take one of the adverſary's in return; and if he can take a ſuperior piece in lieu of that which he loſt, it would be an advantage, and diſtreſs the adverſary.

4. The adverſary's king ſhould never be attacked without a force ſufficient; and if the player's king ſhould be attacked without having it in his power to attack the adverſary's, he ſhould offer to make an exchange of pieces, which may cauſe the adverſary to loſe a move.

5. The board ſhould be looked over with attention, and the men reconnoitred, ſo as to be aware of any ſtroke that the adverſary might attempt in conſequence of his laſt move. If, by counting as many moves forward as poſſible, the player has a proſpect of ſucceſs, he ſhould not fail doing it, and even ſacrifice a piece or two to accompliſh his end.

6. No man ſhould be played till the board is thoroughly examined, that the player might defend himſelf againſt any move the adverſary has in view; neither ſhould any attack be made till the conſequences of the adverſary's next move are conſidered; and when an attack may with ſafety be made, it ſhould be purſued without catching at any bait that might be thrown out in order for the adverſary to gain a move, and thereby cauſe the deſign to miſcarry.

7. The queen ſhould never ſtand in ſuch a manner before the king, that the adverſary, by bringing a rook or biſhop, could check the king if ſhe were not there; as it might be the loſs of the queen.

8. The adverſary's knight ſhould never be ſuffered to check the king and queen, or king and rook, or queen and rook, or the two rooks at the ſame time; eſpecially if the knight is properly guarded: becauſe, in the two firſt caſes, the king being forced to go out of check, the queen or the rook muſt be loſt; and in the two laſt caſes a rook muſt be loſt at leaſt for a worſe piece.

9. The player ſhould take care that no guarded pawn of the adverſary's fork two of his pieces.

10. As ſoon as the kings have caſtled on different ſides of the board, the pawns on that ſide of the board ſhould be advanced upon the adverſary's king, and the pieces, eſpecially the queen and rook, ſhould be brought to ſupport them; and the three pawns belonging to the king that is caſtled muſt not be moved.

11. The more moves a player can have as it were in ambuſcade, the better; that is to ſay, the queen, biſhop, or rook, is to be placed behind a pawn or a piece, in ſuch a poſition as that upon playing that pawn or piece a check is diſcovered upon the adverſary's king, by which means a piece or ſome advantage is often gained.

12. An inferior piece ſhould never be guarded with a ſuperior, when a pawn would anſwer the ſame purpoſe; for this reaſon, the ſuperior piece may remain out of play; neither ſhould a pawn be guarded with a piece when a pawn would do as well.

13. A well ſupported pawn that is paſſed often coſts the adverſary a piece; and when a pawn or any other advantage is gained without endangering the loſs of the move, the player ſhould make as frequent exchanges of pieces as he can. The advantage of a paſſed pawn is this: for example, if the player and his adverſary have each three pawns upon the board, and no piece, and the player has one of his pawns on one ſide of the board, and the other two on the other ſide, and the adverſary's three pawns are oppoſite to the player's two pawns, he ſhould march with his king as ſoon as he can, and take the adverſary's pawns: If the adverſary goes with his king to ſupport them, the player ſhould go on to queen with his ſingle pawns; and then if the adverſary goes to hinder him, he ſhould take the adverſary's pawns, and move the others to queen (B).

14. When the game is near finiſhed, each party having only three or four pawns on each ſide of the board, the kings muſt endeavour to gain the move in order to win the game. For inſtance, when the player brings his king oppoſite to the adverſary's with only one ſquare between, he will gain the move.

15. If the adverſary has his king and one pawn on the board, and the player has only his king, he cannot loſe the game, provided he brings his king oppoſite to the adverſary's, when the adverſary is directly before or on one ſide of his pawn, and there is only one ſquare between the kings.

16. If the adverſary has a biſhop and one pawn on the rook's line, and this biſhop is not of the colour that commands the corner ſquare the pawn is going to, and the player has only his king, if he can get into that corner, he cannot loſe; but, on the contrary, may win by a ſtale (C).

17. If the player has greatly the diſadvantage of the game, having only his queen left in play, and his king happens to be in a poſition to win, as abovementioned, he ſhould keep giving check to the adverſary's king, always taking care not to check him where he can interpoſe any of his pieces that make the ſtale; by ſo doing he will at laſt force the adverſary to take his queen, and then he will win the game by being in a ſtale-mate.

18. The

(A) *Caſtle his king*, is to cover the king with a caſtle; which is done by a certain move which each player has a right to whenever he thinks proper.

(B) *To queen*, is to make a queen; that is, to move a pawn into the adverſary's back row, which is the rule at this game when the original one is loſt.

(C) When the king is blocked up ſo as to have no move at all.

18. The player ſhould never cover a check with a piece that a pawn puſhed upon it may take, for fear of getting only the pawn in exchange for the piece.

19. A player ſhould never crowd his adverſary up with peices, for fear of giving a ſtale-mate inadvertently, but always ſhould leave room for his king to move.

By way of corroborating what has been already ſaid with reſpect to this game, it is neceſſary to warn a player againſt playing a timid game. He ſhould never be too much afraid of loſing a rook for an inferior piece; becauſe although a rook is a better piece than any other except the queen, it ſeldom comes into play to be of any great uſe till at the end of the game; for which reaſon it is often better to have an inferior piece in play, than a ſuperior one to ſtand ſtill, or moving to no great purpoſe. If a piece is moved, and is immediately drove away by a pawn, it may be reckoned a bad move, becauſe the adverſary gains a double advantage over the player, in advancing at the ſame time the other is made to retire; although the firſt move may not ſeem of conſequence between equal players, yet a move or two more loſt after the firſt makes the game ſcarcely to be recovered.

There never wants for a variety at this game, provided the pieces have been brought out regular; but if otherwiſe, it often happens that a player has ſcarce any thing to play.

Many indifferent players think nothing of the pawns, whereas three pawns together are ſtrong; but four, which conſtitute a ſquare, with the aſſiſtance of other pieces, well managed, make an invincible ſtrength, and in all probability may produce a queen when very much wanted. It is true, that two pawns with a ſpace between are no better than one; and if there ſhould be three over each other in a line, the game cannot be in a worſe way. This ſhows that the pawns are of great conſequence, provided they are kept cloſe together.

Some middling players are very apt to riſk loſing the game in order to recover a piece: this is a miſtake; for it is much better to give up a piece and attack the enemy in another quarter; by ſo doing, the player has a chance of ſnatching a pawn or two from, or gaining ſome advantage over, the adverſary, whilſt his attention is taken up in purſuing this piece.

If the queen and another piece are attacked at the ſame time, and that by removing the queen the piece muſt be loſt; provided two pieces can be gained in exchange for the queen, the queen ſhould be given up, it being the difference of three pieces, and conſequently more than the value of the queen. By loſing the queen, the game is not thrown into that diſorder which it would otherwiſe have been: in this caſe it would be judicious to give the queen for even a piece, or a pawn or two; it being well known among good players, that he who begins the attack, and cannot maintain it, being obliged to retire, generally loſes the game.

A player ſhould never be fond of changing without reaſon, becauſe the adverſary, if he is a good player, will ruin his ſituation, and gain a conſiderable advantage over him. But rather than loſe a move, when a player is ſtronger than the adverſary, it is good play to change, for he thereby increaſes his ſtrength.

When the game is almoſt drawn to a concluſion, the player ſhould recollect that his king is a capital piece, and conſequently ſhould keep him in motion; by ſo doing he generally gets the move, and often the game.

As the queen, rook, and biſhop, operate at a diſtance, it is not always neceſſary in the attack to have them near the adverſary's king.

If a man can be taken with different pieces, the player ſhould take his time, and conſider which of thoſe pieces is the beſt to take it with.

If a piece can be taken almoſt at any time, the player ſhould not be in a hurry about it, but try to make a good move elſewhere before he takes it.

A player ſhould be cautious how he takes his adverſary's pawn with his king, as it often happens to be a ſafe-guard to it.

After all that has been ſaid, it is ſtill neceſſary for us to adviſe thoſe who would play well at this game, to be very cool and attentive to the matter in queſtion: for it is impoſſible that any perſon in the univerſe can be capable of playing at cheſs if their thoughts are employed elſewhere. The laws at this game are,

1. If a player touches his man, he muſt play it, and if he quits it, he cannot recal it.

2. If by miſtake or otherwiſe a falſe move is played, and the adverſary takes no notice of it till he hath played his next move, it cannot be recalled by either of the parties.

3. If a player miſplaces the men, and he plays two moves, it is at the option of the adverſary to permit him to begin the game or not.

4. If the adverſary plays or diſcovers a check to a player's king, and gives no notice of it, the player may let him ſtand ſtill till he does.

5. After the king is moved, a player cannot caſtle.

Saraſin has an expreſs treatiſe on the different opinions of the original of the Latin *ſchacchi*, whence the French *ethecs*, and our *cheſs*, is formed. Menage is alſo very full on the ſame head. Leunclavius take it to come from *Uſcoches*, famous Turkiſh robbers: P. Sirmond, from the German *ſcachhe*, "theft;" and that from *calculus*. He takes *cheſs* to be the ſame with the *ludus latrunculorum* of the Romans, but miſtakenly. This opinion is countenanced by Voſſius and Salmaſius, who derive the word from *calculus*, as uſed for *latrunculus*. G. Toloſanus derives it from the Hebrew *ſcach, vallavit et mat mortuus*; whence *check* and *check-mate*. Fabricius ſays, a celebrated Perſian aſtronomer, one Schatrenſcha, invented the game of *cheſs*; and gave it his own name, which it ſtill bears in that country. Nicod derives it from *ſcheeque*, or *xeque*, a Mooriſh word for lord, king, and prince. Bochart adds, that *ſcach* is originally Perſian; and that *ſcach-mat*, in that language, ſignifies the king is dead.—The opinion of Nicod and Bochart, which is likewiſe that of Scriverius, appears the moſt probable.

Mr Twiſs mentions a ſmall treatiſe on cheſs, written, as he ſuppoſes, about 400 years ago; at the end of which is a repreſentation of a round cheſs-board, with directions for placing the men upon it. In this the knight can cover the 64 ſquares on the board at as many moves. The board is divided into theſe 64 parts by four concentric circles, having an empty ſpace in the middle; and each of theſe is divided into 16 parts. Number 1 is placed in the outermoſt circle; number 2 in the third circle counting inwards, in the diviſion to the right hand of the former; number 3 is placed in the outermoſt circle, in the diviſion to the right hand of 2; 4 in the third circle counting inwards to the right hand of three; and thus alternately from the firſt to the third, and from the third to the firſt circle, till the round is completed by 16 on the third circle to the left hand of 1. Number 17 is then placed on the diviſion of the innermoſt circle to the right hand of 1; 18 on the ſecond circle counting inwards, to the right hand of 17; and thus alternately from the fourth to the ſecond, and from the ſecond to the fourth circles, until the round is completed by 32, directly below number 1. Number 33 then is placed on the third circle directly to the right hand of number 2; 34 on the fourth circle, to the right hand of 4; and thus alternately between the third and fourth circles, until the round is again completed by 48 on the fourth circle, directly below number 33. The numbers are now placed in a retrograde faſhion; 50 on the outer circle in that diviſion immediately to the right hand of 1; 51 on the third circle, to the left hand of 2, and directly below number 32; 52 is then placed on the outer circle, immediately on the left hand of 1: 53 on the third circle directly to the left hand of 16; and thus alternately on the firſt and third circles, until the laſt round is completed by 64 between the numbers 3 and 5. On this round cheſs-board, ſuppoſing the black king to be placed in number 48 on the fourth circle, the queen ſtands on number 17 at his left hand; the biſhops in 33 and 2; the knights 18 and 47; the caſtles in 3 and 50; the pawns on 19, 4, 49, 64, and 46, 51 32, 1. The white king will then ſtand in 25, oppoſite the black queen; the white queen in 40 oppoſite to the black king, and ſo on. In playing on a board of this kind, it will be found that the power of the caſtle is double to that in the common game, and that of the biſhop only one half; the former having 16 ſquares to range in, and the laſt only four. The king can caſtle only one way; and it is very difficult to bring the game to a concluſion.

With regard to the origin of the game at cheſs, we are much in the dark. Though it came to us from the Saracens, it is by no means probable that they were the original inventors of it. According to ſome it was invented by the celebrated Grecian hero Diomedes. Others ſay, that two Grecian brothers, Ledo and Tyrrheno, were the inventors; and that being much preſſed with hunger, they ſough to alleviate the pain by this amuſement. It is certain, however, that it is a game of very ancient ſtanding, and in former ages has been very faſhionable in every part of Europe; though in this country it is not very common, probably on account of the intenſe application of thought required to play at it. It has long been a favourite of the Icelanders and other northern people. There is little difference between their game and ours.

The game of cheſs has been generally practiſed by the greateſt warriors and generals; and ſome have even ſuppoſed that it was neceſſary for a military man to be well ſkilled in this game. It is a game which has ſomething in it peculiarly intereſting. We read that Tamerlane was a great cheſs-player, and was engaged in a game during the very time of the deciſive battle with Bajazet the Turkiſh emperor, who was defeated and taken priſoner. It is alſo related of Al Amin the khalif of Bagdad, that he was engaged at cheſs with his freedman Kuthar at the time when Al Mamun's forces were carrying on the ſiege of that city with ſo much vigour that it was on the point of being carried by aſſault. Dr Hyde quotes an Arabic hiſtory of the Saracens, in which the khalif is ſaid to have cried out when warned of his danger, Let me alone, for I ſee check-mate againſt Kuthar! We are told that Charles I. was at cheſs when news were brought of the final intention of the Scots to ſell him to the Engliſh; but ſo little was he diſcompoſed by this alarming intelligence, that he continued his game with the utmoſt compoſure; ſo that no perſon could have known that the letter he received had given him information of any thing remarkable. King John was playing at cheſs when the deputies from Rouen came to acquaint him that their city was beſieged by Philip Auguſtus; but he would not hear them until he had finiſhed his game.

The following remarkable anecdote we have from Dr Robertſon in his Hiſtory of Charles V. John Frederic, elector of Saxony, having been taken priſoner by Charles, was condemned to death. The decree was intimated to him while at cheſs with Erneſt of Brunſwic, his fellow-priſoner. After a ſhort pauſe, and making ſome reflections on the irregularity and injuſtice of the emperor's proceedings, he turned to his antagoniſt, whom he challenged to finiſh the game. He played with his uſual ingenuity and attention; and having beat Erneſt, expreſſed all the ſatisfaction that is commonly felt on gaining ſuch victories. He was not, however, put to death, but ſet at liberty after five years confinement.

In the Chronicle of the Mooriſh kings of Granada we find it related, that in 1396, Mehemed Balba ſeized upon the crown in prejudice of his elder brother, and paſſed his life in one continual round of diſaſters. His wars with Caſtile were invariably unſucceſsful; and his death was occaſioned by a poiſoned veſt. Finding his caſe deſperate, he diſpached an officer to the fort of Salobrena to put his brother Juzaf to death, leſt that prince's adherents ſhould form any obſtacle to his ſon's ſucceſſion. The alcayde found the prince playing at cheſs with an *alfaqui* or prieſt. Juzaf begged hard for two hours reſpite, which was denied him; at laſt with great reluctance the officer permitted him to finiſh the game; but before it was finiſhed a meſſenger arrived with the news of the death of Mehemed, and the unanimous election of Juzaf to the crown.

We have a curious anecdote of Ferrand count of Flanders; who having been accuſtomed to amuſe himſelf at cheſs with his wife, and being conſtantly beaten by her, a mutual hatred took place; which came to ſuch an height, that when the count was taken priſoner at the battle of Bovines, ſhe ſuffered him to remain a long time in priſon though ſhe could eaſily have procured his releaſe.

The game of cheſs has undergone conſiderable variations ſince it was firſt invented. We have it on good authority, that among the eaſtern nations, the piece now called the *queen* was formerly called the *vizir* or king's miniſter, and that the powers of the queen herſelf were but very ſmall. The cheſs-boards uſed by Tamerlane were larger, and contained many more ſquares, than thoſe at preſent in uſe. Carrera invented two new pieces to be added to the eight commonly in uſe. One of theſe, which he calls *campione*, is placed between the king's knight and caſtle; the other, named *Centaur*, between the queen's knight and caſtle, has the move of the biſhop and knight united. This invention, however, did not ſurvive its author. In another of this kind, the two additional pieces are called the *centurion* and *decurion*; the former, ſituated between the king and his biſhop, in its move the ſame with that of the queen, but only for two ſquares; the latter moves as the biſhop, but only one ſquare at a time. This, like the former, died with its inventor. The cheſs-board of Tamerlane was a parallelogram, having eleven ſquares one way and twelve the other. In the Memoirs of the late Marſhal Keith, we find it related, that he invented an amuſement ſomething ſimilar to that of cheſs, with which the king of Pruſſia was highly entertained. Several thouſand ſmall ſtatues were caſt by a founder; and theſe were ranged oppoſite to each other as if they had been drawn up in an army; making the different movements with them as in real ſervice in the field.

A very complicated kind of game at cheſs was invented by the late duke of Rutland. At this the board has 14 ſquares in breadth and 10 in height, which make in all 140 houſes: and there are 14 pawns on each ſide, which may move either one, two, or three ſquares the firſt time. The other pieces were the king, queen, two biſhops, two knights, a crowned caſtle uniting the move of the king and caſtle, and a common caſtle. On the other ſide of the king was a *concubine*, whoſe move united that of the caſtle and knight, two biſhops, a ſingle knight, a crowned caſtle, and a common one. In this game the pawns are of very little uſe; and by the extent of the board, the knights loſe much of their value, which conſequently renders the game more defective and leſs intereſting than the common one.

There is an amuſing variety at the game of cheſs, in which the king with eight pawns engages the whole ſet, by being allowed to make two moves for every one of his adverſary. In this he is almoſt certain of coming off victorious; as he can make his firſt move into check, and the ſecond out of it. Thus he can take the queen when ſhe ſtands immediately before her king, and then retreat; for he cannot remain in check. He cannot be check-mated unleſs his adverſary has preſerved his queen and both caſtles.

CHESS-Trees, taquets d'amure; two pieces of wood bolted perpendicularly, one on the ſtarboard, and another on the larboard, ſide of the ſhip. They are uſed to confine the *clue*, or lower corners of the main-ſail; for which purpoſe there is a hole in the upper part, through which the rope paſſes that uſually extends the clue of the ſail to windward. See TACK.

The cheſs-trees are commonly placed as far before the main-maſt as the length of the main-beam.

CHEST, in commerce, a kind of meaſure, containing an uncertain quantity of ſeveral commodities.

A cheſt of ſugar, *v. g.* contains from ten to fifteen hundred weight; a cheſt of glaſs, from two hundred to three hundred feet: of Caſtile ſoap, from two and an half to three hundred weight; of indigo, from one and an half to two hundred weight, five ſcore to the hundred.

CHEST, or *Thorax*. See ANATOMY, Part IV.

CHESTER, commonly called *Weſt-Cheſter*, to diſtinguiſh it from many other Cheſters in the kingdom; the capital of Cheſhire, in England. It is a very ancient city, ſuppoſed to have been founded by the Romans; and plainly appears to have been a Roman ſtation by the many antiquities which have been and are ſtill diſcovered in and about the town. It was among the laſt places the Romans quitted; and here the Britons maintained their liberty long after the Saxons had got poſſeſſion of the reſt of their country. At preſent it is a large well-built wealthy city, and carries on a conſiderable trade. Mr Pennant calls it *a city without parallel*, on account of the ſingular ſtructure of the four principal ſtreets. They are as if excavated out of the earth, and ſunk many feet beneath the ſurface; the carriages drive far beneath the level of the kitchens on a line with ranges of ſhops. The houſes are moſtly of wood, with galleries, piazzas, and covered walls before them; by which not only the ſhops, but thoſe who are walking about the town, are ſo hid, that one would imagine there were ſcarce any inhabitants in it, though it is very populous. But though by this contrivance ſuch as walk the ſtreets are ſcreened from rain, &c. yet the ſhops are thereby rendered dark and inconvenient. The back courts of all the houſes are on a level with the ground; but to go into any of the four principal ſtreets, it is neceſſary to deſcend a flight of ſeveral ſteps.

Cheſter is a biſhop's ſee. It was anciently part of the dioceſe of Litchfield; one of whoſe biſhops removing the ſeat of his ſee hither in the year 1075, occaſioned his ſucceſſors to be frequently ſtyled *biſhops of Cheſter*. But it was not erected into a diſtinct biſhopric until the general diſſolution of monaſteries, when king Henery VIII. in the year 1541, raiſed it to this dignity, and allotted the church of the abbey of St Werburgh for the cathedral, ſtyling it the *cathedral church of Chriſt and the bleſſed Virgin;* adding the biſhopric to the province of Canterbury: but ſoon after he disjoined it from Canterbury, and added it to the province of York. When this abbey was diſſolved, its revenues were valued at L. 1003 : 5 : 11. This dioceſe contains the entire counties of Cheſter and Lancaſter, part of the counties of Weſtmoreland, Cumberland, and Yorkſhire, two chapelries in Denbyſhire, and five pariſhes in Flintſhire; amounting in all to 256 pariſhes, of which 101 are impropriations. This biſhopric is valued in the king's books at L.420 : 1 ; 8, and is computed to be worth annually L.2700; the clergy's tenth amounting to L435 : 12 : 0. To this cathedral belong a dean, two archdeacons, a chancellor, a treaſurer, ſix prebendaries, and other inferior officers and ſervants. W. Long. 3. 0. N. Lat. 53. 12.

CHESTER-le-Street, the *Cuneaceſtre* of the Saxons: a ſmall thoroughfare town between Newcaſtle and Durham, with a good church and fine ſpire. In the Saxon times this place was greatly reſpected on account of the relics of St Cuthbert, depoſited here by biſhop Eardulf, for fear of the Danes, who at that time (about 884) ravaged the country. His ſhrine became afterwards an object of great devotion. King Athelſton, on his expedition to Scotland, paid it a viſit, to obtain, by enterceſſion of the ſaint, ſucceſs on his arms; beſtowed a multitude of gifts on the church; and directed, in caſe he died in his enterprize, that his body ſhould be enterred there. At the time that this place was honoured with the remains of St Cuthbert, the biſhoprie of Lindesfarn was removed here, and endowed with all the lands between the Tyne and the Were, the preſent county of Durham. It was ſtyled *St Cuthbert's patrimony*. The inhabitants had great privileges, and always thought themſelves exempt from all military duty, except that of defending the body of their ſaint. Cheſter-le-ſtreet may be conſidered as the parent of the ſee of Durham; for when the relics were removed there, the ſee in 995 followed them. Tanner ſays, that probably a chapter of monks, or rather ſecular canons, attended the body at this place from its firſt arrival; but biſhop Beke, in 1286, in honour of the ſaint, made the church collegiate, and eſtabliſhed here a dean and ſuitable eccleſiaſtics; and, among other privileges, gives the dean a right of fiſhing on the Were, and the tythe of fiſh.

New CHESTER, a town in the ſtate of Pennſylvania, and capital of a county of that name. It is ſeated on the Delaware; and has a fine capacious harbour, admitting veſſels of any burden. W. Long. 74. 7. N. Lat. 40. 15.

CHESTERFIELD, a market town of Derbyſhire in England, pleaſantly ſituated on a hill between two ſmall rivers. It has the title of an earldom; and a conſiderable market for corn, lead, and other country commodities. The houſes are, for the moſt part, built of rough ſtone, and covered with ſlate. W. Long. 1.25. N. Lat. 53. 20.

CHESTERFIELD (Earl of). See STANHOPE.

CHEVAL *de* FRISE, a large piece of timber pierced, and traverſed with wooden ſpikes, armed or pointed with iron, five or ſix feet long. See Plate CXXXVI.

The term is French and properly ſignifies a *Frieſland horſe*; as having been firſt invented in that country.—It is alſo called a *Turnpike* or *Turniquet*.

Its uſe is to defend a paſſage, ſtop a breach, or make a retrenchment to ſtop the cavalry. It is ſometimes alſo mounted on wheels, with artificial fires, to roll down in an aſſault. Errard obſerves, that the prince of Orange uſed to incloſe his camp with *chevaux de Friſe*, placing them one over another.

CHEVALER, in the manege, is ſaid of a horſe, when, in paſſaging upon a walk or trot, his off fore-leg croſſes or overlaps the near fore-leg every ſecond motion.

CHEVALIER, a French term, ordinarily ſignifying a KNIGHT. The word is formed of the French *cheval*, "horſe;" and the barbarous Latin *cavallus*.

It is uſed, in heraldry, to ſignify any *cavalier*, or horſeman armed at all points; by the Romans called *cataphractus eques*: now out of uſe, and only to be ſeen in coat-armour.

CHEVAUX *de* FRISE. See CHEVAL *de Friſe*.

CHEVIN, a name uſed in ſome parts of England for the CHUB.

CHEVIOT (or TIVIOT) HILLS, run from north to ſouth through Cumberland; and were formerly the borders or boundaries between England and Scotland, where many a bloody battle has been fought between the two nations; one of which is recorded in the ballad of Chevy-chaſe. Theſe hills are the firſt land diſcovered by ſailors in coming from the eaſt into Scotland.

CHEVISANCE, in law, denotes an agreement or compoſition, as an end or order ſet down between a creditor and his debtor, &c. In the ſtatutes, this word is moſt commonly uſed for an unlawful bargain or contract.

CHEVREAU (Urban), a learned writer, born at Lundun in 1613. He diſtinguiſhed himſelf in his youth by his knowledge of the belles lettres; and became ſecretary of ſtate to queen Chriſtina of Sweden. Several German princes invited him to their courts; and Charles-Lewis, the elector palatine, retained him under the title of counſellor. After the death of that prince, he returned to France, and became preceptor to the duke of Maine. At length retiring to Lundun, he died there in 1701, aged 88. He was the author of ſeveral books; and amongſt others, of an Univeſal Hiſtory, which has been often reprinted.

CHEVRON, or CHEVERON, in heraldry. See HERALDRY.

CHEWING-BALLS, a kind of balls made of aſafoetida, liver of antimony, bay-wood, juniper-wood, and pellitory of Spain; which being dried in the ſun, and wrapped in a linen cloth, are tied to the bit of the bridle for the horſe to chew; they create an appetite; and it is ſaid, that balls of Venice-treacle may be uſed in the ſame manner with good ſucceſs.

CHEYKS. See BENGAL, nº 17.

CHEYNE (Dr George), a phyſician of great learning and abilities, born in Scotland in 1671, and educated at Edinburgh under the great Dr Pitcairn. He paſſed his youth in cloſe ſtudy, and with great temperance: but coming to ſettle at London, when about 30, and finding the younger gentry and free-livers to be the moſt eaſy of acceſs and moſt ſuſceptible of friendſhip, he changed on a ſudden his former manner of living in order to force a trade, having obſerved this method to ſucceed with ſome others. The conſequence was, that he grew daily in bulk, and in intimacy with his gay acquaintance; ſwelling to ſuch an enormous ſize, that he exceeded 32 ſtone weight; and he was forced to have the whole ſide of his chariot made open to receive him into it; he grew ſhort-breathed, lethargic, nervous, and ſcorbutic; ſo that his life became an intolerable burden. In this deplorable condition, after having tried all the power of medicine in vain, he reſolved to try a milk and vegetable diet; the good effects of which quickly appeared. His ſize was reduced almoſt a third; and he recovered his ſtrength, activity, and cheerfulneſs, with the perfect uſe of all his faculties. In ſhort, by a regular adherence to this regimen, he lived to a mature period, dying at Bath in 1742, aged 72. He wrote ſeveral treatiſes that were well received; particularly, "An Eſſay on Health and Long Life;" and "The Engliſh Malady, or a Treatiſe of Nervous Diſeaſes;" both the reſult of his own experience. In ſhort, he had great reputation in his own time, both as a practitioner and as a writer; and moſt of his pieces paſſed thro' ſeveral editions. He is to be ranked among thoſe phyſicians

phyſicians who have accounted for the operations of medicines and the morbid alterations which take place in the human body upon mechanical principles. A ſpirit of piety and of benevolence, and an ardent zeal for the intereſts of virtue, are predominant throughout his writings. An amiable candour and ingenuouſneſs are alſo diſcernible, and which led him to retract with readineſs whatever appeared to him to be cenſurable in what he had formerly advanced. Some of the metaphyſical notions which he has introduced into his books, may, perhaps, juſtly be thought fanciful and ill-grounded; but there is an agreeable vivacity in his productions, together with much openneſs and frankneſs, and in general great perſpicuity.

CHIABRERA (Gabriel), eſteemed the Pindar of Italy, was born at Savona in 1552, and went to ſtudy at Rome. The Italian princes, and Urban VIII. gave him public marks of their eſteem. He wrote a great number of poems; but his lyric verſes are moſt admired. He died at Savona in 1638, aged 86.

CHIAN EARTH, in pharmacy, one of the medicinal earths of the ancients, the name of which is preſerved in the catalogues of the materia medica, but of which nothing more than the name has been known for many ages in the ſhops.

It is a very denſe and compact earth; and is ſent hither in ſmall flat pieces from the iſland of Chios, in which it is found in great plenty at this time. It ſtands recommended to us as an aſtringent. They tell us, it is the greateſt of all coſmetics; and that it gives a whiteneſs and ſmoothneſs to the ſkin, and prevents wrinkles, beyond any of the other ſubſtances that have been celebrated for the ſame purpoſes.

CHIAOUS, a word in the original Turkiſh, ſignifying "envoys," are officers to the number of five or ſix hundred in the grand ſignior's court, under the command of a chiaous baſchi. They frequently meet in the grand viſir's palace, that they may be in readineſs to execute his orders, and carry his diſpatches into all the provinces of the empire. The chiaous baſchi aſſiſts at the divan, and introduces thoſe who have buſineſs there.

CHIAPA, the capital of a province of the ſame name in Mexico, ſituated about 300 miles eaſt of Acapulco. W. Long. 98. 0. N. Lat. 16. 30.

CHIAPA el Real, a town of Mexico, in a province of the ſame name, with a biſhop's ſee. Its principal trade conſiſts in chocolate-nuts, cotton, and ſugar. W. Long. 98. 35. N. Lat. 16. 20.

CHIAPAS de los Indos, a large and rich town of North America, in Mexico, and in a province of the ſame name. The governor and moſt of the inhabitants are originally Americans. W. Long. 98. 5. N. Lat. 15. 6.

CHIARI (Joſeph), a celebrated Italian painter, was the diſciple of Carlo Maratti; and adorned the churches and palaces of Rome with a great number of fine paintings. He died of an apoplexy in 1727, aged 73.

CHIARI, a town of Italy, in the province of Breſcia, and territory of Venice, 7 miles weſt of Breſcia, and 27 eaſt of Milan. Here the Imperialiſts gained a victory over the French in 1701. E. Long. 18. 18. N. Lat. 45. 30.

CHIARO-SCURO. See *CLARO-Obſcuro*.

CHIAVENNA, a handſome, populous, and large town of Swiſſerland, in the country of the Griſons. It is a trading place, eſpecially in wine and delicate fruits. The governor's palace and the churches are very magnificent, and the inhabitants are Roman Catholics. It is ſeated near the lake Como. E. Long. 9. 29. N. Lat. 46. 15.

CHIAUSI, among the Turks, officers employed in executing the vizirs, baſhaws, and other great men: the orders for doing this, the grand ſignior ſends them wrapped up in a black cloth; on the reception of which, they immediately perform their office.

CHICANE, or CHICANERY, in law, an abuſe of judiciary proceeding, tending to delay the cauſe, to puzzle the judge, or impoſe upon the parties.

CHICANE, in the ſchools, is applied to vain ſophiſms, diſtinctions, and ſubtleties, which protract diſputes, and obſcure the truth.

CHICHESTER, the capital city of the county of Suſſex in England, was built by Ciſſa, the 2d king of the South Saxons, and by him called *Ciſſan Caeſter*. It is ſurrounded with a wall, which has four gates, anſwering to the four cardinal points; from which run two ſtreets, that croſs one another in the middle and form a ſquare, where the market is kept, and where there is a fine ſtone piazza built by biſhop Read. The ſpace between the weſt and ſouth gates is taken up with the cathedral church and the biſhop's palace. It has five pariſh-churches; and is ſeated on the little river Lavant, which waſhes it on all ſides except the north. This city would have been in a much more flouriſhing condition if it had been built by the ſea-ſide; however, the inhabitants have endeavoured to ſupply this defect in ſome meaſure, by cutting a canal from the city down into the bay. The principal manufactures of the town are malt and needles. The market of Chicheſter is noted for fiſh, wheat, barley, malt, and oats; the fineſt lobſters in England are bred in the Lavant; and it is obſervable, that this river, unlike moſt others, is very low in winter, but in ſummer often overflows its banks. Chicheſter is a city and county of itſelf; it is governed by a mayor, recorder, aldermen, common-council without limitation, and four juſtices of the peace choſen out of the aldermen; and it ſends two members to parliament. It is a biſhop's ſee. The cathedral church was anciently dedicated to St Peter. It was new built by Radulph, the twenty-fifth biſhop; but being deſtroyed by fire, it was again built by Seffridus II. the twenty-ninth biſhop. This ſee hath yielded to the church two ſaints, and to the nation three lord chancellors, two almoners, and one chancellor to the univerſity of Oxford. Anciently the biſhops of Chicheſter were confeſſors to the queens of England. This dioceſe contains the whole of the county of Suſſex (excepting 22 pariſhes, peculiars of the archbiſhop of Canterbury), wherein are 250 pariſhes, whereof 112 are impropriated. It hath two archdeacons, viz. of Chicheſter and Lewes; is valued in the king's books at L.677 : 1 : 3, and is computed to be worth annually L.2600. The tenths of the whole clergy is L.287 : 2 : 0¾. To the cathedral belong a biſhop, a dean, two archdeacons, a treaſurer, a chancellor, thirty-two prebendaries, a chanter, twelve vicars-coral, and other officers. W. Long. 50. N. Lat. 50. 50.

CHICK, or CHICKEN, in zoology, denotes the young

young of the gallinaceous order of birds, eſpecially the common hen. See PHASIANUS.

CHICK-*Weed*, in botany. See ALSINE.

CHICKEN-*Pox*. See *(Index ſubjoined to)* MEDICINE.

CHICKLING-PEA, in botany, a name given to the LATHYRUS.

CHICUITOS, a province of South America, in the government of Santo-Cruz de la Sierra. The chief riches conſiſt of honey and wax; and the original inhabitants are very voluptuous, yet very warlike. They maintained bloody wars with the Spaniards till 1690; ſince which, ſome of them have become Chriſtians. It is bounded by la Plata on the N. E. and by Chili on the W.

CHIDLEY, or CHIMLEY, a market-town of Devonſhire, ſituated in W. Long. 4. 0. N. Lat. 51. 0.

CHIEF, a term ſignifying the head or principal part of a thing or perſon. Thus we ſay, the chief of a party, the chief of a family, *&c.* The word is formed of the French *chef*, "head;" of the Greek κεφαλη, *caput*, "head;" though Menage derives it from the Italian *capo*, formed of the Latin *caput*.

CHIEF, in heraldry, is that which takes up all the upper part of the eſcutcheon from ſide to ſide, and repreſents a man's head. *In chief*, imports ſomething borne in the chief part or top of the eſcutcheon.

CHIEFTAIN, denotes the captain or chief of any claſs, family, or body of men. Thus the chieftains or chiefs of the Highland clans, were the principal noblemen or gentlemen of their reſpective clans. See CLANS.

CHIELEFA, a ſtrong town of Turkey in Europe, in the Morea. It was taken by the Venetians in 1685; but after that the Turks retook it, with all the Morea. E. Long. 22. 21. N. Lat. 26. 50.

CHIGI (Fabio), or Pope Alexander VII. was born at Sienna in 1599. His family finding him a hopeful youth, ſent him early to Rome, where he ſoon engaged in a friendſhip with the marquis Pallavicini, who recommended him ſo effectually to Pope Urban VIII. that he procured him the poſt of Inquiſitor at Malta. He was ſent vice-legate to Ferrara, and afterward nuncio into Germany: there he had an opportunity of diſplaying his intriguing genius; for he was mediator at Munſter, in the long conference held to conclude a peace with Spain. Cardinal Mazarin had ſome reſentment againſt Chigi, who was ſoon after made a cardinal and ſecretary of ſtate by Innocent X. but his reſentment was ſacrificed to political views. In 1655, when a pope was to be choſen, Cardinal Sacchetti, Mazarin's great friend, finding it was impoſſible for him to be raiſed into St Peter's chair becauſe of the powerful oppoſition made by the Spaniſh faction, deſired Cardinal Mazarin to conſent to Chigi's exaltation. His requeſt was granted, and he was elected pope by the votes of all the 64 cardinals who were in the conclave: an unanimity of which there are but few inſtances in the election of popes. He ſhowed uncommon humility at his election, and at firſt forbade all his relations to come to Rome without his leave; but he ſoon became more favourable to his nephews, and loaded them with favours. It is aſſerted that he had once a mind to turn Proteſtant. The news-papers in Holland beſtowed great encomiums upon him; and acquainted the world, that he did not approve of the cruel perſecutions of the Waldenſes in Piedmont. There is a volume of his poems extant. He loved the *Belles-Lettres*, and the converſation of learned men. He was extremely fond of ſtately buildings: the grand plan of the college *Della Sapienza*, which he finiſhed, and adorned with a fine library, remains a proof of his taſte in architecture. He died in 1667.

CHILBLAIN, *(pernio)*, in medicine, a tumour affecting the feet and hands; accompanied with an inflammation, pains, and ſometimes an ulcer or ſolution of continuity: in which caſe it takes the denomination of *chaps* on the hands, and of *kibes* on the heels. Chilblain is compounded of *chill* and *blain*; *q. d.* a blain or ſore contracted by cold. *Pernio* is the Latin name adopted by phyſicians; and is derived by Voſſius from *perna* "a gammon of bacon," on account of ſome reſemblance. *Chap* alludes to *gape*, both in ſound and appearance. *Kibes*, in welch *kibws*, may be derived from the German *kerben*, "to cut;" the ſkin, when broke, appearing like a cut.

Chilblains are occaſioned by exceſſive cold ſtopping the motion of the blood in the capillary arteries. See the article PERNIO.

CHILD, a term of relation to *parent*. See PARENT and CHILDREN.

Bartholine, Paré, Licetus, and many other writers, give an account of a petrified child, which has ſeemed wholly incredible to ſome people. The child, however, which they deſcribe, is ſtill in being; and is kept as a great rarity in the king of Denmark's muſeum at Copenhagen. The woman who was big with this, lived at Sens in Champaign in the year 1582; it was cut out of her belly, and was univerſally ſuppoſed to have lain there about 20 years. That it is a real human fœtus, and not artificial, is evident to the eyes of any obſerver; and the upper part of it, when examined, is found to be of a ſubſtance reſembling the gypſum, or ſtone whereof they make the plaſter of Paris: the lower part is much harder; the thighs and buttocks being a perfect ſtone of a reddiſh colour, and as hard as common quary-ſtone: the grain and ſurface of this part appears exactly like that of the calculi, or ſtones taken out of human bladders: and the whole ſubſtance examined ever ſo nearly, and felt ever ſo carefully, appears to be abſolute ſtone. It was carried from Sens to Paris, and there purchaſed by a goldſmith of Venice; and Frederic III. king of Denmark, purchaſed it of this man at Venice for a very large ſum, and added it to his collection of rarities.

CHILD-*Bed*, } See MIDWIFERY.
CHILD-*Birth*.

CHILD-*Wit*, a power to take a fine of a bond-woman unlawfully gotten with child, that is, without conſent of her lord. Every reputed father of a baſe child got within the manor of Writtel in Eſſex, in England, pays to the lord a fine of 3s. 4d.; where, it ſeems, child-wit extends to free as well as bond-women.

CHILDERMAS-DAY, or INNOCENT'S *Day*, an anniverſary held by the church of England on the 28th of December, in commemoration of the children of Bethlehem maſſacred by order of Herod.

CHILDREN, the plural of CHILD.

Mr Derham computes, that marriages, one with another, produce four children, not only in England, but in other parts alſo.

In the genealogical hiſtory of Tuſcany, wrote by Gamarini, mention is made of a nobleman of Sienna, named Pichi, who of three wives had 150 *children*; and that, being ſent ambaſſador to the pope and the emperor, he had 48 of his ſons in his retinue. In a monument in the church yard of St Innocent, at Paris, erected to a woman who died at 88 years of age, it is recorded, that ſhe might have ſeen 288 *children* directly iſſued from her. This exceeds what Hakewell relates of Mrs Honeywood, a gentlewoman of Kent, in England born in the year 1527, and married at 16 to her only huſband R. Honeywood, of Charing, Eſq.; and died in her 93d year. She had 16 *children* of her own body; of which three died young, and a fourth had no iſſue: yet her *grandchildren*, in the ſecond generation, amounted to 114; in the third, to 228; though in the fourth, they fell to 9. The whole number ſhe might have ſeen in her life-time, being 367. $16+114+228+9=367$. So that ſhe could ſay the ſame as the diſtich does of one of the Dalburg's family at Baſil:

1 2 3 4
Mater ait natæ dic natæ filia natam,
5 6
Ut moneat, natæ, plangere, filiolam.

Management of CHILDREN See INFANT.

Overlaying of CHILDREN, is a misfortune that frequently happens; to prevent which, the Florentines have contrived an inſtrument called *arcuccio*. See ARCUCCIO.

CHILDREN are, in law, a man's iſſue begotten on his wife. As to *illegitimate children*, ſee BASTARD.

For the legal duties of parents to their children, ſee the articles PARENT and BASTARD.

As to the duties of children to their parents, they ariſe from a principle of natural juſtice and retribution. For to thoſe who gave us exiſtence, we naturally owe ſubjection and obedience during our minority, and honour and reverence ever after: they who protected the weakneſs of our infancy, are intitled to our protection in the infirmity of their age; they who by ſuſtenance and education have enabled their offspring to proſper, ought, in return, to be ſupported by that offspring, in caſe they ſtand in need of aſſiſtance. Upon this principle proceed all the duties of children to their parents, which are enjoined by poſitive laws. And the Athenian laws carried this principle into practice with a ſcrupulous kind of nicety: obliging all children to provide for their father when fallen into poverty; with an exception to ſpurious children, to thoſe whoſe chaſtity had been proſtituted with conſent of their father, and to thoſe whom he had not put in any way of gaining a livelihood. The legiſlature, ſays baron Monteſquieu, conſidered, that, in the firſt caſe, the father, being uncertain, had rendered the natural obligation precarious; that, in the ſecond caſe, he had ſullied the life he had given, and done his children the greateſt of injuries, in depriving them of their reputation; and that, in the third caſe, he had rendered their life (ſo far as in him lay) an inſupportable burden, by furniſhing them with no means of ſubſiſtence.

Our laws agree with thoſe of Athens, with regard to the firſt only of theſe particulars, the caſe of ſpurious iſſue. In the other caſes, the law does not hold the tie of nature to be diſſolved by any miſbehaviour of the parent; and therefore a child is equally juſtifiable in defending the perſon, or maintaining the the cauſe or ſuit, of a bad parent as of a good one; and is equally compellable, if of ſufficient ability, to maintain and provide for a wicked and unnatural progenitor, as for one who has ſhown the greateſt tenderneſs and paternal piety. See further the article *FILIAL Affection*.

CHILI, a province of South America, bounded by Peru on the north, by the province of La Plata on the eaſt, by Patagonia on the ſouth, and by the Pacific ocean on the weſt, lying between 75 and 85 degrees of weſt longitude, and between 25 and 45 degrees of ſouth latitude; though ſome comprehend in this province Patagonia and Terra del Fuego.

The firſt attempt of the Spaniards upon this country was made by Almagro in the year 1535, after he and Pizaro had completed the conqueſt of Peru. He ſet out on his expedition to Chili with a conſiderable body of Spaniards and auxiliary Indians. For 200 leagues he was well accommodated with every neceſſary by the Indians, who had been ſubjects of the emperors of Peru: but reaching the barren country of Charcas, his troops became diſcontented through the hardſhips they ſuffered; which determined Almagro to climb the mountains called Cordilleras, in order to get the ſooner into Chili; being ignorant of the invaluable mines of Potoſi, contained in the province of Charcas where he then was. At that time the Cordilleras were covered with ſnow, the depth of which obliged him to dig his way through it. The cold made ſuch an impreſſion on his naked Indians, that it is computed no leſs than 10,000 of them periſhed on theſe dreadful mountains, 150 of the Spaniards ſharing the ſame fate; while many of the ſurvivors loſt their fingers and toes through the exceſs of cold. At laſt, after encountering incredible difficulties, Almagro reached a fine, temperate, and fertile plain on the oppoſite ſide of the Cordilleras, where he was received with the greateſt kindneſs by the natives. Theſe poor ſavages, taking the Spaniards for deputies of their god Virachoca, immediately collected for them an offering of gold and ſilver worth 200,000 ducats: and ſoon after brought a preſent to Almagro worth 300,000 more. Theſe offerings only determined him to conquer the whole country as ſoon as poſſible. The Indians among whom he now was, had acknowledged the authority of the Peruvian incas, or emperors, and conſequently gave Almagro no trouble. He therefore marched immediately againſt thoſe who had never been conquered by the Peruvians, and inhabited the ſouthern parts of Chili. Theſe ſavages fought with great reſolution, and diſputed every inch of ground: but in five months time the Spaniards had made ſuch progreſs, that they muſt infallibly have reduced the whole province in a very little time, had not Almagro returned to Peru, in conſequence of a commiſſion ſent him from Spain.

In 1540, Pizaro having overcome and put Almagro to death, ſent into Chili, Baldivia, or Valdivia, who had learned the rudiments of war in Italy, and was reckoned one of the beſt officers in the Spaniſh ſervice. As he penetrated ſouthwards, however, he met with much oppoſition; the confederated caziques frequently gave him battle, and diſplayed great courage and reſolution; but could not prevent him from penetrating to the valley of Maſiocho, which he found incredibly fertile and populous. Here he founded the city of St Jago; and finding gold mines in the neighbourhood, forced the Indians to work in them; at the ſame time building a caſtle for the ſafety and protection of his new colony. The natives, exaſperated at this ſlavery, immediately took up arms; attacked the fort; and, though defeated and repulſed, ſet fire to the outworks, which contained all the proviſions of the Spaniards. Nor were they diſcouraged by this and many other defeats, but ſtill continued to carry on the war with vigour. At laſt, Valdivia, having overcome them in many battles, forced the inhabitants of the vale to ſubmit; upon which he immediately ſet them to work in the mines of Quilotta. This indignity offered to their countrymen redoubled the fury of thoſe who remained at liberty. Their utmoſt efforts, however, were as yet unable to ſtop Valdivia's progreſs. Having croſſed the large rivers Maulle and Hata, he traverſed a vaſt tract of country, and founded the city of La Conception on the South-ſea-coaſt. He erected fortreſſes in ſeveral parts of the country, in order to keep the natives in awe; and built the city called *Imperial*, about 40 leagues to the ſouthward of Conception. The Spaniſh writers ſay that the neighbouring valley contained 80,000 inhabitants of a peaceable diſpoſition; and who were even ſo tame as to ſuffer Valdivia to parcel out their lands among his followers, while they themſelves remained in a ſtate of inactivity. About 16 leagues to the eaſtward of Imperial, the Spaniſh general laid the foundations of the city *Villa Rica*, ſo called on account of the rich gold mines he found there. But his ambition and avarice had now involved him in difficulties from which he could never be extricated: He had extended his conqueſts beyond what his ſtrength was capable of maintaining. The Chileſians were ſtill as deſirous as ever of recovering their liberties. The horſes, fire-arms, and armour of the Spaniards, indeed, appeared dreadful to them; but thoughts of endleſs ſlavery were ſtill more ſo. In the courſe of the war they had diſcovered that the Spaniards were vulnerable and mortal men like themſelves; they hoped, therefore, by dint of their ſuperiority in numbers, to be able to expel the tyrannical uſurpers. Had all the nations joined in this reſolution, the Spaniards had certainly been exterminated; but ſome of them were of a pacific and fearful diſpoſition, while others conſidered ſervitude as the greateſt of all poſſible calamities. Of this laſt opinion were the Araceans, the moſt intrepid people in Chili, and who had given Valdivia the greateſt trouble. They all roſe to a man, and choſe Capaulican, a renowned hero among them, for their leader. Valdivia, however, received notice of their revolt ſooner than they intended he ſhould, and returned with all expedition to the vale of Araccea; but before he arrived, 14,000 of the Chileſians were there aſſembled under the conduct of Capaulican. He attacked them with his cavalry, and forced them to retreat into the woods; but could not obtain a complete victory, as they kept continually ſallying out and haraſſing his men. At laſt Capaulican, having obſerved that fighting with ſuch a number of undiſciplined troops only ſerved to contribute to the defeat and confuſion of the whole, divided his forces into bodies of 1000 each. Theſe he directed to attack the enemy by turns; and, though he did not expect that a ſingle thouſand would put them to flight, he directed them to make as long a ſtand as they could; when they were to be relieved and ſupported by another body; and thus the Spaniards would be at laſt wearied out and overcome. The event fully anſwered his expectations. The Chileſians maintained a fight for ſeven or eight hours, until the Spaniards, growing faint for want of refreſhment, retired precipitately. Valdivia ordered them to poſſeſs a paſs at ſome diſtance from the field, to ſtop the purſuit; but this deſign being diſcovered to the Chileſians by the treachery of his page, who was a native of that country, the Spaniards were ſurrounded on all ſides, and cut in pieces by the Indians. The general was taken and put to death: ſome ſay with the tortures uſually inflicted by thoſe ſavages on their priſoners; others, that he had melted gold poured down his throat; but all agree, that the Indians made flutes and other inſtruments of his bones, and preſerved his ſkull as a monument of their victory, which they celebrated by an annual feſtival. After this victory the Chileſians had another engagement with their enemies; in which alſo they proved victorious, defeating the Spaniards with the loſs of near 3000 men; and upon this they bent their whole force againſt the colonies. The city of Conception, being abandoned by the Spaniards, was taken and deſtroyed: but the Indians were forced to raiſe the ſiege of Imperial; and their progreſs was at laſt ſtopped by Garcia de Mendoza, who defeated Capaulican, took him priſoner, and put him to death. No defeats, however, could diſpirit the Chileſians. They continued the war for 50 years; and to this day they remain unconquered, and give the Spaniards more trouble than any other American nation. Their moſt irreconcileable enemies are the inhabitants or Araccea and Tucapel, thoſe to the ſouth of the river Bobio, or whoſe country extends towards the Cordilleras — The manners of theſe people greatly reſemble thoſe of North America, which we have already deſcribed under the article AMERICA; but ſeem to have a more warlike diſpoſition. It is a conſtant rule with the Chileſians never to ſue for peace. The Spaniards are obliged not only to make the firſt overtures, but to purchaſe it by preſents. They have at laſt been obliged to abandon all thoughts of extending their conqueſts, and reduced to cover their frontiers by erecting forts at proper diſtances.

The Spaniſh colonies in Chili are diſperſed on the borders of the South-ſea. They are parted from Peru by a deſart 80 leagues in breadth; and bounded by the iſland of Chiloe, at the extremity next the ſtraits of Magellan. There are no ſettlements on the coaſts except that of Baldivia, Conception iſland, Valparaiſo, and Coquimbo or La Serena, which are all ſea-ports. In the inland country is St Jago, the capital of the colony. There is no culture nor habitation at any diſtance from theſe towns. The buildings in the whole province are low, made of unburnt brick, and moſtly thatched. This practice is obſerved on account of the frequent earthquakes; and is properly adapted to the nature of the climate, as well as the indolence of the inhabitants.

The climate of Chili is one of the moſt wholeſome

in

in the whole world. The vicinity of the Cordilleras gives it ſuch a delightful temperature as could not otherwiſe be expected in that latitude. Though gold mines are found in it, their richneſs has been too much extolled; their produce never exceeds L. 218,750. The ſoil is prodigiouſly fertile. All the European fruits have improved in that happy climate. The wine would be excellent if nature were properly aſſiſted by art: and the corn-harveſt is reckoned a bad one when it does not yield a hundred fold. With all theſe advantages, Chili has no direct intercourſe with the mother-country. Their trade is confined to Peru, Paraguay, and the ſavages on their frontiers. With theſe laſt they exchange their leſs valuable commodities, for oxen, horſes, and their own children, whom they are ready to part with for the moſt trifling things. This province ſupplies Peru with great plenty of hides, dried fruit, copper, ſalt-meat, horſes, hemp, lard, wheat, and gold. In exchange, it receives tobacco, ſugar, cocoa, earthen-ware, woollen cloth, linen, hats, made at Quito, and every article of luxury brought from Europe. The ſhips ſent from Callao on this traffic were formerly bound to Conception Bay, but now come to Valparaiſo. The commerce between this province and Paraguay is carried on by land, though it is a journey of 300 leagues, 40 of which lie through the ſnows and precipices of Cordilleras; but if it was carried on by ſea, they muſt either paſs the ſtraits of Magellan or double Cape Horn, which the Spaniards always avoid as much as poſſible. To Paraguay are ſent ſome woollen ſtuffs called *ponchos*, which are uſed for cloaks; alſo wines, brandy, oil, and chiefly gold. In return they receive wax, a kind of tallow fit to make ſoap, European goods, and negroes.

Chili is governed by a chief, who is abſolute in all civil, political, and military affairs, and is alſo independent of the viceroy. The latter has no authority except when a governor dies; in which caſe he may appoint one in his room for a time, till the mother-country names a ſucceſſor. If, on ſome occaſions, the viceroy has interfered in the government of Chili, it was when he has been either authoriſed by a particular truſt repoſed in him by the court, or by the deference paid to the eminence of his office; or when he has been actuated by his own ambition to extend his authority. In the whole province of Chili there are not 20,000 white men, and not more than 60,000 negroes, or Indians, able to bear arms. The military eſtabliſhment amounted formerly to 2000 men; but the maintaining of them being found too expenſive, they were reduced to 500 at the beginning of this century.

CHILIAD, an aſſemblage of ſeveral things ranged by thouſands. The word is formed of the Greek *χιλιας*, *mille*, a thouſand.

CHILIAGON, in geometry, a regular plain figure of 1000 ſides and angles. Though the imagination cannot form the idea of ſuch a figure, yet we may have a very clear notion of it in the mind, and can eaſily demonſtrate that the ſum of all its angles is equal to 1996 right ones: for the internal angles of every plane figure are equal to twice as many right ones as the figure hath ſides, except thoſe four which are about the centre of the figure, from whence it may be reſolved into as many triangles as it has ſides. The author of *l'Art de Penſer*, p. 44. has brought this inſtance to ſhow the diſtinction between imagination and conceiving.

CHILIARCHA, or CHILIARCHUS, an officer in the armies of the ancients, who had the command of a thouſand men.

CHILIASTS, in church-hiſtory. See MILLENARIANS.

CHILLINGWORTH (William), an eminent divine of the church of England, was born at Oxford in 1602, and bred there. He made early great proficiency in his ſtudies, being of a very quick genius. He was an expert mathematician, as well as an able divine, and a very good poet. Study and converſation at the univerſity turning upon the controverſy between the church of England and that of Rome, on account of the king's marriage with Henrietta daughter to Henry IV. king of France, Mr Chillingworth forſook the church of England, and embraced the Romiſh religion. Dr Laud, then biſhop of London, hearing of this, and being greatly concerned at it, wrote Mr Chillingworth; who expreſſing a great deal of candour and impartiality, that prelate continued to correſpond with him. This ſet Mr Chillingworth on a new inquiry; and at laſt determined him to return to his former religion. In 1634 he wrote a confutation of the arguments which had induced him to go over to the church of Rome. He ſpoke freely to his friends of all the difficulties that occurred to him; which gave occaſion to a groundleſs report, that he had turned Papiſt a ſecond time, and then Proteſtant again. His return to the communion of the church of England made a great noiſe, and engaged him in ſeveral diſputes with thoſe of the Romiſh perſuaſion. But in 1635 he engaged in a work which gave him a far greater opportunity to confute the principles of the church of Rome, and to vindicate the Proteſtant religion, under the title of "The Religion of Proteſtants a ſafe way to Salvation." Sir Thomas Coventry, lord keeper of the great ſeal, offering him preferment, Mr Chillingworth refuſed to accept it on account of his ſcruples with regard to the ſubſcription of the 39 articles. However, he at laſt ſurmounted theſe ſcruples; and being promoted to the chancellorſhip of the church of Sarum, with the prebend of Brixworth in Northamptonſhire annexed to it, he complied with the uſual ſubſcription. Mr Chillingworth was zealouſly attached to the royal party; and, in Auguſt 1643, was preſent in king Charles I.'s army at the ſiege of Glouceſter, where he adviſed and directed the making certain engines for aſſaulting the town. Soon after, having accompanied the Lord Hopton, general of the king's forces in the weſt, to Arundel caſtle in Suſſex, he was there taken priſoner by the parliamentary forces under the command of Sir William Waller, who obliged the caſtle to ſurrender. But his illneſs increaſing, he obtained leave to be conveyed to Chicheſter, where he was lodged at the biſhop's palace; and, after a ſhort ſickneſs, died in 1644. He hath left ſeveral excellent works behind him.

CHILMINAR. See PERSEPOLIS.

CHILO, one of the ſeven ſages of Greece, and of the ephori of Sparta the place of his birth, flouriſhed about 556 years before Chriſt. He was accuſtomed to ſay, that there were three things very difficult: "To keep a ſecret; to know how beſt to employ our time; and to ſuffer injuries without murmuring." According to Pliny, it was he who cauſed the ſhort ſentence, *Know thyſelf*, to be written in letters of gold in the temple of Delphos. It is ſaid that he died with joy, while embracing his ſon, who had been crowned at the Olympic games.

CHILOE, an iſland lying near the coaſt of Chili, in South America, under the 43d degree of ſouth latitude. It is the chief of an archipelago of 40 iſlands, and its principal town is Caſtro. It rains here almoſt all the year, inſomuch that nothing but Indian corn, or ſome ſuch grain, that requires but little heat to ripen it, can ever come to perfection. They have excellent ſhell-fiſh, very good wild-fowl, hogs, ſheep, and beeves; as alſo a great deal of honey and wax. They carry on a trade with Peru and Chili; whither they ſend boards of cedar, of which they have vaſt foreſts.

CHILTENHAM, a town in Glouceſterſhire, England, ſix miles from Glouceſter; noted for its purgative chalybeat ſpring, which has rendered it of late years a place of faſhionable reſort. This water, which operates with great eaſe, is deemed excellent in ſcorbutic complaints, and has been uſed with ſucceſs in the gravel.

CHILTERN, a chain of chalky hills forming the ſouthern part of Buckinghamſhire, England, the northern part of the county being diſtinguiſhed by the name of the *Vale*. The air on theſe heights is extremely healthful: The ſoil, though ſtoney, produces good crops of wheat and barley; and in many places it is covered with thick woods, among which are great quantities of beach.—*Chiltern* is alſo applied to the hilly parts of Berkſhire, and it is believed has the ſame meaning in ſome other counties. Hence the HUNDREDS lying in thoſe parts are called the *Chiltern Hundreds*.

CHILTERN *Hundreds (Stewards of.)* Of the Hundreds into which many of the Engliſh counties were divided by King Alfred, for the better government, the juriſdiction was originally veſted in peculiar courts, but came afterwards to be devolved to the county courts; and ſo remains at preſent, excepting with regard to ſome, as the *chilterns*, which have been by privilege annexed to the crown. Theſe having ſtill their own courts, a *Steward* of thoſe courts is appointed by the chancellor of the exchequer, with a ſalary of 20s. and all fees, &c. belonging to the office: And this is deemed an appointment of ſuch profit, as to vacate a ſeat in parliament.

CHIMÆRA, a port-town of Turkey in Europe, ſituated at the entrance of the gulph of Venice, in the province of Epirus, about 32 miles north of the city Corfu, near which are the mountains of Chimæra, which divide Epirus from Theſſaly. E. Long. 20. 40. N. Lat. 40. 20.

CHIMÆRA, in fabulous hiſtory, a celebrated monſter, ſprung from Echidna and Typhon. It had three heads; that of a lion, a goat, and a dragon; and continually vomited flames. The foreparts of its body were thoſe of a lion, the middle was that of a goat, and the hinder parts were thoſe of a dragon. It generally lived in Lycia, about the reign of Jobates, by whoſe orders Bellerophon, mounted on the horſe Pegaſus, overcame it. This fabulous tradition is explained by the recollection that there was a burning mountain in Lycia, whoſe top was the reſort of lions on account of its deſolate wilderneſs; the middle, which was fruitful, was covered with goats; and at the bottom the marſhy ground abounded with ſerpents. Bellerophon is ſaid to have conquered the Chimæra, becauſe he deſtroyed the wild beaſts on that mountain, and rendered it habitable. Plutarch ſays that it was the captain of ſome pirates who adorned their ſhip with the images of a lion, a goat, and a dragon.

By a *chimæra*, among the philoſophers, is underſtood a mere creature of the imagination, compoſed of ſuch contradictions and abſurdities as cannot poſſibly any where exiſt but in thought.

CHIMES of a CLOCK, a kind of periodical muſic, produced at equal intervals of time, by means of a particular apparatus added to a clock.

In order to calculate numbers for the chimes, and adapt the chime-barrel, it muſt be obſerved, that the barrel muſt turn round in the ſame time that the tune it is to play requires in ſinging. As for the chime-barrel, it may be made up of certain bars that run athwart it, with a convenient number of holes punched in them to put in the pins that are to draw each hammer: and theſe pins, in order, to play the time of the tune rightly, muſt ſtand upright, or hang down from the bar, ſome more, ſome leſs. To place the pins rightly, you may proceed by the way of changes on bells, viz. 1, 2, 3, 4; or rather make uſe of the muſical notes. Obſerve what is the compaſs of your tune, and divide the barrel accordingly from end to end.

Thus, in the examples on Plate CXXXVII. each of the tunes is eight notes in compaſs, and accordingly the barrel is divided into eight parts. Theſe diviſions are ſtruck round the barrel; oppoſite to which are the hammer-tails.

We ſpeak here as if there were only one hammer to each bell, that it may be more clearly apprehended; but when two notes of the ſame ſound come together in a tune, there muſt be two hammers to the bell to ſtrike it: ſo that if in all the tunes you intend to chime of eight notes compaſs, there ſhould happen to be ſuch double notes on every bell, inſtead of eight you muſt have ſixteen hammers; and accordingly you muſt divide the barrel, and ſtrike ſixteen ſtrokes round it, oppoſite to each hammer-tail: then you are to divide it round about into as many diviſions as there are muſical bars, ſemibreves, minims, &c. in the tune.

Thus the hundredth-pſalm tune has 20 ſemibreves, and each diviſion of it is a ſemibreve: the firſt note of it alſo is a ſemibreve: and, therefore, on the chime-barrel muſt be a whole diviſion, from five to five, as your may underſtand plainly, if you conceive the ſurface of a chime-barrel to be repreſented by the above figures, as if the cylindrical ſuperficies of the barrel were ſtretched out at length, or extended on a plane; and then ſuch a table, ſo divided, if it were to be wrapped round the barrel, would ſhow the places where all the pins are to ſtand in the barrel; for the dots running about the table are the places of the pins that play the tune.

Indeed, if the chimes are to be complete, you ought to have a ſet of bells to the gamut notes; ſo as that each bell having the true ſound of *ſol, la, mi, fa,* you may play any tune with its flats and ſharps: nay, you may by this means play both the baſs and treble with one barrel: and by ſetting the names of your bells at the head of any tune, that tune may eaſily be transferred to the chime-barrel, without any ſkill in muſic; but it muſt be obſerved, that each line in the muſic is three notes diſtant; that is, there is a note between each line, as well as upon it.

CHIMNEY, in architecture, a particular part of a houſe, where the fire is made, having a tube or funnel to carry off the ſmoke. The word *chimney* comes from the French *cheminee*; and that from the Latin *caminata*, "a chamber wherein is a chimney:" *caminata*, again, comes from *caminous*; and that from the Greek καμινος, "a chimney;" of καιω, *uro* "I burn."

Chimneys are uſually ſuppoſed a modern invention; the ancients only making uſe of ſtoves: but Octavio Ferrari endeavours to prove chimneys in uſe among the ancients. To this end, he cites the authority of Virgil,

Et jam ſumma procul villarum culmina fumant:

and that of Appian, who ſays, "That of thoſe perſons proſcribed by the triumvirate, ſome hid themſelves in wells and common ſewers, and ſome on the tops of houſes and chimneys;" for ſo he underſtands καπνωδεις υπωροφιας, *fumaria ſub tecto poſita*. Add, that Ariſtophanes, in one of his comedies, introduces his old man, Polycleon, ſhut up in a chamber, whence he endeavours to make his eſcape by the *chimney*. However, the few inſtances remaining among the ancients, together with the obſcurity of the rules of Vitruvius on this head, make us rather conclude the uſe of ſtoves, whereof the ancients had entire apartments, induced them to neglect this part of building which the coldneſs of our climates obliges us to have a principal regard to.

Method of Building CHIMNEYS *that will not ſmoke.* Workmen have different methods of drawing up the funnels of chimneys, generally according to their own fancies and judgements, and ſometimes according to the cuſtoms of places. They are ſeldom directed by ſound and rational principles. It will be found for the moſt part, that the ſmoking of chimneys is owing to their being carried up narrower near the top than below, or zig-zag, all in angles: in ſome caſes, indeed, it is owing to accidental cauſes; but, for the moſt part, to thoſe two abovementioned. Where they are carried up in pyramid or tapering form, eſpecially if the houſe be of a conſiderable height, it is ten to one but they ſometimes ſmoke. The air in the rooms, being rarified, is forced into the funnel of the chimney, and receives from the fire an additional force to carry up the ſmoke. Now, it is evident, that the further up the ſmoke flies, the leſs is the force that drives it, the ſlower it muſt move, and conſequently the more room in proportion it ſhould have to move in; whereas in the uſual way it has leſs, by the ſides of the chimney being gathered cloſer and cloſer together.

The method here propoſed of carrying up chimneys will be objected to by ſome thus: The wider a chimney is at the top, ſay they, the more liberty has the wind to blow down. Very true; but is it not reſiſted in going down, both by the form of the chimney and other evident cauſes, ſo that it muſt return again? In the other way, when the wind blows down, the reſiſtance being leſs, the wind and ſmoke are, if we may uſe the expreſſion, impriſoned, and make the ſmoke puff out below. This method has proved effectual after all others had failed: and that in a houſe placed in the worſt ſituation poſſible, namely, under a high mountain to the ſouthward, from which ſtrong blaſts blow down upon it. A vent was carried up without angles, as perpendicular as poſſible; and was made about three or four inches wider at top than at the bottom: the funnel was gathered in a throat directly above the fire-place, and ſo widening upwards. Since that time the houſe has not only ceaſed to ſmoke, but when the doors ſtand open, the draught is ſo ſtrong that it will carry a piece of paper out at the chimney-head. See more on this ſubject under the article SMOKE.

CHIMNEY-Money, otherwiſe called *Hearth-money*, a duty in England on houſes. By ſtat. 14. Char. II. cap. 2. every fire-hearth, and ſtove of every dwelling or other houſe, within England and Wales (except ſuch as pay not to church and poor), was chargeable with 2 s. *per annum*, payable at Michaelmas and Lady-day to the king and his heirs and ſucceſſors *&c.*; which payment was commonly called *chimney-money*. This tax, being much complained of as burdenſome to the people, has been ſince taken off, and others impoſed in its ſtead; among which that on windows has by ſome been eſteemed almoſt equally grievous.

CHIMPANZEE, in natural hiſtory. See SIMIA.

1 Boundaries Extent, &c.

CHINA, a country of Aſia, ſituated on the moſt eaſterly part of that continent. It is bounded on the north by Tartary; from which it is divided, partly by a prodigious wall of 1500 miles in length, and partly by high, craggy, and inacceſſible mountains. On the eaſt, it is bounded by the ocean; on the weſt, by part of the Mogul's empire, and India beyond the Ganges, from which it is parted by other ridges of high mountains and ſandy deſerts. On the ſouth, it is bounded partly by the kingdoms of Lao, Tonquin, Ava, and Cochin-China, and partly by the ſouthern or Indian ſea, which flows between it and the Philippine iſlands. There are ſeveral ways of computing its length and breadth. According to ſome of theſe, it is reckoned 1268, 1600, or 1800 miles in length, and as much in breadth; however, by the beſt and lateſt accounts, this vaſt country is ſomewhat of an oval form, the breadth being leſs than the length by little more than a fourth-part.

2 Diviſion into provinces.

It contains 15 provinces, excluſive of that of Lyau-tong, which is ſituated without the great wall, though under the ſame dominion. Their names are, 1. Shenſi; 2. Shanſi; 3. Pecheli; which are ſituated on the north ſide, along the wall. 4. Shantong; 5. Kyan-nang; 6. Che-Kyang; 7. Fo-keyn: which are ſituated along the eaſtern ocean. 8. Quangtong: 9. Quangſi; 10. Yu-nan; 11. Se-chuen; which ſtretch themſelves towards the ſouth and ſouth-weſt. And, 12. Ho-nan; 13. Hu-quand; 14. Quey-chew; 15 Kyang-ſi; which take up the middle part. For a particular deſcription of all theſe, ſee their proper articles.

3 Chineſe pretenſions to antiquity.

The origin of all nations is involved in obſcurity and fable; but that of the Chineſe much more ſo than any other. Every nation is inclined to aſſume too high an antiquity to itſelf, but the Chineſe carry theirs beyond all bounds. Indeed, though no people on earth are more exact in keeping records of every memorable

4 Why their hiſtory is ſo uncertain.

morable tranſaction, yet ſuch is the genius of the Chineſe for ſuperſtition and fable, that the firſt part of their hiſtory is deſervedly contemned by every rational perſon. What contributes more to the uncertainty of the Chineſe hiſtory is, that neither we, nor they themſelves, have any thing but fragments of their ancient hiſtorical books; for about 213 years before Chriſt, the reigning emperor of Si-whang-ti cauſed all the books in the empire to be burned, except thoſe written by laywers and phyſicians. Nay, the more effectually to deſtroy the memory of every thing contained in them, he commanded a great number of learned men to be buried alive, leſt, from their memories, they ſhould commit to writing ſomething of the true memoirs of the empire. The inaccuracy of the Chineſe annals is complained of even by their moſt reſpected author, Confucius himſelf; who alſo affirms, that, before his time, many of the oldeſt materials for writing ſuch annals had been deſtroyed.

5 Fabulous hiſtory of China.

According to the Chineſe hiſtories, the firſt monarch of the whole univerſe (that is, of China), was called *Puon-ku*, or *Puen-cu*, This, according to ſome, was the firſt man; but according to Bayer and Menzelius, two of the greateſt critics in Chineſe literature that have hitherto appeared, the word ſignifies *the higheſt antiquity*. Puon-ku was ſucceeded by *Tiene-hoang*, which ſignifies *the emperor of heaven*. They call him alſo the intelligent heaven, the ſupreme king of the middle heaven, *&c.* According to ſome of their hiſtorians, he was the inventor of letters, and of the Cyclic characters by which they determine the place of the year, *&c.* Tiene-hoang was ſucceeded by Ti-hoang (the emperor of the earth), who divided the day and night, appointing 30 days to make one moon, and fixed the winter ſolſtice to the 11th moon. Ti-hoang was ſucceeded by Gine-hoang (ſovereign of men), who with his nine brothers ſhared the government among them. They built cities, and ſurrounded them with walls; made a diſtinction between the ſovereign and ſubjects; inſtituted marriage, *&c.*

The reigns of theſe four emperors make up one of what the Chineſe called *ki*, "ages," or "periods," of which there were nine before Fo-hi, whom their moſt ſenſible people acknowledge as the founder of their empire.

The hiſtory of the ſecond *ki* contradicts almoſt every thing ſaid of the firſt; for though we have but juſt now been told that Gine-hoang and his brethren built cities ſurrounded with walls; yet, in the ſucceeding age, the people dwelt in caves, or perched upon trees as it were in neſts. Of the third *ki* we hear nothing; and in the fourth, it ſeems matters had been ſtill worſe, as we are told that men were then only taught to retire into the hollows of rocks. Of the fifth and ſixth we have no account. Theſe ſix periods, according to ſome writers, contained 90,000 years; according to others, 1,100,750.

In the ſeventh and eighth *ki*, they tell us over again what they had ſaid of the firſt; namely, that men began to leave their caves and dwell in houſes, and were taught to prepare cloths, *&c.* Tchine-fang, the firſt monarch of the eighth *ki*, tought his ſubject to take off the hair from ſkins with rollers of wood, and cover themſelves with the ſkins ſo prepared. He taught them alſo to make a kind of web of their hair, to ſerve as a covering to their heads againſt rain. They obeyed his orders with joy, and he called his ſubjects *people clothed with ſkins*. His reign laſted 350 years; that of one of his ſucceſſors, alſo, named Yeou-tſao-chi, laſted more than 300; and his family continued for 12 or 18,000 years. But what is very ſurpriſing, all theſe thouſands and millions of years had elapſed without mankind's having any knowledge of fire. This was not diſcovered till towards the cloſe of this period, by one Souigine. After ſo uſeful a diſcovery, he taught the people to dreſs their victuals; whereas before, they had devoured the fleſh of animals quite raw, drank their blood, and ſwallowed even their hair and feathers. He is alſo ſaid to have been the inventor of fiſhing, letters, *&c.*

In the ninth period we find the invention, or at leaſt the origin of letters, attributed to one Tſang-hie, who received them from a divine tortoiſe that carried them on his ſhell, and delivered them into the hands of Tſang-hie. During this period alſo, muſic, money, carriages, merchandize, and commerce, *&c.* were invented. There are various calculations of the length of theſe *ki* or periods. Some make the time from Puon-ku to Confucius, who flouriſhed about 479 years before Chriſt, to contain 279,000 years; others, 2,276,000; ſome, 2,759,860 years; others, 3,276,000; and ſome no leſs than 96,961,740 years.

6 Fabulous hiſtory explained.

Theſe extravagant accounts are by ſome thought to contain obſcure and imperfect hints concerning the coſmogony and creation of the world, *&c.* Puon-ku, the firſt emperor, they think, repreſents eternity preceding the duration of the world. The ſucceeding ones, Tiene-hoang, Ti-hoang, and Gine-hoang, they imagine, ſignify the creation of the heavens and earth, and the formation of man. The ten *ki*, or ages, nine of which preceded Fo-hi, mean the ten generations preceding Noah. This may very poſſibly be the caſe; for about 300 years before Chriſt, ſome Jews travelled into China, who might have made the Moſaic writings known there.

7 Reign of Fo-hi.

What we have now related, contains the ſubſtance of that part of the Chineſe hiſtory which is entirely fabulous. After the nine *ki* or "ages" already taken notice of, the tenth commenced with Fo-hi; and the hiſtory, though ſtill very dark, obſcrue, and fabulous, begins to grow ſomewhat more conſiſtent and intelligible. Fo-hi was born in the province of Shenſi. His mother walking upon the banks of a lake in that province, ſaw a very large print of a man's foot in the ſand there; and, being ſurrounded by an iris or rainbow, became impregnated. The child was named *Fo-hi*; and, when he grew up, was by his countrymen elected king on account of his ſuperior merit, and ſtyled *Tyent-tſe*, that is "the ſon of heaven." He invented the eight *qua*, or ſymbols, conſiſting of three lines each, which, differently combined, formed 64 characters that were made uſe of to expreſs every thing. To give theſe the greater credit, he pretended that he had ſeen them inſcribed on the back of a dragon-horſe (an animal ſhaped like a horſe, with the wings and ſcales of a dragon), which aroſe from the bottom of a lake. Having gained great reputation among his countrymen by this prodigy, he is ſaid to have created manda-

mandarins or officers, under the name of *dragons.* Hence we may aſſign a reaſon why the emperors of China always carry a dragon in their banners. He alſo inſtituted marriage, invented muſic, *&c.* Having eſtabliſhed a prime miniſter, he divided the government of his dominions among four mandarins, and died after a reign of 115 years.

8 Miraculous ſolſtice.

After Fo-hi followed a ſucceſſion of emperors, of whom nothing remarkable is recorded, except that in the reign of *Yau*, the ſeventh after Fo-hi, the ſun did not ſet for ten days, ſo that the Chineſe were afraid of a general conflagration. This event the compilers of the Univerſal Hiſtory take to be the ſame with that mentioned in the book of Joſhua, when the ſun and moon ſtood ſtill for about the ſpace of a day. Fo-hi, they will have to be the ſame with Noah. They imagine, that after the deluge, this patriarch remained ſome time with his deſcendents; but on their wicked combination to build the tower of Babel, he ſeparated himſelf from them with as many as he could perſuade to go along with him; and that, ſtill travelling eaſtward, he at laſt entered the fertile country of China, and laid the foundation of that vaſt empire—But, leaving theſe fabulous and conjectured times, we ſhall proceed to give ſome account of that part of the Chineſe hiſtory, which may be more certainly depended on.

9 Hypotheſis concerning this ſolſtice and Fo-hi.

As the Chineſe, contrary to the practice of almoſt all nations, have never ſought to conquer other countries, but rather to improve and content themſelves with their own, their hiſtory for many ages furniſhes nothing remarkable. The whole of their emperors, abſtracting from thoſe who are ſaid to have reigned in the fabulous times, are comprehended in 22 dynaſties, mentioned in the following table.

	Emperors.	Before Chriſt.
1. *Hya*, containing	16	2207.
2. *Shang*, or *Ing*,	28	1766.
3. *Chew*,	35	1122.
4. *Tſin*,	4	248.
5. *Han*,	25	206.
		After Chriſt.
6. *Hew-han*,	2	220.
7. *Tſin*,	15	465.
8. *Song*,	8	220.
9. *Tſi*,	5	479.
10- *Lyang*,	4	502.
11. *Chin*,	4	557.
12. *Swi*,	3	
13. *Twand*,	20	618.
14. *Hew-lyang*,	2	907.
15. *Hew-tang*,	4	903.
16. *Hewtſin*,	2	936.
17. *Hew-han*,	4	947.
18. *Hew-chew*,	3	951.
19. *Song*,	18	960.
20. *Iwen*,	9	1280.
21. *Ming*,	16	1368.
22. *Tſing*,		1645.

This table is formed according to the account of the Jeſuit Du Halde, and is commonly reckoned to be the moſt authentic; but according to the abovementioned hypotheſis of the compilers of the Univerſal Hiſtory, who make *Yau* contemporary with Joſhua, the dynaſty of *Hya* did not commerce till the year before Chriſt 1057; and to accommodate the hiſtory to their hypotheſis, great alterations muſt be made in the duration of the dynaſties.

10 Incurſions of the tartars.

The moſt intereſting particulars of the Chineſe hiſtory relate only to the incurſions of the Tartars, who at laſt conquered the whole empire, and who ſtill continue to hold the ſovereignty; though by transferring the ſeat of the empire to Peking, and adopting the Chineſe language, manners, *&c.* Tartary would ſeem rather to have been conquered by China, than China by Tartary. Theſe incurſions are ſaid to have begun very early; even in the time of the emperor Shun, ſucceſſor to Yau abovementioned, in whoſe reign the miraculous ſolſtice happenned. At this time, the Tartars were repulſed, and obliged to retire into their own territories. From time to time, however, they continued to threaten the empire with invaſions, and the northern provinces were often actually ravaged by the Tartars in the neighbourhood. About the year before Chriſt 213, Shi-whang-ti, having fully ſubdued all the princes, or kings, as they were called, of the different provinces, became emperor of China with unlimited power. He divided the whole empire into 36 provinces; and finding the northern part of his dominions much incommoded by the invaſions of the neighbouring barbarians, he ſent a formidable army againſt them, which drove them far beyond the boundaries of China. To prevent their return, he built the famous wall already mentioned, which ſeparates China from Tartary. After this, being elated with his own exploits, he formed a deſign of making poſterity believe that he himſelf had been the firſt Chineſe emperor that ever ſat on the throne. For this purpoſe, he ordered all the hiſtorical writings to be burnt, and cauſed many of the learned to be put to death, as already mentioned.

11 Great wall built.

12 Kitan Tartars ſettle in China.

What effect the great wall for ſome time had in preventing the invaſions of the Tartars, we are not told; but in the tenth century of the Chriſtian aera, thoſe of Kitan or Lyau got a footing in China. The Kitan were a people of eaſtern Tartary, who dwelt to the north and north-eaſt of the province of Pecheli in China, particularly in that of Layu-tong lying without the great wall. Theſe people having ſubdued the country between Korea and Kaſhgar, became much more troubleſome to the Chineſe than all the other Tartars. Their empire commenced about the year 916, in the fourth year of Mo-ti-kyan-ti, ſecond emperor of the 14th Chineſe dynaſty called *Hew-lyang*. In 946, Mingt-ſong, ſecond emperor of the 15th dynaſty, being dead, Sheking-tang, his ſon-in-law, rebelled againſt Mingt-ſong, his ſon and ſucceſſor, whom he deprived of his crown and life. This he accompliſhed by means of an army of 50,000 men furniſhed by the Kitan. Fi-ti, the ſon of Mingt-Song, being unable to reſiſt the uſurper, fled to the city Ghey-chew; where ſhutting himſelf up with his family and all his valuable effects, he ſet fire to the palace, and was burnt to aſhes. On his death, Sheking-tang aſſumed the title of emperor; founded the 16th dynaſty; and changed his name to that of *Kaut-ſu*. But the Kitan general refuſing to acknowledge him, he was obliged to purchaſe

chaſe a peace by yielding up to the Tartars 16 cities in the province of Pecheli, beſides a yearly preſent of 300,000 pieces of ſilk.

This ſubmiſſion ſerved only to inflame the avarice and ambition of the Kitan. In 959, they broke the treaty when leaſt expected, and invaded the empire afreſh. Tſi-vang, the emperor at that time, opppoſed them with a formidable army : but through the treachery of his general Lyew-chi-ywen, the Tartars were allowed to take him priſoner. On this, Tſi-vang was glad to recover his liberty by accepting of a ſmall principality ; while the traitor became emperor of all China, and, changing his name to *Kaut-ſu*, founded the 17th dynaſty. The Tartars, in the mean time, ravaged all the northern provinces without oppoſition, and then marched into the ſouthern. But being here ſtopped by ſome bodies of Chineſe troops, the general thought proper to retire with his booty into Tartary. In 962, Kaut-ſu, dying, was ſucceeded by his ſon In-ti. The youth of this prince gave an opportunity to the eunuchs to raiſe commotions ; eſpecially as the army was employed at a diſtance in repelling the invaſions of the Tartars. This army was commanded by Ko-ghey, who defeated the enemy in ſeveral battles, and thus reſtored peace to the northern provinces. In the mean time, In-ti was ſlain by his eunuchs, and the empreſs placed his brother on the throne : but Ko-ghey, returning in triumph, was ſaluted emperor by his victorious army, and the empreſs being unable to ſupport the rights of her ſon, was obliged to ſubmit, while Ko-ghey, aſſuming the name of *Tay-tſu*, founded the 18th dynaſty. Nine years after this, however, the grandees of the empire, ſetting aſide Kong-ti, the third in ſucceſſion from Tay-tſu, on account of his non-age, proclamed his guardian, named *Chau-quang-yu*, emperor; who aſſuming the name of Kau-tſu, founded the 19th dynaſty, called *Song*, or *Tſong*.

Under this monarch the empire began to recover itſelf ; but the Kitan ſtill continued their incurſions. The ſucceſſors of Kau-tſu, oppoſed them with various ſucceſs ; but at laſt, in 978, the barbarians became ſo ſtrong as to lay ſiege to a conſiderable city. Tay-tſong, ſucceſſor to Kau-tſu, detached 3000 ſoldiers, each carrying a light in his hand, againſt them in the night-time, with orders to approach as near as poſſible to the Tartar camp. The barbarians imagining by the number of lights, that the whole Chineſe army was at hand, immediately fled, and falling into the ambuſcades laid for them by the Chineſe general, were almoſt all cut to pieces.

This check, however, did not long put a ſtop to the ravages of the Kitan. In the year 999, they laid ſiege to a city in the province of Peche-li : but Ching-tſong, ſucceſſor to Tay-tſong, came upon them with his army ſo ſuddenly, that they betook themſelves to flight. The emperor was adviſed to take advantage of their conſternation, and recover their country which had been yielded to them : but inſtead of purſuing his victory, he bought a peace, by conſenting to pay annually 100,000 tael (about L.34,000), and 200,000 pieces of ſilk. The youth and pacific diſpoſition of Jin-tſong, ſucceſſor to Ching-tſong, revived the courage of the Kitan ; and, in 1035, war would have been renewed, had not the emperor condeſcended to as ſhameful a treaty as that concluded by his father. Two years after, the Tartars demanded reſtitution of ten cities in the province of Peche-li, which had been taken by Ko-ghey founder of the 18th dynaſty ; upon which Jin-tſong engaged to pay them an annual tribute of 200,000 taels of ſilver, and 300,000 pieces of ſilk in lieu of theſe cities.

13
Kitan driven out by the eaſtern Tartars.

From this time the Kitan remained in peaceable poſſeſſion of their Chineſe dominions till the year 1117. Whey-tſong, at that time emperor, being able neither to bear their ravages, nor by himſelf to put a ſtop to them, reſolved upon a remedy which at laſt proved worſe than the diſeaſe . This was to call in the Nu-che, Nyu-che, or Eaſtern Tartars, to deſtroy the kingdom of the Kitan. From this he was diſſuaded by the king of Korea, and moſt of his own miniſters ; but, diſregarding their ſalutary advice, he joined his forces to thoſe of the Nu-che. The Kitan were then every where defeated ; and at laſt reduced to ſuch extremity, that thoſe who remained were forced to leave their country, and fly to the mountains of the weſt.

14
Who aſſume the name of *Kin*, and invade China.

Thus the empire of the Kitan was totally deſtroyed, but nothing to the advantage of the Chineſe; for the Tartar general, elated with his conqueſt, gave the name of *Kin* to his new dominion, aſſumed the title of emperor, and began to think of aggrandizing himſelf and enlarging his empire. For this purpoſe, he immediately broke the treaties concluded with the Chineſe emperor; and invading the provinces of Peche-li and Shen-ſi, made himſelf maſter of the greater part of them. Whey-tſong, finding himſelf in danger of loſing his dominions, made ſeveral advantageous propoſals to the Tartar ; who, ſeeming to comply with them, invited him to come and ſettle matters by a perſonal conference. The Chineſe monarch complied : but, on his return, the terms agreed on ſeemed intolerable to his miniſters ; ſo that they told him the treaty could not ſubſiſt, and that the moſt cruel war was preferable to ſuch an ignominious peace. The Kin monarch, being informed of all that paſſed, had recourſe to arms, and took ſeveral cities. Whey-tſong was weak enough to go in perſon to hold a ſecond conference ; but, on his arrival, was immediately ſeized by the Tartar. He was kept priſoner under a ſtrong guard during the remaining part of his life ; and ended his days in 1126, in the deſert of Shamo, having nominated his eldeſt ſon Kin-tſong to ſucceed him.

15
They take the emperor priſoner.

16
Imperial city and another emperor taken.

Kin-tſong began his reign with putting to death ſix miniſters of ſtate, who had betrayed his father into the hands of the Kin Tartars. The barbarians in the mean time purſued their conqueſts without oppoſition. They croſſed the Whang-ho, or Yellow River, which an handful of troops might have prevented ; and marching directly towards the imperial city, took and plundered it. Then ſeizing the emperor and his conſort, they carried them away captives : but many of the principal lords, and ſeveral of the miniſters, preferring death to ſuch an ignominious bondage, killed themſelves. The Kin being informed by the empreſs *Meng* that ſhe had been divorced, they left her behind. This proved the means of ſaving the empire: for

for by her wiſdom and prudence ſhe got the crown placed on the head of Kau-tſong, ninth ſon of the emperor Whey-tſong by his divorced empreſs.

Kau-tſong fixed his court at Nanking the capital of Kyang-nan; but ſoon after was obliged to remove it to Kang-chew in Che-kyang. He made ſeveral efforts to recover ſome of his provinces from the Kin, but without effect. Ili-tſong the Kin monarch, in the mean time, endeavoured to gain the eſteem of his Chineſe-ſubjects by paying a regard to their learning and learned men, and honouring the memory of Confucius. Some time after, he advanced to Nanking, from whence Kau-tſong had retired, and took it: but, receiving advice that Yo-ſi, general of the Song, or ſouthern Chineſe, was advancing by long marches to the relief of that city, they ſet fire to the palace, and retired northward.

17 Progreſs the Kin checked.

However, Yo-ſi arrived time enough to fall upon their rear-guard; which ſuffered very much; and from this time the Kin never dared to croſs the river Kyang. In a few years afterwards the Chineſe emperor ſubmitted to become tributary to the Kin, and concluded a peace with them upon very diſhonourable terms. This ſubmiſſion, however, was of little avail: for, in 1163, the Tartars broke the peace; and, invading the ſouthern province with a formidable army, took the city of Yang-chew. The king, having approached the river Kyang, near its mouth, where it is wideſt as well as moſt rapid, commanded his troops to croſs it, threatening with his drawn ſword to kill thoſe who refuſed. On receiving ſuch an unreaſonable command, the whole army mutinied; and the king being killed in the beginning of the tumult, the army immediately retired.

18 They are attacked by Jenghiz-khan and the king of Hya.

From this time to the year 1210, nothing remarkable occurs in the Chineſe hiſtory; but this year, Jenghiz-khan, chief of the weſtern Tartars, *Moguls*, or *Mungls*, quarrelled with Yong-tſi emperor of the Kin; and at the ſame time the king of Hya, diſguſted at being refuſed aſſiſtance againſt Jenghiz-khan, threatened him with an invaſion on the weſt ſide. Yong-tſi prepared for his defence; but in 1211, receiving news that Jenghiz-khan was advancing ſouthward with his whole army, he was ſeized with fear, and made propoſals of peace, which were rejected.

19 Great wall forced by Jenghiz-khan.

In 1212, the Mogul generals forced the great wall; or, according to ſome writers, had one of the gates treacherouſly opened to them, to the north of Shanſi; and made incurſions as far as Peking the capital of the Kin empire. At the ſame time the province of Lyau-tong was almoſt totally reduced by ſeveral Kitan lords who had joined Jenghiz-khan; ſeveral ſtrong places were taken, and an army of 300,000 Kin defeated by the Moguls. In autumn they laid ſiege to the city of Tay-tong-fu; where, although the governor Hujaku fled, yet Jenghiz-khan met with a conſiderable reſiſtance. Having loſt a vaſt number of men, and being himſelf wounded by an arrow, he was obliged to raiſe the ſiege and retire into Tartary; after which the Kin retook ſeveral cities. The next year, however, Jenghiz-khan re-entered China; retook the cities which the Kin had reduced the year before; and overthrew their armies in two bloody battles, in one of which the ground was ſtrewed with dead bodies for upwards of four leagues.

The ſame year Yong-tſi was ſlain by his general Hujaku; and Sun, a prince of the blood, advanced in his room. After this the Moguls, attacking the empire with four armies at once, laid waſte the provinces of Shanſi, Honan, Pecheli, and Shantong. In 1214 Jenghiz-khan ſat down before Peking; but inſtead of aſſaulting the city, offered terms of peace, which were accepted, and the Moguls retired into Tartary. After their departure, the emperor, leaving his ſon at Peking, removed his court to Pyen-lyang near Kay-ſong-fu, the capital of Honan. At this Jenghiz-khan being offended, immediately ſent troops to beſiege Peking.

20 Peking taken.

The city held out to the fifth month of the year 1215, and then ſurrendered. At the ſame time the Moguls finiſhed the conqueſt of Lyau-tong; and the Song refuſed to pay the uſual tribute to the Kin.

21 Southern Chineſe declared war againſt the Kin.

In 1216, Jenghiz-khan returned to purſue his conqueſts in the weſt of Aſia, where he ſtaid ſeven years; during which time his general Muhuli made great progreſs in China againſt the Kin emperor. He was greatly aſſiſted by the motions of Ning-tſong emperor of the Song, or ſouthern China; who, incenſed by the frequent perfidies of the Kin, had declared war againſt them, and would hearken to no terms of peace, though very advantageous propoſals were made. Notwithſtanding this, however, in 1220, the Kin, exerting themſelves raiſed two great armies, one in Shenſi, and the other in Shang-ton. The former baffled the attempts of the Song and king of Hya, who had united againſt them; but the latter, though no fewer than 200,000, were entirely defeated by Muhuli. In 1221, that officer paſſed the Whang-ho, and died after conquering ſeveral cities.

22 Jenghiz-khan deſtroys the kingdom of Hya;

In 1224, the Kin emperor died; and was ſucceeded by his ſon Shew, who made peace with the king of Hya: but next year, that kingdom was entirely deſtroyed by Jenghiz-khan. In 1226, Oktay ſon to Jenghiz-khan marched into Honan, and beſieged Kay-Song-fu, capital of the Kin empire; but was obliged to withdraw into Shenſi, where he took ſeveral cities, and cut in pieces an army of 30,000 men.

23 And dies.

In 1227 Jenghiz-khan died, after having deſired his ſons to demand a paſſage for their army through the dominions of the Song, without which he ſaid they could not eaſily vanquiſh the Kin.

After the death of that great conqueror, the war was carried on with various ſucceſs; but though the Moguls took above 60 important poſts in the province of Shenſi, they found it impoſſible to force Tong-quan, which it behoved them to do in order to penetrate effectually into Honan. In April 1231 they took the capital of Shenſi, and defeated the Kin army which came to its relief. Here one of the officers deſired prince Toley to demand a paſſage from the Song through the country of Han-chong-fu. This propoſal Toley communicated to his brother Oktay, who approved of it as being conformable to the dying advice of Jenghiz-khan. Hereupon Toley, having aſſembled all his forces, ſent a meſſenger to the Song generals to demand paſſage through their territories.

24 Moguls quarrel with the Song.

This, however, they not only refuſed, but put the meſſenger to death; which ſo enraged Toley that he ſwore to make them repent of it, and was ſoon as good as his word.

25 Exploits of Toley.

He decamped in Auguſt 1231; and having forced the paſſages, put to the ſword the inhabitants of Wha-

Wha-yang and Fong-chew, two cities in the diſtrict of Han-chong-fu. Then having cut down rocks to fill up deep abyſſes, and made roads through places almoſt inacceſſible, he came and beſieged the city of Han-chong-fu itſelf. The miſerable inhabitants fled to the mountains on his approach, and more than 100,000 of them periſhed. After this, Toley divided his forces, conſiſting of 30,000 horſe, into two bodies. One of theſe went weſtward to Myen-chew: from thence, after opening the paſſages of the mountains, they arrived at the river Kyaling, which runs into the great Kyang. This they croſſed on rafts made of the wood of demoliſhed houſes; and then, marching along its banks, ſeized many important poſts. At laſt, having deſtroyed more than 140 cities, towns, or fortreſſes, they returned to the army. The ſecond detachment ſeized an important poſt in the mountains, called *Tautong*, ſix or ſeven leagues to the eaſtward of Han-chong-fu. On the other ſide Oktay advanced, in October, towards Pu-chew a city of Shan-ſi; which being taken after a vigorous defence, he prepared to paſs the Whang-ho. Toley, after ſurmounting incredible difficulties, arrived in December on the borders of Honan, and made a ſhew as if he deſigned to attack the capital of the Kin empire. On his firſt appearance in Honan through a paſſage ſo little ſuſpected, every body was filled with terror and aſtoniſhment, ſo that he proceeded for ſome time without oppoſition. At laſt the emperor ordered his generals, Hota, Ilapua, and others, to march againſt the enemy. Toley boldly attacked them; but was obliged to retire, which he did in good order. Hota was for purſuing him, ſaying that the Mogul army did not exceed 30,000 men, and that they ſeemed not to have eaten any thing for two or three days. Ilapua, however, was of opinion that there was no occaſion for being ſo haſty, as the Moguls were incloſed between the rivers Han and Whang-ho, ſo that they could not eſcape. This negligence they ſoon had occaſion to repent of: for Toley, by a ſtratagem, made himſelf maſter of their heavy baggage; which accident obliged them to retire to Tang-chew. From thence they ſent a meſſenger to acquaint the emperor that they had gained the battle, but concealed the loſs of their baggage. This good news filled the court with joy; and the people who had retired into the capital for its defence, left it again, and went into the country; but, in a few days after, the vanguard of the Moguls, who had been ſent by the emperor Oktay, appeared in the field, and carried off a great number of thoſe that had quitted the city.

26 Capital of the Kin empire beſieged.

In January 1232, Oktay paſſing the Whang-ho, encamped in the diſtrict of Kay-fong-fu, capital of the Kin empire, and ſent his general Suputay to beſiege the city. At that time the place was near 30 miles in circumference: but having only 40,000 ſoldiers to defend it, as many more from the neighbouring cities, and 20,000 peaſants, were ordered into it; while the emperor publiſhed an affecting declaration, animating the people to defend it to the laſt extremity. Oktay, having heard with joy of Toley's entrance into Honan, ordered him to ſend ſuccours to Suputay. On the other hand, the Kin generals advanced with 150,000 men to relieve the city; but being obliged to divide their forces in order to avoid in part the great road which Toley had obſtructed with trees, they were attacked by that prince at a diſadvantage, and, after a faint reſiſtance, defeated with great ſlaughter, and the loſs of both their generals, one killed and the other taken. The emperor now ordered the army at Tong-quan and other fortified places to march to the relief of Kay-fong-fu. They aſſembled accordingly, to the number of 110,000 foot and 15,000 horſe; and were followed by vaſt numbers of people who expected by their means to be protected from the enemy. But many of theſe troops having deſerted, and the reſt being enfeebled by the fatigues of their march, they diſperſed on the approach of their purſuers, who killed all they found in the highways. After this the Moguls took Tong-quan and ſome other conſiderable poſts; but were obliged to raiſe the ſieges of Quey-te-fu and Loyang, by the bravery of the governors. Kyang-ſhin, governor of Loyang, had only 3 or 4000 ſoldiers under him, while his enemies were 30,000 ſtrong. He placed his worſt ſoldiers on the walls, putting himſelf at the head of 400 brave men; whom he ordered to go naked, and whom he led to all dangerous attacks. He invented engines to caſt large ſtones, which required but few hands to play them, and aimed ſo true as to hit at 100 paces diſtance. When their arrows failed, he cut thoſe ſhot by the enemy into four pieces; pointed them with pieces of braſs coin; and diſcharged them from wooden tubes with as much force as bullets are from a muſket. Thus he haraſſed the Moguls for three months ſo grievouſly, that they were obliged, notwithſtanding their numbers, to abandon the enterprize.

27 Bravery of the beſieged.

Oktay, at laſt, notwithſtanding his ſucceſſes, reſolved to return to Tartary; and offered the Kin emperor peace, provided he became tributary, and delivered up to him 27 families which he named. Theſe offers were very agreeable to the emperor; but Suputay, taking no notice of the treaty, puſhed on the ſiege of the capital with more vigour than ever. By the help of the Chineſe ſlaves in his army, the Mogul general ſoon filled the ditch; but all his efforts ſeemed only to inſpire the beſieged with new vigour. The Moguls at that time made uſe of artillery, but were unable to make the leaſt impreſſion upon the city walls. They raiſed walls round thoſe they beſieged, which they fortified with ditches, towers, and battlements. They proceeded alſo to ſap the walls of the city; but were very much annoyed by the artillery of the beſieged, eſpecially by their bombs, which ſinking into the galleries, and burſting under ground, made great havock among the miners. For 16 days and nights the attack continued without intermiſſion; during which time an incredible number of men periſhed on both ſides: at length, Suputay, finding that he could not take the city, withdrew his troops, under pretence of conferences being on foot. Soon after, the plague began in Kay-fong-fu; and raged with ſuch violence, that in 50 days, 900,000 biers were carried out, beſides a vaſt multitude of the poorer ſort who could not afford any.

28 Peace concluded;

29 And broken.

In a ſhort time, two unlucky accidents occaſioned a renewal of the war; which now put an end to the empire of the Kin. Gan-yong, a young Mogul lord, having aſſumed the government of ſome cities in Kyang-nan, and killed the officer ſent to take poſſeſſion

ſion of them, declared for the Kin. The emperor unwarily took Gan-yong into his ſervice, and gave him the title of Prince. Upon this Oktay ſent an envoy, attended by 30 other perſons, to inquire into the affair; but the Kin officers killed them all, without being puniſhed by the emperor. Suputay, having informed his maſter of all theſe proceedings, was ordered to continue the war in Honan. Shew-fu now commanded his officers to unite their troops for the defence of the capital; but before his orders could be obeyed, they were attacked and defeated, one after another, by the Moguls. This obliged him to raiſe ſoldiers from among the peaſants, for whoſe ſubſiſtence the people were taxed $\frac{3}{10}$ of the rice they poſſeſſed. The city began now to be diſtreſſed for want of proviſions; and as it was but in a bad poſture of defence, the emperor marched with an army againſt the Moguls. His expedition proved unfortunate; for, ſending part of his army to beſiege a city called Why-chew, it was totally cut in pieces, and Suputay a ſecond time ſat down before the capital.

30 Capital again beſieged,

31 And taken.

On hearing this bad news, the emperor repaſſed the Whang-ho, and retired to Quey-te-fu. Here he had not been long before the capital was delivered up by treachery, and Suputay put all the males of the imperial race to death; but, by the expreſs command of Oktay, ſpared the inhabitants, who are ſaid to have amounted to 1,400,000 families. After this diſaſter the unhappy monarch left his troops at Quey-te-fu, and retired to Juning-fu, a city in the ſouthern part of Honan, attended only by 400 perſons. Here the diſtance of the Moguls made him think of living at eaſe; but while he flattered himſelf with theſe vain hopes; the enemy's army arrived before the city and inveſted it. The garriſon were terrified at their approach; but were encouraged by the emperor, and his brave general Hu-ſye-hu, to hold out to the laſt. As there were not in the city a ſufficient number of men, the women, dreſſed in mens clothes, were employed to carry wood, ſtones, and other neceſſary materials to the walls. All their efforts, however, were ineffectual. They were reduced to ſuch extremities, that for three months they fed on human fleſh; killing the old and feeble, as well as many priſoners, for food. This being known to the Moguls, they made a general aſſault in January 1234. The attack continued from morning till night: but at laſt the aſſailants were repulſed. In this action, however, the Kin loſt all their beſt officers; upon which the emperor reſigned the crown to Cheng-lin a prince of the blood. Next morning, while the ceremony of inveſting the new emperor was performing, the enemy mounted the ſouth walls, which were defended only by 200 men; and the ſouth gate being at the ſame time abandoned, the whole army broke in. They were oppoſed, however, by Hu-ſye-hu; who, with 1000 ſoldiers, continued to fight with amazing intrepidity. In the mean time Shew-fu, ſeeing every thing irreparably loſt, lodged the ſeal of the empire in a houſe; and then cauſing ſheaves of ſtraw to be ſet round it, ordered it to be ſet on fire as ſoon as he was dead. After giving this order he hanged himſelf, and his commands were executed by his domeſtics. Hu-ſye-hu, who ſtill continued fighting with great bravery, no ſooner heard of the tragical death of the emperor than he drowned himſelf in the river Ju; as did alſo 500 of his moſt reſolute ſoldiers. The ſame day the new emperor, Cheng-lin, was ſlain in a tumult; and thus an end was put to the dominion of the Kin Tartars in China.

32 Siege of Juning-fu.

33 Unhappy fate of the emperor.

34 Diſſolution of the Kin empire.

The empire of China was now to be ſhared between the Song, or Southern Chineſe, and the Moguls. It had been agreed upon, that the province of Honan ſhould be delivered up to the Song as ſoon as the war was finiſhed. But they, without waiting for the expiration of the term, or giving Oktay notice of their proceedings, introduced their troops into Kay-fong-fu, Lo-yang, and other conſiderable cities. On this the Mogul general reſolved to attack them; and repaſſing the Whang-ho, cut in pieces part of the garriſon of Lo-yang, while they were out in ſearch of proviſions. The garriſon of Kay-fong-fu likewiſe abandoned that place; and the Song emperor degraded the officers who had been guilty of thoſe irregularities, ſending ambaſſadors to Otkay, at the ſame time, to deſire a continuance of the peace. What Oktay's anſwer was we are not told, but the event ſhowed that he was not well pleaſed; for, in 1235, he ordered his ſecond ſon prince Kotovan, and his general Chahay, to attack the Song in Se-chwen, while others marched towards the borders of Kyang-nan.

35 War between the Song and the Moguls.

In 1236, the Moguls made great progreſs in the province of Hu-quang, where they took ſeveral cities, and put vaſt numbers to the ſword. This year they introduced paper or ſilk money, which had formerly been uſed by Chang-tſong ſixth emperor of the Kin. Prince Kotovan forced the paſſages into the diſtrict of Hang-chong-fu in the province of Shenſi, which he entered with an army of 500,000 men. Here a terrible battle was fought between the vaſt army of the Moguls and the Chineſe troops, who had been driven from the paſſages they defended. The latter conſiſted only of 10,000 horſe and foot, who were almoſt entirely cut off; and the Moguls loſt ſuch a number of men, that the blood is ſaid to have run for two leagues together. After this victory the Moguls entered Sechwen, which they almoſt entirely reduced, committing ſuch barbarities, that, in one city, 40,000 people choſe rather to put an end to their own lives than ſubmit to ſuch cruel conquerors.

36 Dreadful engagement.

In 1237, the Moguls received a conſiderable check before the city of Gan-tong in Kyang-nan, the ſiege of which they were obliged to raiſe with loſs. In 1238 they beſieged Lu-chew, another city in the ſame province. They ſurrounded it with a rampart of earth and a double ditch; but the Chineſe general ordered their intrenchments to be filled with immenſe quantities of herbs ſteeped in oil, and then ſet on fire, while he ſhot ſtones upon them from a tower ſeven ſtories high. At the ſame time a vigorous ſally was made; and the Mogul army being thrown into the utmoſt diſorder, were obliged finally to abandon the ſiege and retire northwards.

In 1239, theſe barbarians were oppoſed by a general called Meng-kong, with great ſucceſs; who, this and the following year, gained great honour by his exploits. While he lived, the Moguls were never able to make any conſiderable progreſs; but his death, in 1246, proved of the greateſt detriment to the Chineſe affairs; and ſoon after, the Tartars renewed the war with more vigour and ſucceſs than ever. In

37 Siege of Ho-chew.

38 Moguls defeated and their emperor killed.

1225, they re-entered the province of Se-chwen; but ſtill met with vigorous oppoſition in this quarter, becauſe the Chineſe took care to have Se-chwen furniſhed with good troops and generals. Though they were always beaten, being greatly inferior in number to their enemies, yet they generally retook the cities the Moguls had reduced, as the latter were commonly obliged to withdraw for want of proviſions and forage. In 1259 they undertook the ſiege of Ho-chew, a ſtrong city to the weſt of Peking, defended by Vang-kyen, a very able officer, who commanded a numerous garriſon. The ſiege continued from the month of February till Auguſt; during which time the Moguls loſt an immenſe number of men. On the 10th of Auguſt they made a general aſſault in the night. They mounted the walls before the governor had intelligence; but were ſoon attacked by him with the utmoſt fury. The Mogul emperor, Meng-ko, himſelf came to the ſcalade; but his preſence was not ſufficient to overcome the valour of Vang-kyen. At the ſame time the ſcaling-ladders of the Moguls were blown down by a ſtorm; upon which a terrible ſlaughter enſued, and among the reſt fell the emperor himſelf. Upon this diſaſter the Mogul generals agreed to raiſe the ſiege, and retire towards Shen-ſi.

On the death of Meng-ko, Hupilay, or Kublay Khan, who ſucceeded him, laid ſiege to Vu-chang-fu, a city not far diſtant from the capital of the Song empire.

At this the emperor being greatly alarmed, diſtributed immenſe ſums among his troops; and, having raiſed a formidable army, marched to the relief of Vu-chang-fu. Unfortunately the command of this army was committed to the care of Kya-tſe-tau, a man without either courage or experience in war. He was beſides very vain and vindictive in his temper; often uſing the beſt officers ill, and entirely overlooking their merit, which cauſed many of them to go over to the Moguls. The ſiege of Vu-chang-fu was commenced, and had continued a conſiderable time, when Kya-tſe-tau, afraid of its being loſt, and at the ſame time not daring to take any effectual ſtep for its relief, made propoſals of peace. A treaty was accordingly concluded, by which Kya-tſe-tau engaged to pay an annual tribute of about L.50,000 in ſilver, and as much in ſilk; acknowledging likewiſe the ſovereignty of the Moguls over the Song empire. In conſequence of this treaty, the Moguls retreated after the boundaries of the two empires had been fixed, and repaſſed the Kyang; but 170 of them having ſtaid on the other ſide of the river, were put to death by Kya-tſe-tau.

39 Treachery of a Chineſe miniſter.

This wicked miniſter totally concealed from the emperor his having made ſuch a ſhameful treaty with the Moguls; and the 170 ſoldiers maſſacred by his order, gave occaſion to report that the enemy had been defeated; ſo that the Song court believed that they had been compelled to retreat by the ſuperior valour and wiſdom of Kya-tſe-tau. This proved the ruin of the empire; for, in 1260, the Mogul emperor ſent Hauking to the Chineſe court to execute the treaty according to the terms agreed on with Kya-tſe-tau. The miniſter, dreading the arrival of this envoy, impriſoned him near Nanking; and took all poſſible care that neither Hupilay, nor Li-tſong the Chineſe emperor, ſhould ever hear any thing of him.

40 Deſperate conflict.

It was impoſſible ſuch unparalleled conduct could fail to produce a new war. Hupilay's courtiers inceſſantly preſſed him to revenge himſelf on the Song for their treacherous behaviour; and he ſoon publiſhed a manifeſto againſt them, which was followed by a renewal of hoſtilities in 1268. The Mogul army amounted to 300,000 men; but notwithſtanding their numbers, little progreſs was made till the year 1271. Syan-yang and Fan-ching, cities in the province of Se-chew had been beſieged for a long time ineffectually; but this year, an *Igur* lord adviſed Hupilay to ſend for ſeveral of thoſe engineers out of the weſt, who knew how to caſt ſtones of 150 pounds weight out of their engines, which made holes of ſeven or eight feet wide in the ſtrongeſt walls. Two of theſe engineers were accordingly ſent for; and after giving a ſpecimen of their art before Hupilay, were ſent to the army in 1272. In the beginning of 1273 they planted their engines againſt the city of Fan-ching, and preſently made a breach in the walls. After a bloody conflict the ſuburbs were taken; and ſoon after the Moguls made themſelves maſters of the walls and gates of the city. Nevertheleſs, a Chineſe officer, with only 100 ſoldiers, reſolved to fight from ſtreet to ſtreet. This he did for a long time with the greateſt obſtinacy, killing vaſt numbers of the Moguls; and both parties are ſaid to have been ſo much overcome with thirſt, that they drank human blood to quench it. The Chineſe ſet fire to the houſes, that the great beams, falling down, might embarraſs the way of their purſuers; but at laſt being quite wearied out, and filled with deſpair, they put an end to their own lives. After the taking of Fan-ching, all the materials which had ſerved at the ſiege were tranſported to Seyen-yang. The two engineers poſted themſelves againſt a wooden entrenchment raiſed on the ramparts. This they quickly demoliſhed: and the beſieged were ſo intimidated by the noiſe and havock made by the ſtones caſt from theſe terrible engines, that they immediately ſurrendered.

41 Chineſe empreſs ſubmits.

In 1274, Pe-yen, an officer of great valour, and endowed with many other good qualities, was promoted to the command of the Mogul army. His firſt exploits were the taking of two ſtrong cities; after which he paſſed the great river Ky-ang, defeated the Song army, and laid ſiege to Vu-chang-fu. This city was ſoon intimidated into a ſurrender; and Pe-yen, by reſtraining the barbarity of his ſoldiers, whom he would not allow to hurt any body, ſoon gained the hearts of the Chineſe ſo much, that ſeveral cities ſurrendered to him on the firſt ſummons. In the mean time the treacherous Kya-tſe-tau, who was ſent to oppoſe Pe-yen, was not aſhamed to propoſe peace on the terms he had formerly concluded with Hupilay; but theſe being rejected, he was obliged at length to come to an engagement. In this he was defeated, and Pe-yen continued his conqueſts with great rapidity. Having taken the city of Nanking, and ſome others, he marched towards Hang-chew-fu, the capital of the Song empire. Peace was now again propoſed, but rejected by the Mogul general; and at laſt the empreſs was conſtrained to put herſelf, with her ſon, then an infant, into the hands of Pe-yen, who immediately ſent them to Hupilay.

The ſubmiſſion of the empreſs did not yet put an end to the war. Many of the chief officers ſwore to do their utmoſt to reſcue her from the hands of her enemies. In conſequence of this reſolution they diſtributed their money among the ſoldiers, and ſoon got together an army of 40,000 men. This army attacked the city where the young emperor Kong-tſong was lodged, but without ſucceſs; after which, and ſeveral other vain attempts, they raiſed one of his brothers to the throne, who then took upon him the name of Twon-tſong. He was but nine years of age when he was raiſed to the imperial dignity, and enjoyed it but a very ſhort time. In 1277 he was in great danger of periſhing, by reaſon of the ſhip on board which he then was being caſt away. The poor prince fell into the water, and was taken up half dead with the fright. A great part of his troops periſhed at that time, and he ſoon after made offers of ſubmiſſion to Hupilay. Theſe, however, were not accepted; for, in 1278, the unhappy Twon-tſong was obliged to retire into a little deſert iſland on the coaſt of Quang-tong, where he died in the 11th year of his age.

42
Diſſolution of the Song empire.

Notwithſtanding the progreſs of the Moguls, vaſt territories ſtill remained to be ſubdued before they could become maſters of all the Chineſe empire. On the death of Twon-tſong, therefore, the mandarins raiſed to the throne his brother, named Te-ping, at that time but eight years of age. His army conſiſted of no fewer than 200,000 men; but being utterly void of diſcipline, and entirely ignorant of the art of war, they were defeated by 20,000 Mogul troops. Nor was the fleet more ſucceſsful; for being put in confuſion by that of the Moguls, and the emperor in danger of falling into their hands, one of the officers taking him on his ſhoulders, jumped with him into the ſea, where they were both drowned. Moſt of the mandarins followed this example, as did alſo the empreſs and miniſter, all the ladies and maids of honour, and multitudes of others, inſomuch that 100,000 people are thought to have periſhed on that day. Thus ended the Chineſe race of emperors; and the Mogul dynaſty, known by the name of *Ywen*, commenced.

43
Reign of Hupilay.

Though no race of men that ever exiſted were more remarkable for cruelty and barbarity than the Moguls; yet it doth not appear that the emperors of the Ywen dynaſty were in any reſpect worſe than their predeceſſors. On the contrary, Hupilay, by the Chineſe called *Shi-tſu*, found the way of reconciling the people to his government, and even of endearing himſelf to them ſo much, that the reign of his family is to this day ſtyled by the Chineſe *the wiſe government*. This he accompliſhed by keeping as cloſe as poſſible to their ancient laws and cuſtoms, by his mild and juſt government, and by his regard for their learned men. He was indeed aſhamed of the ignorance and barbarity of his Mogul ſubjects, when compared with the Chineſe. The whole knowledge of the former was ſummed up in their ſkill in managing their arms and horſes, being perfectly deſtitute of every art or ſcience, or even of the knowledge of letters. In 1269, he had cauſed the Mogul characters to be contrived. In 1280, he cauſed ſome mathematicians ſearch for the ſource of the river Whang-ho, which at that time was unknown to the Chineſe themſelves. In four months time they arrived in the country where it riſes, and made a map of it, which they preſented to his majeſty. The ſame year a treatiſe on aſtronomy was publiſhed by his order; and, in 1282, he ordered the learned men to repair from all parts of the empire to examine the ſtate of literature, and take meaſures for its advancement.

At his firſt acceſſion to the crown he fixed his reſidence at Tay-ywen-fu, the capital of Shen-ſi; but thought proper afterwards to remove it to Peking. Here, being informed that the barks, which brought to court the tribute of the ſouthern provinces, or carried on the trade of the empire, were obliged to come by ſea, and often ſuffered ſhipwreck, he cauſed that celebrated canal to be made, which is at preſent one of the wonders of the Chineſe empire, being 300 leagues in length. By this canal above 9000 imperial barks tranſport with eaſe, and at ſmall expence, the tribute of grain, rice, ſilks, *&c.* which is annually paid to the court. In the third year of his reign Shi-tſu formed a deſign of reducing the iſlands of Japan, and the kingdoms of Tonkquin and Cochin-china. Both theſe enterpriſes ended unfortunately, but the firſt remarkably ſo; for of 100,000 perſons employed in it, only four or five eſcaped with the melancholy news of the deſtruction of the reſt, who all periſhed by ſhipwreck. Shi-tſu reigned 15 years, died in the 80th year of his age, and was ſucceeded by his grandſon.

42
Moguls driven out.

The throne continued in the Ywen family till the year 1367, when Shun-ti, the laſt of that dynaſty, was driven out by a Chineſe named Chu. During this period the Tartars had become enervated by long proſperity; and the Chineſe had been rouſed into valour by their ſubjection. Shun-ti, the reigning prince, was quite ſunk in ſloth and debauchery; and the empire, beſides, was oppreſſed by a wicked miniſter named Ama.

45
Exploits of Chu.

In June 1355, Chu, a Chineſe of mean extraction, and head of a ſmall party, ſet out from How-chew, paſſed the Kyang, and took Tay-ping. He then aſſociated himſelf with ſome other malcontents, at the head of whom he reduced the town of Tu-chew, in Kyang-nan. Soon after he made himſelf maſter of Nanking, having defeated the Moguls who come to its relief. In December 1356, he was able to raiſe 100,000 men, at the head of whom he took the city of U-chew, in the eaſt borders of Quang-ſi; and here, aſſembling his generals, it was reſolved neither to commit ſlaughters nor to plunder. The moſt formidable enemy he had to deal with was *Chen-yew-lyang*, ſtyled "emperor of the Han." This man being grieved at the progreſs made by Chu, equipped a fleet, and raiſed a formidable army, in order to reduce Nan-chang-fu, a city of Kyang-ſi, which his antagoniſt had made himſelf maſter of. The governor, however, found means to inform Chu of his danger; upon which that chief cauſed a fleet to be fitted out at Nanking, in which he embarked 200,000 ſoldiers. As ſoon as Chen-yew-lyang was informed of his enemy's approach, he raiſed the ſiege of Nan-chang-fu, and gave orders for attacking Chu's naval force. An engagement enſued between a part of the fleets, in which Chu proved victorious; and next day, all the ſquadrons having joined in order to come to a general engagement, Chu gained a ſecond victory, and burnt 100 of the enemy's veſſels. A third and fourth engagement happened, in both which Chu gained the victory; and in the laſt, Chen-yew-lyang himſelf was killed, his ſon taken priſoner, and his generals obliged to ſurrender themſelves, with all their forces and veſſels.

46
He is proclaimed king of U.

In January 1364, Chu's generals propoſed to have him proclaimed emperor; but this he declined, and at firſt contented himſelf with the title of king of *U*. In February he made himſelf maſter of Vu-chang-fu, capital of Hu-quang; where, with his uſual humanity, he relieved thoſe in diſtreſs, encouraged the literati, and would allow his troops neither to plunder nor deſtroy. This wiſe conduct procured him an eaſy conqueſt both of Kyang-ſi and Hu-quang. The Chineſe ſubmitted to him in crowds, and profeſſed the greateſt veneration and reſpect for his perſon and government.

47
Becomes emperor of China.

48
Moguls driven beyond the deſert.

All this time Shun-ti, with an unaccountable negligence, never thought of exerting himſelf againſt Chu, but continued to employ his forces againſt the rebels who had taken up arms in various parts of the empire; ſo that Chu found himſelf in a condition to aſſume the title of emperor. This he choſe to do at Nanking on the firſt day of the year 1368. After this his troops entered the province of Honan, which they preſently reduced. In the third month, Chu, who had now taken the title of *Hong-vu*, or *Tay-tſu*, reduced the fortreſs of Tong-quan; after which his troops entered Pecheli from Honan on the one ſide, and Shan-tong on the other. Here his generals defeated and killed one of Shun-ti's officers; after which they took the city of Tong-chew, and then prepared to attack the capital, from which they were now but 12 miles diſtant. On their approach the emperor fled with all his family beyond the great wall, and thus put an end to the dynaſty of Ywen. In 1370 he died, and was ſucceeded by his ſon, whom the ſucceſſor of Hong-vu drove beyond the Kobi or Great Deſert, which ſeparates China from Tartary. They continued their incurſions, however, for many years; nor did they ceaſe their attempts till 1583, when vaſt numbers of them were cut in pieces by the Chineſe troops.

49
China again conquered by the Tartars.

The 21ſt dynaſty of Chineſe emperors, founded in 1368 by Chu, continued till the year 1644, when they were again expelled by the Tartars. The laſt Chineſe emperor was named Whay-tſong, and aſcended the throne in 1628. He was a great lover of the ſciences, and a favourer of the Chriſtians; though much addicted to the ſuperſtitions of the Bonzes. He found himſelf engaged in a war with the Tartars, and a number of rebels in different provinces. That he might more effectually ſuppreſs the latter, he reſolved to make peace with the former; and for that end ſent one of his generals, named *Ywen*, into Tartary, at the head of an army, with full power to negociate a peace; but that traitor made one upon ſuch ſhameful terms, that the emperor refuſed to ratify it. Ywen, in order to oblige his maſter to comply with the terms made by himſelf, poiſoned his beſt and moſt faithful general, named *Mau-ven-long*; and then deſired the Tartars to march directly to Peking, by a road different from that which he took with his army. This they accordingly did, and laid ſiege to the capital. Ywen was ordered to come to its relief: but, on his arrival, was put to the torture and ſtrangled; of which the Tartars were no ſooner informed, than they raiſed the ſiege, and returned to their own country. In 1636, the rebels abovementioned compoſed four great armies, commanded by as many generals; which, however, were ſoon reduced to two, commanded by Li and Chang. Theſe agreed to divide the empire between them; Chang taking the weſtern provinces, and Li the eaſtern ones. The latter ſeized on part of Shen-ſi, and then of Honan, whoſe capital, named Kay-fong-fu, he laid ſiege to, but was repulſed with loſs. He renewed it ſix months after, but without ſucceſs; the beſieged chooſing rather to feed on human fleſh than ſurrender. The imperial forces coming ſoon after to its aſſiſtance, the general made no doubt of being able to deſtroy the rebels at once, by breaking down the banks of the Yellow River; but unfortunately the rebels eſcaped to the mountains, while the city was quite overflowed, and 300,000 of the inhabitants periſhed.

50
Unhappy fate of the emperor and his family.

After this diſaſter, Li marched into the provinces of Shen-ſi and Honan; where he put to death all the mandarins, exacted great ſums from the officers in place, and ſhowed no favour to any but the populace, whom he freed from all taxes: by this means he drew ſo many to his intereſt, that he thought himſelf ſtrong enough to aſſume the title of emperor. He next advanced towards the capital, which, though well garriſoned, was divided into factions. Li had taken care to introduce before-hand a number of his men in diſguiſe; and by theſe the gates were opened to him the third day after his arrival. He entered the city in triumph at the head of 300,000 men; whilſt the emperor kept himſelf ſhut up in his palace, buſied only with his ſuperſtitions. It was not long, however, before he found himſelf betrayed: and, under the greateſt conſternation, made an effort to get out of the palace, attended by about 600 of his guards. He was ſtill more ſurpriſed to ſee himſelf treacherouſly abandoned by them, and deprived of all hopes of eſcaping the inſults of his ſubjects. Upon this, preferring death to the diſgrace of falling alive into their hands, he immediately retired with his empreſs, whom he tenderly loved, and the princeſs her daughter, into a private part of the garden. His grief was ſo great that he was not able to utter a word; but ſhe ſoon underſtood his meaning, and, after a few ſilent embraces, hanged herſelf on a tree in a ſilking ſtring. Her huſband ſtaid only to write theſe words on the border of his veſt; "I have been baſely deſerted by my ſubjects; do what you will with me, but ſpare my people." He then cut off the young princeſs's head with one ſtroke of his ſcymitar, and hanged himſelf on another tree, in the 17th year of his reign, and 36th of his age. His prime miniſter, queens, and eunuchs, followed his example; and thus ended the Chineſe monarchy, to give place to that of the Tartars, which hath continued ever ſince.

It was ſome time before the body of the unfortunate monarch was found. At laſt it was brought before the rebel Li, and by him uſed with the utmoſt indignity; after which he cauſed two of Whey-tſong's ſons, and all his miniſters, to be beheaded; but his eldeſt ſon happily eſcaped by flight. The whole empire ſubmitted peaceably to the uſurper, except prince U-ſan-ghey, who commanded the imperial forces in the province of Lyau-tong. This brave prince, finding himſelf unable to cope with the uſurper, invited the Tartars

Tartars to his aſſiſtance, and Tſong-te their king immediately joined him with an army of 80,000 men. Upon this the uſurper marched directly to Peking; but not thinking himſelf ſafe there, plundered and burnt the palace, and then fled with the immenſe treaſure he had got. What became of him afterwards we are not told; but the young Tartar monarch was immediately declared emperor of China, his father Tſong-te having died almoſt as ſoon as he ſet his foot in that empire.

The new emperor, named *Shun-chi*, or *Xun-chi*, began his reign with rewarding U-ſan-ghey, by conferring upon him the title of King; and aſſigned him the city of Si-gnan-fu, capital of Shen-ſi, for his reſidence. This, however, did not hinder U-ſan-ghey from repenting of his error in calling in the Tartars, or, as he himſelf uſed to phraſe it, in ſending for lions to drive away dogs.” In 1674, he formed a very ſtrong alliance againſt them, and had probably prevailed if his allies had been faithful; but they treacherouſly deſerted him one after another: which ſo affected him, that he died ſoon after. In 1681 Hong-wha, ſon to U-ſan-ghey, who continued his efforts againſt the Tartars, was reduced to ſuch ſtraits that he put an end to his own life.

51
Empire totally reduced.

52
Chriſtianity firſt encouraged and then perſecuted.

During this ſpace, there had been ſome reſiſtance made to the Tartars in many of the provinces. Two princes of Chineſe extraction had at different times been proclaimed emperors; but both of them were overcome and put to death. In 1682, the whole 15 provinces were ſo effectually ſubdued, that the emperor Kang-hi, ſucceſſor to Shunc-hi, determined to viſit his native dominions of Tartary. He was accompanied by an army of 70,000 men, and continued for ſome months taking the diverſion of hunting. This he continued to do for ſome years; and in his journeys took father Verbeiſt along with him; by which means we have a better deſcription of theſe countries than could poſſibly have been otherwiſe obtained. This prince was a great encourager of learning and of the Chriſtian religion; in favour of which laſt he publiſhed a decree, dated in 1692. In 1716, however, he revived ſome obſolete laws againſt the Chriſtians; nor could the Jeſuits with all their art preſerve the footing they had got in China. The cauſes of this alteration in his reſolution are, by the miſſionaries, ſaid to have been the ſlanders of the mandarins: but, from the known character of the Jeſuits, it will be readily believed, that there was ſomething more at bottom. This emperor died in 1722, and was ſucceeded by his ſon Yon-ching; who not only gave no encouragement to the miſſionaries, but perſecuted all Chriſtians of whatever denomination, not excepting even thoſe of the imperial race. At the beginning of his reign he baniſhed all the Jeſuits into the city of Canton, and in 1732 they were baniſhed from thence into Ma-kau, a little iſland inhabited by the Portugueſe, but ſubject to China. He died in 1736; but though the Jeſuits entertained great hopes from his ſucceſſor, we have not heard that they have yet met with any ſucceſs.

Thus we have given an account of the moſt memorable tranſactions recorded in the Chineſe hiſtory. It now remains only to deſcribe the preſent ſtate of the empire and its inhabitants, according to the beſt and lateſt accounts.

53
Climate, ſoil, and produce.

The climate as well as the ſoil of this extenſive empire is very different in different parts; ſevere cold being often felt in the northern provinces, while the inhabitants of the ſouthern ones are ſcarce able to bear the heat. In general, however, the air is accounted wholeſome, and the inhabitants live to a great age.—The northern and weſtern provinces have many mountains, which in the latter are cultivated, but in the north are barren, rocky, and incapable of improvement. On the mountains of Chenſi, Honan, Canton, and Fokien, are many foreſts, abounding with tall, ſtraight trees, of different kinds, fit for building, and particularly adapted for maſts and ſhip-timber. Theſe are uſed by the emperor in his private buildings; and from theſe foreſts enormous trunks are ſometimes tranſported to the diſtance of more than 300 leagues. Other mountains contain quickſilver, iron, tin, copper, gold, and ſilver. Formerly theſe laſt were not allowed to be opened, leſt the people ſhould thereby be induced to neglect the natural riches of the ſoil; and it is certain, that, in the 15th century, the emperor cauſed a mine of precious ſtones to be ſhut, which had been opened by a private perſon. Of late, however, the Chineſe are leſs ſcrupulous, and a great trade in gold is carried on by them. Many extravagant fables are told by the Chineſe of their mountains, particularly of one in Chen-ſi which throws out flames, and produces violent tempeſts, whenever any one beats a drum or plays on a muſical inſtrument near it. In the province of Folkien is a mountain, the whole of which is an idol, or ſtatue of the god Fo. This natural coloſſus, for it appears not to have been the work of art, is of ſuch an enormous ſize, that each of its eyes is ſeveral miles in circumference, and its noſe extends ſome leagues.

54
Lakes and rivers.

China has ſeveral large lakes; the principal one is that named Poyang-hou, in the province of Kiang-ſi. It is formed by the confluence of four large rivers, extends near 100 leagues in length; and, like the ſea, its waters are raiſed into tempeſtuous waves. The empire is watered by an immenſe number of rivers of different ſizes, of which two are particularly celebrated, *viz.* the *Yang-tſe kiang*, or *ſon of the ſea*, and *Hoang-ho*, or the *Yellow river*. The former riſes in the province of Yun-nan, and paſſing through Hou-quang and Kiang-nan, falls into the eaſtern ocean, after a courſe of 1200 miles, oppoſite to the iſland of Tſon-ming, which is formed by the ſand accumulated at its mouth. This river is of immenſe ſize, being half a league broad at Nanking, which is near 100 miles from its mouth. The navigation is dangerous, ſo that great numbers of veſſels are loſt on it. It runs with a rapid current, forming ſeveral iſlands in its courſe, which are again carried off and new ones formed in different places, when the river is ſwelled by the torrents from the mountains. Theſe iſlands, while they remain, are very uſeful; producing great quantities of reeds ten or twelve feet high, which are uſed in all the neighbouring countries for fuel. The Hoang-ho, or yellow river, has its name from the yellow colour given it by the clay and ſand waſhed down in the time of of rain. It riſes in the mountains which border the province of Te-tchuen on the weſt, and after a courſe of near 600 leagues, diſcharges itſelf into the eaſtern ſea not far from the mouth of the Kiang. It is very broad and rapid, but ſo ſhallow that it is ſcarce navigable. It is very liable to inundations, often overflowing its banks, and deſtroying whole villages. For this reaſon it has been found neceſſary to confine it in ſeveral places by long and ſtrong dykes; which yet do not entirely anſwer the purpoſe. The people of Honan, therefore, whoſe land is exceedingly low, have ſurrounded moſt of their cities with ſtrong ramparts of earth faced with turf, at the diſtance of three furlongs.

55
Canals.

The Chineſe have been at great pains to turn their lakes and rivers to the advantage of commerce, by promoting an inland navigation. One of their principal works for this purpoſe, is the celebrated canal reaching from Canton to Peking, and forming a communication between the ſouthern and northern provinces. This canal extends through no leſs a ſpace than 600 leagues; but its navigation is interrupted in one place by a mountain, where paſſengers are obliged to travel 10 or 12 leagues over land. A number of other canals are met with in this and other provinces; moſt of which have been executed by the induſtry of the inhabitants of different cities and towns, in order to promote their communication with the various parts of the empire. M. Groſier remarks, that, in theſe works, the Chineſe have "ſurmounted obſtacles that perhaps would have diſcouraged any other people; ſuch, for example, is a part of a canal which conducts from *Chao-king* to *Ning-po*." Near theſe cities there are two canals, the waters of which do not communicate, and which differ ten or twelve feet in their level. To render this place paſſable for boats, the Chineſe have conſtructed a double glacis of large ſtones, or rather two inclined planes, which unite in an acute angle at their upper extremity, and extend on each ſide to the ſurface of the water. If the bark is in the lower canal, they puſh it up the plane of the firſt glacis by means of ſeveral capſtans, until it is raiſed to the angle, when by its own weight it glides down the ſecond glacis, and precipitates itſelf into the water of the higher canal with the velocity of an arrow. It is aſtoniſhing that theſe barks, which are generally very long and heavily loaden, never burſt aſunder when they are balanced on this acute angle; however, we never hear of any accident of this kind happening in the paſſage. It is true, they take the precaution of uſing for their keels a kind of wood which is exceedingly hard, and proper for reſiſting the violence of ſuch an effort.

56
Remarkable river, which partly ſinks under ground.

The following remarkable phenomenon in a Chineſe river is related by Father *le Couteux*, a French miſſionary. "Some leagues above the village Che-pai (ſays he), the river becomes conſiderably ſmaller, although none of its waters flow into any other channel; and, eight or nine leagues below, it reſumes its former breadth, without receiving any additional ſupply, excepting what it gets from a few ſmall rivulets, which are almoſt dry during the greater part of the year. Oppoſite to Che-pai it is ſo much diminiſhed, that, excepting one channel, which is not very broad, I have paſſed and repaſſed it ſeveral times by the help of a common pole. I was always ſurpriſed to find this river ſo narrow and ſhallow in that place; but I never thought of inquiring into the cauſe of it, until the loſs of a bark belonging to a Chriſtian family afforded me an opportunity. In that place where the river diminiſhes almoſt of a ſudden, it flows with great impetuoſity; and where it reſumes its former breadth it is equally rapid. At the ſixth moon, when the water was high and the wind ſtrong, the bark I have mentioned arriving above Che-pai, was driven on a ſand-bank; for between theſe two places the river is full of moveable ſands, which are continually ſhifting their ſituation. The maſter of the boat dropped his anchor until the wind ſhould abate, and permit him to continue his voyage; but a violent vortex of moveable ſand, which was caſt up from the bottom of the river, laid the bark on its ſide; a ſecond vortex ſucceeded; then a third; and afterwards a fourth, which ſhattered the bark to pieces. When I arrived at the place where this bark had been loſt, the weather was mild and ſerene; I perceived eddies in the current every where around; which abſorbed, and carried to the bottom of the river whatever floated on the ſurface; and I obſerved, at the ſame time, that the ſand was thrown violently up with a vortical motion. Above theſe eddies the water was rapid, but without any fall; and in the place below, where the river reſumes its uſual courſe, no eddies are to be ſeen, but the ſand is thrown up in the ſame violent manner; and in ſome places there are water-falls, and a kind of ſmall iſlands ſcattered at ſome diſtance from one another. Theſe iſlands which appear above the ſurface of the water, are not ſolid earth, but conſiſt of branches of trees, roots, and herbs collected together. I was told that theſe boughs roſe up from the water, and that no one knew the place from whence they came. I was informed, that theſe maſſes, which were 40 or 50 feet in extent on that ſide on which we paſſed, were immoveable, and fixed in the bottom of the river; that it was dangerous to approach them, becauſe the water formed whirlpools every where around them; that, however, when the river was very low, the fiſhermen ſometimes ventured to collect the buſhes that floated on its ſurface, and which they uſed for fuel. I am of opinion, that, at the place of the river which is above Che-pai, the water falls into deep pits, from whence it forces up the ſand with that vertical motion; and that it flows underground to the other place, eight or nine leagues below, where it carries with it all the boughs, weeds, and roots, which it waſhes down in its courſe, and thus forms thoſe iſlands which appear above its ſurface. We know there are ſome rivers that loſe themſelves entirely, or in part, in the bowels of the earth, and which afterwards ariſe in ſome other place; but I believe there never was one known to loſe part of its water below its own channel, and again to recover it at the diſtance of ſome leagues."

57
Why China is ſubject to famines, notwithſtanding its fertility.

It has already been ſaid, that China is, in general, a fertile country; and indeed all travellers agree in this reſpect, and make encomiums on the extent and beauty of its plains. So careful are the huſbandmen of this empire to loſe none of their ground, that neither incloſure, hedge, nor ditch, nay, ſcarce a ſingle tree, are ever to be met with. In ſeveral places the land yields two crops a year; and even in the interval between the harveſts, the people ſow ſeveral kinds of pulſe and ſmall grain. The plains of the northern provinces yield wheat; thoſe of the ſouthern, rice, becauſe the country is low and covered with water. Notwithſtanding all this fertility, however, the inhabitants are much more frequently afflicted with famine than thoſe of the European nations, though the countries of Europe produce much leſs than China. For this

this two cauſes are aſſigned. 1. The deſtruction of the riſing corps by drought, hail, inundations, locuſts, *&c.* in which caſe China cannot like the European countries be ſupplied by importation. This is evident by conſidering how it is ſituated with regard to other nations. On the north are the Mogul Tartars, a lazy and indolent race, who ſubſiſt principally on the fleſh of their flocks; ſowing only a little millet for their own uſe. The province of Leatong, which lies to the north-eaſt, is indeed extremely fertile, but too far diſtant from the capital and centre of the empire to ſupply it with proviſions; and beſides, all carriage is impracticable but in the winter, when great quantities of game, and fiſh, preſerved in ice, are ſent thither. No corn is brought from Corea to China; and, though the Japan iſlands are only three or four days ſailing from the Chineſe provinces of Kiang-nan and Che-kyang, yet no attempt was ever made to obtain proviſions from thence, whether it be, that the Japaneſe have nothing to ſpare, or on account of the inſults offered by theſe iſlanders to foreign merchants. Formoſa lies oppoſite to the province of Fo-kien; but ſo far is that iſland from being able to ſupply any thing, that in a time of ſcarcity it requires a ſupply from China itſelf. The province of Canton is alſo bounded by the ſea, and has nothing on the ſouth but iſlands and remote countries. One year, when rice was exceedingly ſcarce there, the emperor ſent for F. Parranin, a Jeſuit miſſionary, and aſked him if the city of Macao could not furniſh Canton with rice until the ſupply he had ordered from other provinces ſhould arrive; but was informed that Macao had neither rice, corn, fruits, herbs, nor flocks; and that it generally got from China what was neceſſary for its ſubſiſtence.—The only method, therefore, the Chineſe can take to guard againſt famines ariſing from theſe cauſes is to erect granaries and public magazines in every province and moſt of the principal cities of the empire. This has at all times been a principal object of care to the public miniſters; but though this mode of relief ſtill takes place in theory, ſo many ceremonies are to be gone through before any ſupply can be drawn from thoſe public repoſitories, that it ſeldom arrives ſeaſonably at the places where it is wanted; and thus numbers of unhappy wretches periſh for want. 2. Another cauſe of the ſcarcity of grain in this empire, is the prodigious conſumpt of it in the compoſition of wines, and a ſpirituous liquor called *rack*. But though government is well appriſed that this is one of the principal ſources of famine throughout the empire, it never employed means ſufficient to prevent it. Proclamations indeed have frequently been iſſued, prohibiting the diſtillation of rack; and the appointed officers will viſit the ſtill-houſes and deſtroy the furnaces if nothing is given them; but on ſlipping ſome money into their hands, they ſhut their eyes, and go ſomewhere elſe to receive another bribe. When the mandarin himſelf goes about, however, theſe diſtillers do not eſcape quite ſo eaſily, the workmen being whipped and impriſoned, after which they are obliged to carry a kind of collar called the *Cangue**; the maſters are likewiſe obliged to change their habitations and conceal themſelves for a ſhort time, after which they generally reſume their operations. It is impoſſible, however, that any method of this kind can prove effectual in ſuppreſſing theſe manufactories while the liquors themſelves are allowed to be ſold publicly; and againſt this there is no law throughout the empire. Our author, however, juſtly obſerves, that in caſe of a prohibition of this kind, the grandees would be obliged to deny themſelves the uſe of theſe luxuries, which would be too great a ſacrifice for the good of the empire.

*See below No. 74.

58 Immenſe population.

The population of China is ſo great, in compariſon with that of the European countries, that the accounts of it have generally been treated as fabulous by the weſtern nations; but by an accurate inveſtigation of ſome Chineſe records concerning the number of perſons liable to taxation throughout the empire, M. Groſier has ſhowed that it cannot be leſs than 200 millions. For this extraordinary population he aſſigns the following cauſes. 1. The ſtrict obſevance of filial duty throughout the empire, and the prerogatives of fraternity, which make a ſon the moſt valuable property of a father. 2. The infamy attached to the memory of thoſe who die without children. 3. The univerſal cuſtom by which the marriage of children becomes the principal concern of the parents. 4. The honours beſtowed by the ſtate on thoſe widows who do not marry a ſecond time. 5. Frequent adoptions, which prevent families from becoming extinct. 6. The return of wealth to its original ſtock by the diſinheriting of daughters. 7. The retirement of wives, which renders them more complaiſant to their huſbands, ſaves them from a number of accidents when big with child, and conſtrains them to employ themſelves in the care of their children. 8. The marriage of ſoldiers. 9. The fixed ſtate of taxes; which being always laid upon lands, never fall but indirectly on the trader and mechanic. 10. The ſmall number of ſailors and travellers. 11. To theſe may be added the great number of people who reſide in China only by intervals; the profound peace which the empire enjoys; the frugal and laborious manner in which the great live; the little attention that is paid to the vain and ridiculous prejudice of marrying below one's rank; the ancient policy of giving diſtinction to men and not to families; by attaching nobility only to employments and talents, without ſuffering it to become hereditary. And, 12. laſtly, A decency of public manners, and a total ignorance of ſcandalous intrigues and gallantry.

59 Unlimited authority of the emperor.

The government of China, according to the Abbe Groſier, is purely patriarchal. The emperor is more unlimited in his authority than any other potentate on earth; no ſentence of death, pronounced by any of the tribunals can be executed without his conſent, and every verdict in civil affairs is ſubject to be reviſed by him; nor can any determination be of force until it has been confirmed by the emperor: and, on the contrary, whatever ſentence he paſſes is executed without delay; his edicts are reſpected throughout the empire as if they came from a divinity; he alone has the diſpoſal of all offices, nor is there any ſuch thing as the purchaſe of places in China; merit, real or ſuppoſed, raiſes to an office, and rank is attached to it only. Even the ſucceſſion to the throne is not altogether hereditary. The emperor of China has a power of chooſing his own ſucceſſor without conſulting any of his nobility; and can ſelect one not only from among his own children, but even from the body of his people; and there have been ſeveral inſtances of his making uſe of this right: and he has even a power of altering the ſucceſſion after it has once been fixed, in caſe the perſon pitched upon does not behave towards him with proper reſpect. The emperor can alſo prevent the princes of the blood from exerciſing the title, with which, according to the conſtitution of the empire, they are inveſted. They may indeed, notwithſtanding this poſſeſs their hereditary dignity; in which caſe they are allowed a revenue proportioned to their high birth, as well as a palace, officers, and a court; but they have neither influence nor power, and their authority is lower than that of the meaneſt mandarin.

60 Mandarins of different claſſes.

The mandarins are of two claſſes, *viz.* thoſe of letters, and the inferior ſort, ſtyled mandarins of arms. The latter by no means enjoy the ſame conſideration with the former ſort; indeed in China the literati are highly honoured, and to their influence M. Groſier ſuppoſes that we may in a great meaſure aſcribe the mildneſs and equity of the government; though he thinks that the balance may incline rather too much in their favour. Several degrees, anſwering to thoſe of bachelor, licentiate, and doctor, muſt be paſſed through before one can attain to the dignity of a mandarin of letters; though ſometimes, by the favour of the emperor, it is conferred on thoſe who have attained only the two firſt degrees: but even the perſons who have gone through all the three, enjoy at firſt only the government of a city of the ſecond or third claſs. When ſeveral vacancies happen in the government of cities, the emperor invites to court a correſponding number of the literati, whoſe names are written down in a liſt. The names of the vacant governments are then put into a box, raiſed ſo high that the candidates are able only to reach it with their hands; after which they draw in their turns, and each is appointed governor of the city whoſe name he has drawn.

There are eight orders of theſe mandarins in China. 1. The *calao*, from whom are choſen the miniſters of ſtate, the preſidents of the ſupreme courts, and all the ſuperior officers among the militia. The chief of this order preſides alſo in the emperor's council, and enjoys a great ſhare of his confidence. 2. The *te-kioſe*, or man of acknowledged ability, is a title beſtowed upon every mandarin of the ſecond rank; and from theſe are ſelected the viceroys and preſidents of the ſupreme council in the different provinces. 3. The *tchong-tchueo*, or ſchool of mandarins, act as ſecretaries to the emperor. 4. *Y-tchuen,-tao.* Theſe keep in repair the harbours, royal lodging-houſes, and barks, which belong to the emperor, unleſs particularly engaged in ſome other office by his order. 5. The *ping-pi-tao* have the inſpection of the troops. 6. The *tun-tien-hao* have the care of the high-ways. 7. The *ho-tao* ſuperintend the rivers. 8. The *hai-tao* inſpect the ſea-coaſts.

Thus the whole adminiſtration of the Chineſe empire is intruſted to the mandarins of letters; and the homage paid by the common people to every mandarin in office, almoſt equals that paid to the emperor himſelf. This indeed flows from the nature of their government. In China it is a received opinion that the emperor is the father of the whole empire; that the governor of a province is the father of that province; and that the Mandarin who is governor of a city is alſo the father of that city. This idea is productive of the higheſt reſpect and ſubmiſſion, which is not at all leſſened by their great number; for though the mandarins of letters amount to more than 14,000, the ſame reſpect is paid to every one of them.

The mandarins of arms are never indulged with any ſhare in the government of the ſtate; however, to attain to this dignity, it is alſo neceſſary to paſs through the degrees of bachelor, licentiate, and doctor of arms. The accompliſhments neceſſary for a mandarin of arms are, ſtrength of body, with ability and readineſs in performing the various military exerciſes, and comprehending the orders requiſite for the profeſſion of arms: an examination on theſe ſubjects muſt be undergone before the candidate can obtain the wiſhed for dignity.

61 Tribunal of the mandarins of arms.

The mandarins of arms have tribunals, the members of which are ſelected from among their chiefs; and among theſe they reckon princes, counts, and dukes; for all theſe dignities, or ſomething equivalent to them, are met with in China. The principal of theſe tribunals is held at Peking, and conſiſts of five claſſes. 1. The mandarins of the rear-guard, called *heou-fou*. 2. Of the left wing, or *tſa-fou*. 3. Of the right wing, or *yeou-feou*. 4. Of the advanced main-guard, or *te-hong-fou*. 5. Of the advanced guard, or *tſien-fou*. Theſe five tribunals are ſubordinate to one named *iong-tching-fou*; the preſident of which is one of the great lords of the empire, whoſe authority extends over all the military men in the empire. By his high dignity he could render himſelf formidable even to the emperor; but to prevent this inconvenience, he has for his aſſeſſor a mandarin of letters, who enjoys the title and exerciſes the function of ſuperintendant of arms. He muſt alſo take the advice of two inſpectors who are named by the emperor; and when theſe four have agreed upon any meaſure, their reſolution muſt ſtill be ſubmitted to the reviſal of an higher court named *Ping-pou*, which is entirely of a civil nature. The chief of theſe mandarins is a general of courſe, whoſe powers are equivalent to thoſe of our commanders in chief; and below him are other mandarins who act as ſubordinate officers.

Theſe two claſſes of mandarins compoſe what is called the nobility of China; but as we have already hinted, their office is not hereditary; the emperor alone continues or confers it. They have the privilege of remonſtrating to the emperor, either as individuals or in a body, upon any part of his conduct which appears contrary to the intereſts of the empire. Theſe remonſtrances are ſeldom ill received, though the ſovereign complies with them only when he himſelf thinks proper. The number of literary mandarins in China is computed at upwards of 14,000; and thoſe of arms at 18,000; the former, however, are conſidered as the principal body in the empire; and this preference is thought to damp the military ardour of the nation in general, and to be one cauſe of that weakneſs in war for which the Chineſe are remarkable.

62 Military force.

The armies of this empire are proportioned to its vaſt extent and population; being computed in time of of peace at more than 700,000. Their pay amounts to about twopence half-penny and a meaſure of rice per day, though ſome of them have double pay, and the pay of a horſeman is double that of a foot-ſoldier; the emperor furniſhes a horſe, and the horſeman receives two meaſures of ſmall beans for his daily ſubſiſtence; the arrears of the army being punctually paid up every three months.

The arms of a horſeman are, a helmet, cuiraſs, lance, and ſabre; thoſe of a foot-ſoldier are a pike and ſabre; ſome have fuſees, and others bows and arrows. All theſe are carefully inſpected at every review; and if any of them are found in the leaſt ruſted, or otherwiſe in bad condition, the poſſeſſor is inſtantly puniſhed; if a Chineſe, with 30 or 40 blows of a ſtick; or, if a Tartar, with as many laſhes.

63 Uſe of fire-arms loſt and revived.

Though the uſe of gun-powder is certainly very ancient in China, it appears to have been afterwards totally loſt, at leaſt fire-arms ſeem to have been almoſt entirely unknown ſome centuries ago. Three or four cannon were to be ſeen at that time about the gates of Nanking; but not a ſingle perſon in China knew how to make uſe of them; ſo that, in 1621, when the city of Macao made a preſent of three pieces of artillery to the emperor, it was found neceſſary alſo to ſend three men to load them. The utility of theſe weapons was quickly perceived by the execution which the three cannon did againſt the Tartars, at that time advanced as far as the great wall. When the invaders threatened to return, the mandarins of arms gave it as their opinion, that cannons were the beſt arms they could make uſe of againſt them. They were then taught the art of caſting cannon by F. Adam Schaal and Verbieſt, two Jeſuit miſſionaries, and their artillery was increaſed to the number of 320 pieces; at the ſame time that they were inſtructed in the method of fortifying towns, and conſtructing fortreſſes and other buildings according to the rules of modern architecture.

The beſt ſoldiers in China are procured from the three northern provinces, the others being ſeldom called forth, but allowed to remain at peace with their families: indeed there is not often occaſion for exerting their military talents, unleſs it be in the quelling of an inſurrection, when a mandarin or governor uſually accompanies them. They march in a very tumultuous manner, but want neither ſkill nor agility in performing their different evolutions. They, in general, handle a ſabre well, and ſhoot very dexterouſly with bows and arrows. There are in China more than 2000 places of arms; and through the different provinces there are diſperſed about 3000 towers or caſtles, all of them defended by garriſons. Soldiers continually mount guard there; and on the firſt appearance of tumult, the neareſt centinel makes a ſignal from the top of the tower, by hoiſting a flag in the day time, or lighting a torch in the night; when the neighbouring garriſons immediately repair to the place where their preſence is neceſſary.

64 Account of the great wall.

The principal defence of the empire againſt a foreign enemy is the great wall which ſeparates China from Tartary, extending more than 1500 miles in length, and of ſuch thickneſs that ſix horſeman may eaſily ride abreaſt upon it. It is flanked with towers two bow-ſhots diſtant from one another; and it is ſaid that a third of the able bodied men in the empire were employed in conſtructing it. The workmen were ordered, under pain of death, to place the materials ſo cloſely, that not the leaſt entrance might be afforded for any inſtrument of iron; and thus the work was conſtructed with ſuch ſolidity, that it is ſtill almoſt entire, though 2000 years have elapſed ſince it was conſtructed. This extraordinary work is carried on not only through the low lands and valleys, but over hills and mountains; the height of one of which was computed by F. Verbieſt at 1236 feet above the level of the ſpot where he ſtood. According to F. Martini it begins at the gulf of Lea-tong, and reaches to the mountains near the city of Kin on the yellow river; between which places it meets with no interruption except to the north of the city of Suen in the province of Pecheli, where it is interrupted by a ridge of hedious and inacceſſible mountains, to which it is cloſely united. It is likewiſe interrupted by the river Hoang-ho; but for others of an inferior ſize, arches have been conſtructed, through which the water paſſes freely. Mr Bell informs us, that it is caracid acroſs rivers, and over the tops of the higheſt hills, without the leaſt interruption, keeping nearly along that circular range of barren rocks which incloſes the country; and, after running about 1200 miles, ends in impaſſable mountains and ſandy deſerts. The foundation conſiſts of large blocks of ſtone laid in mortar; but all the reſt is of brick. The whole is ſo ſtrong and well built, that it ſcarcely needs any repairs; and, in the dry climate in which it ſtands, may remain in the ſame condition for many ages. When carried over ſteep rocks, where no horſe can paſs, it is about 15 or 20 feet high: but when running through a valley, or croſſing a river, it is about 30 feet high, with ſquare towers and embraſures at equal diſtances. The top is flat, and paved with cut ſtone; and where it riſes over a rock or eminence, there is an aſcent made by an eaſy ſtone-ſtair. "This wall (our author adds) was begun and completely finiſhed in the ſhort ſpace of five years; and it is reported, that the labourers ſtood ſo cloſe for many miles, that they could hand the materials from one to another. This ſeems the more probable, as the rugged rocks among which it is built muſt have prevented all uſe of carriages; and neither clay for making bricks, nor any kind of cement, are to be found among them."

65 Courts by which the civil government is managed.

The whole civil government of China is managed by the following courts. 1. The emperor's grand council, compoſed of all the miniſters of ſtate, preſidents and aſſeſſors of the ſix ſovereign courts, and of three others, to be afterwards mentioned. This is never aſſembled but on affairs of the greateſt importance; the emperor's private council being ſubſtituted to it in all caſes of ſmaller moment. 2. The chief of the other courts furniſhes mandarins for the different provinces, watches over their conduct, and keeps a journal of their tranſactions, and informs the emperor of them, who rewards or puniſhes according to the report he gets.

This ſecond tribunal, which may be called a kind of civil inquiſition, is ſubdivided into four others; the firſt entruſted with the care of ſelecting thoſe who, on account of their learning or other good properties, are capable of filling the offices of government; the ſecond appointed to take care of the conduct of the mandarins; the third affixing the ſeals to the different public acts, giving the ſeals to mandarins, and examining thoſe of the different diſpatches; while the fourth enquires into the merit of the grandees of the empire, not excepting the princes of the imperial blood themſelves. The principal ſovereign court to which theſe four laſt are ſubordinate is called *Lii-pou*.

2. *Hou-pou*, or the grand treaſurer, ſuperintends all the finances of the ſtate; is the guardian and protector of the treaſures and dominions of the emperor, keeping an account of his revenues, *&c.* ſuperintending the management and coining of money; the public magazines, cuſtom-houſes; and, laſtly, keeping an exact regiſter of all the families in the empire. To aſſiſt this court, 14 others are appointed throughout the different provinces of the empire.

3. *Li-pou*, or the court of ceremonies. "It is an undoubted fact (ſays M. Groſier), that ceremonies form, in part, the baſe of the Chineſe government. This tribunal therefore takes care to ſupport them, and enforce their obſervance; it inſpects alſo the arts and ſciences. It is conſulted by the emperor when he deſigns to confer particular honours; takes care of the annual ſacrifices offered up by him, and even regulates the entertainments which he gives either to ſtrangers or his own ſubjects. It alſo receives and entertains foreign ambaſſadors, and preſerves tranquillity among the different religious ſects in the empire. It is aſſiſted by four inferior tribunals.

4. *Ping-pou*, or the tribunal of arms, comprehends in its juriſdiction the whole militia of the empire; inſpecting alſo the fortreſſes, magazines, arſenals, and ſtore-houſes of every kind, as well as the manufactories of arms both offenſive and defenſive; examining and appointing officers of every rank. It is compoſed entirely of mandarins of letters; and the four tribunals depending upon it conſiſt alſo of literati."

5. The *hong-pou* is the criminal bench for the whole empire, and is aſſiſted by 14 ſubordinate tribunals.

6. The *cong-pou*, or tribunal of public works, ſurveys and keeps in repair the emperor's palaces, as well as thoſe of the princes and viceroys, and the buildings where the tribunals are held, with the temples, tombs of the ſovereigns, and all public monuments. It has beſides the ſuperintendence of the ſtreets, public highways, bridges, lakes, rivers, and every thing relating either to internal or foreign navigation. Four inferior tribunals aſſiſt in the diſcharge of theſe duties; the firſt drawing the plans of public works: the ſecond directing the work-ſhops in the different cities of the empire; the third ſurveying the cauſeways, roads, bridges, canals, &c.; and the fourth taking care of the emperor's palaces, gardens, and orchards, and receiving their produce.

66 Partiality of government towards the Chineſe.

All thoſe tribunals are compoſed, one half of Chineſe, and the other of Tartars; and one of the preſidents of each ſuperior tribunal is always a Tartar born. None of the courts above deſcribed, however, has abſolute authority even in its own juriſdiction; nor can its deciſions be carried into execution without the concurrence of another tribunal, and ſometimes of ſeveral others. The fourth tribunal, for inſtance, has indeed under its juriſdiction the whole troops of the empire; but the payment of them is entruſted with the ſecond, while the ſixth has the care of the arms, tents, chariots, barks, and ſtores neceſſary for military operations; ſo that nothing relative to theſe can be put in execution without the concurrence of all the three tribunals.

67 Cenſors.

To prevent any lawful combination among the tribunals, each has its *cenſor* appointed. This is an officer whoſe duty is merely to watch over the proceedings of the court, without deciding upon any thing himſelf. He aſſiſts therefore at all aſſemblies, reviſes all their acts, and without acquainting the court in the leaſt with either his ſentiments or intentions, immediately informs the emperor of what he judges to be amiſs. He likewiſe gives information of the behaviour of the mandarins, either in the public adminiſtration of affairs, or in their private conduct; nay, ſometimes he will not ſcruple to reprimand the emperor for what he ſuppoſes to be erroneous in his conduct.

Theſe cenſors are never removed from their places but in order to be promoted; and thus, holding their offices for life, they have the greater courage to ſpeak out when they obſerve any impropriety or abuſe. Their accuſation is ſufficient to ſet on foot an inquiry, which generally leads to a proof; in which caſe the accuſed is diſcharged from his office, and never held in any eſtimation afterwards. The complaints of the cenſors, however, are referred to the very tribunals againſt whoſe members they complain; though, being afraid of an accuſation themſelves, they very ſeldom paſs ſentence againſt the accuſers.

Beſides all this, the cenſors alſo form a tribunal of their own, named *tou-tche-yven*. Its members have a right of remonſtrating with the emperor, whenever his own intereſt or that of the public renders it neceſſary. They inſpect all lawyers and military men in public employments. "In ſhort (ſays M. Groſier), they are, morally ſpeaking, placed between the prince and the mandarins; between the mandarines and the people; between the people and families; between families and individuals; and they generally unite to the importance of their office incorruptible probity and invincible courage. The ſovereign may, if he proceeds to rigour, take away their lives; but many of them have patiently ſuffered death, rather than betray the cauſe of truth, or wink at abuſes. It is not ſufficient therefore to have got rid of one, they muſt all be treated in the ſame manner; the laſt that might be ſpared would tread in the ſame ſteps with no leſs reſolution than thoſe who went before him. In the annals of no nation do we find an example of ſuch a tribunal, yet it appears to be neceſſary in all, without exception. We muſt not, however, imagine, that the privileges of a cenſor gave him a right to forget his duty to his ſovereign, or to communicate to the public thoſe remarks which he takes the liberty of making to him: were he only to give the leaſt hint of them to his colleagues, he would be puniſhed with death; and he would ſhare the ſame fate did he, in any of his repreſentations, ſuffer a ſingle word, inconſiſtent with moderation or reſpect, to eſcape him."

68 Two courts peculiar to China.

There are ſtill two other courts in China, both of them peculiar to the empire, which deſerve to be mentioned. The firſt is that of princes; and which, in conformity with its title, is compoſed of princes only.

In the regiſters of this tribunal are inſcribed the names of all the children of the imperial family as ſoon as they are born; and to theſe are alſo conſigned the dignities and titles which the emperor confers upon them. This is the only tribunal where the princes can be tried; and here they are abſolved or puniſhed according to the pleaſure of the judges.

The other tribunal is that of hiſtory, called by the Chineſe *han-lin-yvan*. It is compoſed of the greateſt geniuſes of the empire, and of men of the moſt profound erudition. Theſe are entruſted with the education of the heir apparent to the throne, and the compilation and arrangement of the general hiſtory of the empire; which laſt part of their office renders them formidable even to the emperor himſelf. From this body the mandarins of the firſt claſs, and the preſidents of the ſupreme claſs, are generally choſen.

69
Filial piety the baſis of all their laws:

The baſis of all the civil laws of the Chineſe is filial piety. Every mandarin, who is a governor either of a province or city, muſt inſtruct the people aſſembled round him twice a month, and recommend to them the obſervance of certain ſalutary rules, which are ſummed up in a few ſhort ſentences, and ſuch as no perſon can ever be ſuppoſed capable of forgetting.

70
Of their marriages.

The Chineſe are allowed only to have one wife, whoſe rank and age muſt be nearly equal to that of their huſbands; but they are allowed to have ſeveral concubines, whom they may admit into their houſes without any formality, after paying the parents a ſum of money, and entering into a written engagement to uſe their daughters well. Theſe concubines, however, are all in ſubjection to the lawful wife; their children are conſidered as heirs; they addreſs her as mother, and can give this title to her only. A perſon that has once been married, whether man or woman, may lawfully marry again, but it is then no longer neceſſary to ſtudy equality of age or condition. A man may chooſe his ſecond wife from among his concubines; and, in all caſes, this new marriage requires very few formalities. A widow is abſolute miſtreſs of herſelf, and can neither be compelled by her parents to marry again, nor to continue in a ſtate of widowhood, contrary to her own inclination. Thoſe of moderate rank, however, who have no children, do not enjoy the ſame privilege, as the parents of the former huſband can diſpoſe of her in marriage, not only without her conſent, but without her knowledge. The law authoriſes the diſpoſal of them in this manner, in order to indemnify the relations of the deceaſed huſband for the money they may have coſt him. If the wife is left big with child, this cannot take place, until ſhe is delivered; nor can it be done at all if ſhe brings forth a ſon. There are likewiſe two exceptions; 1. when the parents of the widow aſſign her a proper maintenance; and, 2. if the widow embraces a religious life, and becomes a bonzeſſe.

71
Divorces, unlawful marriages, &c.

Divorces are allowed in China in caſes of adultery, mutual diſlike, incompatibility of tempers, jealouſy, &c. No huſband, however, can put away or ſell his wife until a divorce is legally obtained; and if this regulation be not ſtrictly obſerved, the buyer and ſeller become equally culpable. If a wife, lawfully married, privately withdraws herſelf from her huſband, he may immediately commence an action at law; by the ſentence of which ſhe becomes his ſlave, and he is at liberty to ſell her to whom he pleaſes. On the other hand, if an huſband leaves his wife for three years, ſhe is at liberty, after laying her caſe before the mandarins, to take another huſband; but if ſhe were to anticipate their conſent, ſhe would be liable to a ſevere puniſhment.

Marriage is deemed illegal in China in the following caſes. 1. If a young woman has been betrothed to a young man, and preſents have been given and received by the parents of the intended huſband and wife. 2. If in the room of a beautiful young woman another be ſubſtituted of a diſagreeable figure; or if the daughter of a free man marry his ſlave; or if any one give his ſlave to a free woman, pretending to her parents that he is his ſon or relation. In all theſe caſes the marriage is null and void; and all thoſe who have had any ſhare in making up the match are ſeverely puniſhed.

3. Any mandarin of letters is forbidden to form an alliance with any family reſiding in the province or city of which he is governor.

4. No Chineſe youth can enter into a ſtate of marriage during the time of mourning for his father or mother; and if promiſes have been made before, they ceaſe immediately on that event taking place. After the uſual time of mourning is expired, however, the parents of the intended bride are obliged to write to thoſe of the young man, putting him in mind of his engagement.

5. Marriage is alſo ſuſpended when a family experiences any ſevere misfortune, and even if a near relation were thrown into priſon; though this may be ſet aſide, provided the unfortunate perſon give his conſent.

6. Two brothers cannot marry two ſiſters; nor is a widower at liberty to marry his ſon to the daughter of a widow whom he chooſes for his own wife. A man is alſo forbidden to marry any of his own relations, however diſtant the degree of conſanguinity may be between them.

In China every father of a family is reſponſible for the conduct of his children, and even of his domeſtics; all thoſe faults being imputed to him which it was his duty to have prevented. Every father has the power of ſelling his ſon, “provided (ſays the law) the ſon has a right of ſelling himſelf.” This cuſtom, however, is barely tolerated among the middling and inferior ranks; and all are forbidden to ſell them to comedians, or people of infamous character, or very mean ſtations.

In China a ſon remains a minor during the whole lifetime, and is even liable for the debts contracted by his father, thoſe from gaming only excepted. Adoption is authoriſed by law, and the adopted child immediately enters into all the rights of a lawful ſon; only the law gives a right to the father of making a few diſpoſitions in favour of his real children. The children, however, whether adopted or not, cannot ſucceed to the dignity or titles of their father, though they may to his eſtate. The emperor alone can confer honours; and even then they muſt be reſigned when the perſon attains the age of 70; though this reſignation is conſidered as an advice rather than a law.

law. The will of a father cannot be ſet aſide in China on account of any informality; nor can any mother in this empire make a will.

Though the Chineſe laws authoriſe ſlavery, yet the power of the maſter extends only to thoſe matters which concern his own ſervice; and he would be puniſhed with death for taking advantage of his power to debauch the wife of his ſlave.

By the laws of China huſbandmen are exempt from the payment of taxes after they have begun to till the earth to the beginning of harveſt.

72 Criminal laws in China.

In criminal matters every perſon accuſed muſt be examined before five or ſix tribunals; and whoſe enquiries are directed not only againſt him, but againſt his accuſer, and the witneſſes that appear in the cauſe. He is, however, obliged to remain in priſon during the proceſs: "but (ſays M. Groſier) the Chineſe priſons are not horrible dungeons like thoſe of ſo many other nations; they are ſpacious, and have even a degree of convenience. One of the mandarins is obliged to inſpect them frequently; and this he does with the greater punctuality, as he muſt anſwer for thoſe who are ſick. He is obliged to ſee them properly treated, to ſend for phyſicians, and to ſupply them with medicines at the emperor's expence. If any of them dies, he muſt inform the emperor, who perhaps will order ſome of the higher mandarins to examine whether the former has diſcharged his duty faithfully or not.

73 Method of inflicting the baſtinado.

The ſlighteſt puniſhment in China is the baſtinado; and the number of blows is to be determined by the degree of the offender's guilt. Twenty is the loweſt number; and in this caſe the puniſhment is conſidered as having nothing infamous in it, but being only a ſimple paternal correction. In this way the emperor ſometimes orders it to be inflicted on his courtiers; which does not prevent them from being afterwards received into favour, and as much reſpected as before. Every mandarin may inflict the baſtinado when any one forgets to ſalute him, or when he ſits in judgment in public. The inſtrument of correction is called *pan-tſee*, and is a piece of bamboo a little flatted, broad at the bottom, and poliſhed at the upper extremity, in order to manage it more eaſily with the hand. When the puniſhment is to be inflicted, the magiſtrate ſits gravely behind a table, having on it a bag filled with ſmall ſticks, while a number of petty officers ſtand around him, each furniſhed with theſe *pan-tſees*, and waiting only for his ſignal to make uſe of them. The mandarin then takes out one of the little ſticks contained in the bag, and throws it into the hall of audience. On this the culprit is ſeized and ſtretched out with his belly towards the ground; his breeches are pulled down to his heels, and an athletic domeſtic applies five ſmart blows with his *pan-tſee*. If the judge draws another ſmall ſtick from the bag, another officer ſucceeds, and beſtows five more blows; and ſo on until the judge makes no more ſignals. When the puniſhment is over, the criminal muſt throw himſelf on his knees, incline his body three times to the earth, and thank the judge for the care he takes of his education.

74 The *cangue*, or wooden collar.

For faults of a higher nature, the carrying of a wooden collar, called by the Portugueſe the *cangue*, is inflicted. This machine is compoſed of two pieces of wood hollowed out in the middle, which, when put together, leave ſufficient room for the neck. Theſe are laid upon the ſhoulders of the criminal, and joined together in ſuch a manner, that he can neither ſee his feet nor put his hands to his mouth; ſo that he is incapable of eating without the aſſiſtance of another. This diſagreeable burden he is obliged to carry day and night; its weight is from 50 to 200 pounds, according to the enormity of the crime, to which the time of carrying it is alſo proportioned. For robbery, breaking the peace, or diſturbing a family, or being a notorious gambler, it is generally carried three months. During all this time the criminal is not allowed to take ſhelter in his own houſe, but is ſtationed for a certain ſpace of time, either in ſome public ſquare, the gate of a city or temple, or perhaps even of the tribunal where he was condemned. On the expiration of his term of puniſhment, he is again brought before the judge, who exhorts him in a friendly manner to amend; and after giving him 20 ſound blows diſcharges him.

75 Baniſhment, &c.

Baniſhment is infliction for crimes of a nature inferior to homicide, and the duration is often for life, if the criminals be ſent into Tartary. Some culprits are condemned to drag the royal barks for three years, or to be branded in the cheeks with a hot iron, indicating the nature of their tranſgreſſions. Robbery between relations is more ſeverely puniſhed than any other; and that is accounted the moſt atrocious where younger brothers or nephews appropriate to themſelves beforehand any part of the ſucceſſion in which they have a right to ſhare with their elder brothers or nephews.

76 Puniſhment of informers againſt parents, &c.

Information againſt a father or mother, grandfather or grandmother, uncle or eldeſt brother, even though the accuſation be juſt, is puniſhed with 100 blows of the pan-tſee, and three years baniſhment. If the accuſation be falſe, it is puniſhed with death. Deficiency in proper filial reſpect to a father, mother, grandfather, or grandmother, is puniſhed with 100 blows of the pan-tſee; abuſive language to theſe relations is death by ſtrangling; to ſtrike them is puniſhed by beheading; and if any one preſumes to hurt or maim them, his fleſh is torn from his bones with red hot pincers, and he is cut into 1000 pieces. Abuſing an elder brother is puniſhed with 100 blows of the pan-tſee; ſtriking him, with the puniſhment of exile.

77 Capital puniſhments, how inflicted.

Homicide, even though accidental, is puniſhed with death in China. A rope about ſix or ſeven feet in length, with a running nooſe, is thrown over the criminal's head; and a couple of domeſtics belonging to the tribunal pull it ſtrongly in different directions. They then ſuddenly quit it, and in a few moments give a ſecond pull; a third is ſeldom neceſſary to finiſh the buſineſs. Beheading is accounted in China the moſt diſhonourable of all puniſhments, and is reſerved only for deſperate aſſaſſins, or thoſe who commit ſome crime equally atrocious with murder. To be cut in a thouſand pieces is a puniſhment inflicted only upon ſtate criminals or rebellious ſubjects. It is performed by tying the criminal to a poſt, ſcalping the ſkin from the head, and pulling it over the eyes. The executioner then tears the fleſh from different parts of the unhappy wretch's body; and never quits this horrible employment till mere fatigue obliges him to give over: the remains of the body are then left to the barbarous ſpectators, who finiſh what he has begun. Though this puniſhment, however, has been inflicted by ſome emperors with all the dreadful circumſtances juſt mentioned, the law orders only the criminal's belly to be opened, his body to be cut into ſeveral peices, and then thrown into a ditch or river.

The torture, both ordinary and extraordinary, is uſed in China. The former is applied to the hands or feet: for the hands, ſmall pieces of wood are applied diagonally between the fingers of the criminal; his fingers are then tied cloſe with cords, and he is left for ſome time in that painful ſituation. The torture for the feet is ſtill worſe. An inſtrument, conſiſting of three croſs pieces of wood, is provided, that in the middle being fixed, the others moveable. The feet of the criminal are then put into this machine, which ſqueezes them ſo cloſe that the ancle bones become flat. The extraordinary torture conſiſts in making ſmall gaſhes in the body, and then tearing off the ſkin like thongs. It is never applied but for ſome great crime, ſuch as treaſon, or where the criminal's guilt has been clearly proved, and it is neceſſary to make him diſcover his accomplices.

78
M. Groſier's general view of the Chineſe laws.

Notwithſtanding thoſe dreadful puniſhments, M. Groſier is at great pains to prove that the laws of the Chineſe, with regard to criminal matters, are extremely mild. "One law (ſays he) will no doubt appear exceedingly ſevere and rigorous; it inflicts the puniſhment of death on thoſe who uſe pearls. Thoſe who read the hiſtory of China will be apt to fall into certain miſtakes reſpecting the penal laws of that nation. Some of its ſovereigns have indulged themſelves in gratifying ſanguinary caprices which were not authoriſed by the laws, and which have often been confounded with them: but theſe princes are even yet ranked among the number of tyrants, and their names are ſtill abhorred and deteſted throughout the whole empire. The Chineſe, in their criminal procedure, have a great advantage over all other nations: it is almoſt impoſſible that an innocent man ſhould ever become a victim to a falſe accuſation: in ſuch caſes the accuſer and witneſs are expoſed to too much danger. The ſlowneſs of the proceſs, and the numberleſs reviſions it undergoes, are another ſafeguard for the accuſed. In ſhort, no ſentence of death is ever carried into execution until it has been approved and confirmed by the emperor. A fair copy of the whole proceſs is laid before him; a number of other copies are alſo made out, both in the Chineſe and Tartar languages, which the emperor ſubmits to the examination of a like number of doctors, either Tartars or Chineſe. When the crime is of great enormity, and clearly proved, the emperor writes with his own hand at the bottom of the ſentence, "When you receive this order, let it be executed without delay." In caſes where the crime, though puniſhable by death according to law, is ranked in the ordinary claſs, the emperor writes at the bottom of the ſentence, "Let the criminal be detained in priſon, and executed in autumn;" that being the ſeaſon in which they are generally executed, and all on the ſame day.

79
Caſes in which crimes may be pardoned.

The emperor of China never ſigns an order for the execution of a criminal till he has prepared himſelf by faſting. Like other monarchs he has the power of giving pardons; but in this reſpect is much more limited than any other. The only caſes in which the Chineſe monarch can remit the puniſhment inflicted by law, are, 1. To the ſon of a widow who has not married again; 2. To the heir of an ancient family; 3. The deſcendents of great men or citizens who have deſerved well of their country; and, 4. laſtly, the ſons, or grandſons of a mandarin, who has become illuſtrious, and diſtinguiſhed himſelf by faithfully diſcharging the duties of his office. Neither a child, nor a man of very advanced age, can be cited before a tribunal. The ſon of a very aged father and mother is pardoned, if private property or the public peace be not hurt by giving him a pardon; and if the ſons of ſuch a father and mother be all guilty, or accomplices in the ſame crime, the youngeſt is pardoned in order to comfort his parents.

In China the accuſed are always treated with tenderneſs and lenity, being accounted innocent until their guilt be clearly proved; and even then, liberty excepted, they are ſcarce allowed to want for any thing. A jailor is puniſhed who behaves rigorouſly towards his priſoners; and the judges muſt likewiſe anſwer at their peril for any additions to the ſeverity of the law: depoſition being the ſlighteſt puniſhment inflicted upon them.

Subſtitution is ſometimes allowed by the laws of China; ſo that the near relation of a guilty perſon may put himſelf into the criminal's place, provided, however, that the chaſtiſement be ſlight, and the accuſed his ancient friend. The ſons, grandſons, wife, and brothers of a baniſhed Chineſe, are allowed to follow him into exile; and the relations of all perſons are permitted to viſit them in priſon, and to give them every aſſiſtance in their power; to do which good offices they are even encouraged, inſtead of being prevented.

80
Of the cities and their government.

Every city in China is divided into different quarters, each of which is ſubjected to the inſpection of a certain officer, who is anſwerable for whatever paſſes in the place under his juriſdiction. Fathers of families, as we have already obſerved, are anſwerable for the conduct of their children and domeſtics. Neighbours are even obliged to anſwer for one another, and are bound to give every help and aſſiſtance in caſes of robery, fire, or any accident, eſpecially in the night-time. All the cities are furniſhed with gates, which are barricaded on the commencement of night. Centinels are alſo poſted at certain diſtances throughout the ſtreets, who ſtop all who walk in the night, and a number of horſemen go round the ramparts for the ſame purpoſe; ſo that it is almoſt impoſſible to elude their vigilance by favour of the darkneſs. A ſtrict watch is alſo kept during the day time; and all thoſe who give any ſuſpicion by their looks, accent, or behaviour, are immediately carried before a madarin, and ſometimes even detained until the pleaſure of the governor be known.

Private quarrels do not often happen in China, and it is rare that they are attended with a fatal iſſue. The champions ſometime decide the quarrel with their fiſts, but moſt frequently refer the caſe to a mandarin, who very often orders them both a ſound drubbing. None but military people are permitted to wear arms in public; and this privilege is extended even to them only during the time of war, or when they accompany a mandarin, mount guard, or attend a review. Proſtitutes are not allowed to remain within the walls of a city, or to keep a houſe of their own even in the ſuburbs. They may, however, lodge in the houſe of another: but that other is accountable for every diſturbance which may happen on their account.

81
Borrowing of money.

In all the Chineſe cities, and even in ſome of their ordinary towns, there is an office where money may be borrowed upon pledges at the common rate of the country; which, however, is no leſs than 30 *per cent.* Every pledge is marked with a number when left at the office, and muſt be produced when demanded: but it becomes the property of the office if left there a ſingle day longer than the term agreed upon for the payment of the money. The whole tranſaction remains an inviolable ſecret; not even the name of the perſon who leaves the pledge being inquired after.

82
Of the Chineſe roads.

Great attention is paid by the adminiſtration of China to the conveniency of travellers. The roads are generally very broad, all of them paved in the ſouthern provinces, and ſome in the northern; but neither horſes nor carriages are allowed to paſs along theſe. In many places valleys have been filled up, and rocks and mountains cut through, for the purpoſe of making commodious high ways, and to preſerve them as nearly as poſſible on a level. They are generally bordered with very lofty trees, and in ſome places with walls eight or ten feet high, to prevent travellers from going into the fields; but openings are left in proper places, which give a paſſage into croſs roads that lead to different villages. Covered ſeats are erected on all the great roads, where travellers may ſhelter themſelves from the inclemency of the weather; temples and pagods are alſo frequent, into which travellers are admitted without ſcruple in the day-time, but often meet with a refuſal in the night. In theſe mandarins only have a right to reſt themſelves as long as they think proper. There is, however, no want of inns on the great roads, or even the croſs ones in China; but they are ill ſupplied with proviſions: and thoſe who frequent them are even obliged to carry beds along with them to ſleep on, or elſe take up with a plain mat.

Towers are erected on all the roads of this great empire, with watch-boxes on the top, with flag-ſtaffs, for the convenience of ſignals, in caſe of any alarm. Theſe towers are ſquare, and generally conſtructed of brick, but ſeldom exceed twelve feet in height. They are built, however, in ſight of one another, and are guarded by ſoldiers, who run with great ſpeed from one to another, carrying letters which concern the emperor. Intelligence of any remarkable event is alſo conveyed by ſignals; and thus the court is informed with ſurpriſing quickneſs of any important matter. Thoſe which are built on any of the roads conducting to court, are furniſhed with battlements, and have alſo very large bells of caſt iron. According to law theſe towers ſhould be only five *lys*, about half a French league, diſtant from one another.

83
Method of conveyance.

There is no public poſt-office in China, though ſeveral private ones have been eſtabliſhed; but the couriers and offices charged with diſpatches for the empire have only a right to make uſe of them. This inconvenience, however excepted, travellers find conveyance very eaſy from one part of China to another. Great numbers of porters are employed in every city, all of whom are aſſociated under the conduct of a chief, who regulates all their engagements, fixes the price of their labour, receives their hire, and is reſponſible for every thing they carry. When porters are wanted, he furniſhes as many as may be neceſſary, and gives the ſame number of tickets to the traveller; who returns one to each porter when they have conveyed their loads to an appointed place. Theſe tickets are carried back to the chief, who immediately pays them from the money he received in advance. On all the great roads in China there are ſeveral offices of this kind, which have a ſettled correſpondence with others; the travellers therefore have only to carry to one of theſe offices a liſt of ſuch things as they wiſh to have tranſported: this is immediately written down in a book; and though there ſhould be occaſion for two, three, or four hundred porters, they are inſtantly furniſhed. Every thing is weighed before the eyes of their chief, and the hire is five pence per hundred weight for one day's carriage. An exact regiſter of every thing is kept in the office; the traveller pays the money in advance, after which he has no occaſion to give himſelf any farther trouble: on his arrival at the city he deſigns, his baggage is found at the correſponding office, and every thing is delivered to him with the moſt ſcrupulous exactneſs.

84
Cuſtom-houſes.

The cuſtom-houſes are here regulated by the general police of the country; and according to M. Groſier's account, theſe cuſtom-houſe officers are the moſt civil in the world. They have no concern with any claſs of people but the merchants, whom they take care not to diſtreſs by any rigorous exactions; neither, though they have authority to do ſo, do they ſtop travellers till their baggage is examined, nor do they even require the ſmalleſt fee from them. Duties are paid either by the piece or the load; and in the former caſe credit is given to the merchant's book without aſking any queſtions. A mandarin is appointed by the viceroy of each province to inſpect the cuſtom-houſes of the whole diſtrict; and the mandarins have alſo the care of the poſt-offices.

85
Money of the empire.

In former times the only money uſed in China was made of ſmall ſhells, but now both ſilver and copper coin are met with. The latter conſiſts of round pieces about nine-tenths of an inch (A) in diameter, with a ſmall ſquare hole in the middle, inſcribed with two Chineſe words on one ſide, and two Tartar ones on the other. The ſilver pieces are valued only by their weight. For the convenience of commerce, the metal is therefore caſt into plates of different ſizes; and for want of ſmall coin, a Chineſe always carries about

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(A) The Chineſe foot is longer by one hundredth part than the French, and the inch is divided into ten parts.

about him his ſcales, weights, and a pair of ſciſſars to cut the metal. This operation is performed by putting the ſilver between the ſciſſars, and then knocking them againſt a ſtone till the pieces drop off. In giving of change, however, people have no right to value ſilver by the numerical value of copper, this being entirely regulated by the intrinſic value of the metals. Thus, an ounce of ſilver will ſometimes be worth 1000 copper pieces, and ſometimes only 800; and thus the copper money of China may frequently be ſold for more than it would paſs for in commerce. The emperor would loſe much by this recoinage, were he not the ſole proprietor of all the copper mines in China. It is, however, expreſsly forbidden to employ copper coin in any manufacture where it might be employed as plain copper, and it is alſo forbidden to be ſold for the purpoſe of melting: but, if the price of the metal has not fallen, the infraction of this law is not very ſeverely puniſhed. On the other hand, if the value of unwrought copper exceeds that of the coin, a quantity of the latter is iſſued out to reſtore the equilibrium.

To keep up a conſtant circulation of all the coin in the empire, the Chineſe government are attentive to preſerve an equilibrium between the proportional value of the gold and ſilver; that is, to regulate the intrinſic value of each in ſuch a manner that the poſſeſſor of ſilver may not be afraid to exchange it for copper, nor the poſſeſſor of copper for ſilver. The method uſed for this purpoſe is, when ſilver becomes ſcarce, to make all the payments for ſome time in ſilver; but if copper, to make them all for ſome time in that metal only.

86 Of the Chineſe commerce.

The commerce of China is under the inſpection of the tribunal of finances; but on this ſubject the Chineſe entertain an opinion quite different from that of the Europeans. Commerce, according to them, is only uſeful as far as it eaſes the people of their ſuperfluities, and procures them neceſſaries. For this reaſon they conſider even that which is carried on at Canton as prejudicial to the intereſt of the empire. "They take from us (ſay the Chineſe) our ſilks, teas, and porcelain: the price of theſe articles is raiſed through all the provinces: ſuch a trade therefore cannot be beneficial. The money brought us by Europeans, and the high-priced baubles that accompany it, are mere ſuperfluities to ſuch a ſtate as ours. We have no occaſion for more bullion than what may be neceſſary to anſwer the exigencies of government, and to ſupply the relative wants of individuals. It was ſaid by Kouan-tſe, two thouſand years ago, That the money introduced does not enrich a kingdom in any other way than as it is introduced by commerce. No commerce can be advantageous long, but that which conſiſts in a mutual exchange of things neceſſary or uſeful. That trade, whether carried on by barter or money, which has for its object the importing of articles that tend to the gratification of pride, luxury, or curioſity, always ſuppoſes the exiſtence of luxury: but luxury, which is an abundance of ſuperfluities among certain claſſes of people, ſuppoſes the want of neceſſaries among a great many others. The more horſes the rich put to their carriages, the greater will be the number of thoſe who are obliged to walk on foot; the larger and more magnificent their houſes are, ſo much the more confined and wretched muſt thoſe of the poor be; and the more their tables are covered with a variety of diſhes, the more muſt the number of thoſe increaſe who are reduced to the neceſſity of feeding upon plain rice. Men, united by ſociety in a large and populous kingdom, can employ their induſtry, talents, and economy, to no better purpoſe than to provide neceſſaries for all, and procure convenience for ſome."

87 Hiſtory of the trade with Ruſſia.

The only commerce conſidered by the Chineſe as advantageous to their empire, is that with Ruſſia and Tartary; by which they are ſupplied with thoſe furs ſo neceſſary in the northern provinces. The diſputes concerning the limits of the reſpective empires of Ruſſia and China ſeem to have paved the way to this commerce. Theſe diſputes were ſettled by treaty on the 27th of Auguſt 1689, under the reign of Ivan and Peter Alexiowitz. The chief of the embaſſy on the part of Ruſſia was Golovin governor of Siberia; and two Jeſuits were deputed on the part of the emperor of China; and the conferences were held in Latin, with a German in the Ruſſian ambaſſador's train, who was acquainted with that language. By this treaty the Ruſſians obtained a regular and permanent trade with China, which they had long deſired; but in return they yielded up a large territory, beſides the navigation of the river Amour. The firſt intercourſe had taken place in the beginning of the 17th century; at which time a ſmall quantity of Chineſe merchandize was procured by ſome Ruſſian merchants from the Kalmuck Tartars. The rapid and profitable ſale of theſe commodities encouraged certain Siberian Wayvodes to attempt a direct and open communication with China. For this purpoſe ſeveral deputations were ſent to the emperor; and though they failed of obtaining the grant of a regular commerce, their attempts were attended with ſome conſequences of importance. Thus the Ruſſian merchants were tempted to ſend traders occaſionally to Peking; by which means a faint connection was preſerved with that metropolis. This commerce, however, was at laſt interrupted by the commencement of hoſtilities on the river Amour; but after the concluſion of the treaty in 1689, was reſumed with uncommon alacrity on the part of the Ruſſians: and the advantages thence ariſing were found to be ſo conſiderable, that a deſign of enlarging it was formed by Peter the Great. Iſbrand Ides, a native of the duchy of Holſtein, then in the Ruſſian ſervice, was therefore diſpatched to Peking in 1692; by whoſe means the liberty of trade, before confined to individuals, was now extended to caravans. In the mean time, private merchants continued to trade as before, not only with the Chineſe, but alſo at the head quarters of the Mogul Tartars. The camp of theſe roving Tartars, which was generally ſtationed near the confluence of the Orhon and Toula rivers between the ſouthern frontiers of Siberia and the Mogul deſert, thus became the ſeat of an annual fair. Complaints, however, were ſoon made of the diſorderly behaviour of the Ruſſians; on which the Chineſe monarch threatened to expel them from his dominions entirely, and to allow them neither to trade with the Chineſe nor Moguls. This produced another embaſſy to Peking in 1719, when matters were again adjuſted to the

the ſatisfaction of both parties. The reconciliation, was of no long duration; for the Ruſſians having ſoon renewed their diſorderly behaviour, an order for their expulſion was iſſued in 1722, and all intercourſe between the two nations forbidden. The differences were once more made up in 1727, and a caravan allowed to go to Peking once in three years, provided it conſiſted of no more than 100 perſons; and that during their ſtay their expences ſhould not, as formerly, be defrayed by the emperor of China. The Ruſſians at the ſame time obtained permiſſion to build a church within the precincts of the caravanſary; and that four prieſts were allowed to reſide at Peking for the celebration of divine ſervice; the ſame indulgence being granted to ſome Ruſſian ſcholars, for the purpoſe of learning the Chineſe language, and qualifying themſelves for being interpreters between the two nations. This intercourſe continued till the year 1755; ſince which time no more caravans have been ſent to China. It was firſt interrupted by a miſunderſtanding betwixt the two courts; and though that difference was afterwards made up, no caravans have been ſent ever ſince. The empreſs of Ruſſia, ſenſible that the monopoly of the fur trade (which was entirely confined to the caravans belonging to the crown, and prohibited to individuals) was prejudicial to commerce, gave it up in favour of her ſubjects in 1762; and the centre of commerce betwixt the two nations is now at Kiatka. Here the trade is entirely carried on by barter. The Ruſſians are prohibited from exporting their own coin; finding it more advantageous to take goods in exchange than to receive bullion at the Chineſe ſtandard. The principal exports from Ruſſia are furs of different kinds; the moſt valuable of which are thoſe of ſea-otters, beavers, wolves, foxes, martins, ſables, and ermines; the greater part of which are brought from Siberia and the newly diſcovered iſlands; but as they cannot ſupply the demand, there is a neceſſity for importing foreign furs to Peterſburgh, which are afterwards ſent to Kiatka. Various kinds of cloth are likewiſe ſent to China, as well as hardware, and live cattle, ſuch as horſes, camels, &c. The exports from China are, raw and manufactured ſilk, cotton, porcelain, rhubarb, muſk, &c. The government of Ruſſia likewiſe reſerves to itſelf the excluſive privilege of purchaſing rhubarb. It is brought to Kiatka by ſome Bukharian merchants, who have entered into a contract to ſupply the crown with it in exchange for furs: the exportation of the beſt rhubarb is forbidden under ſevere penalties, but yet is procured in ſufficient quantities, ſometimes by clandeſtinely mixing it with inferior roots, and ſometimes by ſmuggling it directly. Great part of Europe is ſupplied with rhubarb from Ruſſia.

88
Emperor's revenue.

The revenue of the emperor of China amounts to more than 41 millions ſterling; and might eaſily be increaſed, did the ſovereign incline to burden his ſubjects with new impoſitions. The annual expences of government are indeed immenſe, but they are regulated in ſuch a manner as never to be augmented but in caſes of the utmoſt neceſſity; it even happens very often that adminiſtration makes greater ſavings every year. When this happens to be the caſe, the ſurplus ſerves to increaſe the general treaſure of the empire, and prevents the neceſſity of new impoſitions in time of war, or other public calamities. The greater part of the taxes are paid in kind; thoſe, for inſtance, who breed ſilk worms, pay their taxes in ſilk, the huſbandmen in grain, the gardeners in fruits, &c. This method, at the ſame time that it is exceedingly convenient for the ſubject, is no way detrimental to the public intereſt. There are numbers of people every where in the ſervice of government, who are thus furniſhed with food and clothing; ſo that the commodities collected as taxes are almoſt conſumed in the provinces where they are levied; what remains is ſold for the behoof of the emperor, and the money depoſited in the imperial treaſury. The taxes paid in money ariſe principally from the cuſtoms and ſale of ſalt (which belongs entirely to the emperor), from the duties paid by veſſels entering any port, and from other impoſts on various branches of manufactures. Excepting theſe, the trader ſcarcely contributes any thing to the exigencies of the ſtate, and the mechanic nothing at all; the whole burden of taxation thus falling upon the huſbandman. This burden is regulated in proportion to the extent and fertility of his lands; and the greateſt care has been taken to manage matters ſo, that he may neither be overcharged in the impoſition nor haraſſed in the levying of the duties. "The regiſtering of lands (ſays M. Groſier), ſo often and to no purpoſe projected in France, has been long practiſed in this empire, notwithſtanding its prodigious extent."

89
Of the taxes in China.

The levying of taxes in China is as ſimple as the nature of the thing will admit of. The duties levied from towns and villages are carried to cities of the third claſs; then they are conducted to thoſe of the ſecond; then to thoſe of the firſt; and at laſt to the capital. The levying and impoſition of taxes is ſubmitted to the tribunal of finances; and matters are ſo managed, that beſides the conſumption in each diſtrict for diſcharging the ordinary expences of government, ſomething is left by way of reſerve for anſwering accidental demands, and to be ready in caſes of neceſſity. This ſum becomes gradually leſs from the capital to cities of the firſt, ſecond, and third claſs. A proper ſtatement of what is paid in the provinces, of what is reſerved in the different cities, or contained in the different treaſuries of the empire, is ſubjected to the examination of the grand tribunal of finances. This reviſes the whole, and keeps an exact account of what is conſumed, and of whatever ſurplus may be left.

90
Of lending money, and deficiencies in paying intereſt.

Lending money upon intereſt has been in uſe in China for about 2000 years. It has often been aboliſhed, and as often eſtabliſhed. The intereſt, as has been already hinted, is no leſs than 30 *per cent.* and the year is only lunar. A tenth part of this intereſt is paid monthly; and concerning neglects of payment, the following laws have been enacted. "However much the debt may have accumulated by months or years, the principal and intereſt ſhall remain always the ſame. Whoever infringes this law ſhall receive 40 blows of a *pan-tſee*; or an hundred, if he uſes any artifice to add the principal and intereſt together." This law is explained by the following. "Whoever ſhall be convicted before a mandrain of not having paid a month's intereſt, ſhall receive ten blows; twenty for two months, and thirty for three; and in this manner as far as ſixty; that is to ſay, to the ſixth month. The debtor is then obliged to pay principal and intereſt; but thoſe who obtain payment by uſing violence and force, are condemned to receive 24 blows.

Many Chineſe writers have endeavoured unſucceſsfully to ſhow why government ſhould allow ſuch exorbitant intereſt to be taken for money; but the moſt ſatisfactory and rational account ſeems to be, that the great intereſt of money prevents the rich from purchaſing much land; as landed eſtates would only embarraſs and impoveriſh them, their produce being ſo much inferior to that of money. The patrimony of a family in China is ſeldom divided; and it never happens there, as in almoſt every other country, that wealth and riches are engroſſed by one part of the nation, while the other poſſeſſes nothing.

91 Agriculture greatly encouraged.

92 Ceremony of the emperor tilling the earth with his own hands.

Agriculture is by the Chineſe conſidered as the firſt and moſt honourable of all profeſſions; ſo that in this empire the huſbandman enjoys many and great privileges, while the merchant and mechanic are much leſs eſteemed. Part of the crop is allowed to be uſed in diſtillation; but if the harveſt happens to be bad, this operation is prohibited. In China, the tillage of the earth is not only encouraged by law, but alſo by the example of the emperor, who annually tills the earth with his own hands. The beginning of ſpring in China is always reckoned to be in the mouth of February; but it belongs to the tribunal of mathematics to determine the preciſe day. The tribunal of ceremonies announces it to the emperor by a memorial; in which every thing requiſite to be done by him is mentioned with the moſt ſcrupulous exactneſs. The ſovereign then names 12 of the moſt illuſtrious perſons in his court to accompany him, and to hold the plough after he has performed his part of the ceremony. Among theſe there are always three princes of the blood, and nine preſidents of ſupreme courts; and if any of them are too old and infirm to undergo the fatigue, the ſubſtitutes muſt be authoriſed by the emperor. The feſtival is preceded by a ſacrifice, which the emperor offers up to *Chang-ti* (the ſupreme God); after which he and his attendants prepare themſelves by three days faſting and continence. Others are appointed by the emperor, on the evening before the ceremony, to go and proſtrate themſelves at the ſepulchre of his anceſtors, and to acquaint them, that, on the day following, he intends to celebrate a grand ſacrifice. This is offered up on a ſmall mount a few furlongs diſtant from the city, which, by the indiſpenſable rules of the ceremony, muſt be 50 feet in height. The Chang-ti is invoked by the emperor, who ſacrifices under the title of ſovereign pontiff, and prays for an abundant harveſt in favour of his people. He then deſcends, accompanied by the three princes and nine preſidents who are to put their hands to the plough along with him; the field ſet apart for this purpoſe being at a ſmall diſtance from the mount. Forty labourers are ſelected to yoke the oxen, and to prepare the ſeeds which the emperor is to ſow; and which are of five different kinds, viz. wheat, rice, two kinds of millet, and beans. They are brought to the ſpot in magnificent boxes, carried by perſons of the moſt diſtinguiſhed rank. The emperor then lays hold of the plough, and turns up ſeveral furrows; the princes of the blood do the ſame, and then the preſidents; after which the emperor throws into the furrows the five kinds of ſeeds already mentioned: laſtly, four pieces of cotton-cloth, proper for making dreſſes, are diſtributed to each of the labourers, who aſſiſt in yoking the oxen and preparing the ſeeds; and the ſame preſents are made to 40 other perſons who have only been ſpectators of the ceremony.

93 Of the peaſants.

“We muſt not (ſays M. Groſier) judge of the Chineſe peaſants from thoſe of Europe, eſpecially in what relates to the lights acquired by education. Free ſchools are very numerous in every province of China, and even ſome of the villages are not deſtitute of this advantage. The ſons of the poor are there received as readily as thoſe of the rich; their duties and their ſtudies are the ſame; the attention of the maſters is equally divided between them; and from this obſcure ſource talents often ſpring, which afterwards make a conſpicuous figure on the grand ſtage of life. Nothing is more common in China than to ſee the ſon of a peaſant governor of that province in which his father had long toiled in cultivating only a few acres. The father himſelf, if taken from his plough, and elevated to a ſuperior ſphere, might, by reviving the inſtruction he received in his youth, and eſpecially if he be endowed with genius, find himſelf fully competent for his new employment.”

94 Groſier's defence of the Chineſe from the charge of murdering and expoſing their children.

The Chineſe have been greatly reproached with the inhuman practice of murdering their children; but though our author cannot deny that they are guilty of this practice, he excuſes them by ſaying, that “the crime when committed in China is commonly owing to the fanaticiſm of idolatry; a fanaticiſm which prevails only among the loweſt of the people. It is either in obedience to the oracle of a bonze, to deliver themſelves from the power of magic ſpells, or to diſcharge a vow, that theſe infatuated wretches precipitate their children into the river: they imagine that, by doing ſo, they make an expiatory ſacrifice to the ſpirit of the river. All nations of antiquity almoſt have diſgraced themſelves by the like horrid practices; but the Chineſe are far from countenancing this barbarity on that account. Beſides, theſe criminal ſacrifices are never practiſed but in certain cantons of China, where the people, blinded by idolatry, are the dupes of prejudice, fanaticiſm, and ſuperſtition.—It often happens alſo, that the bodies of thoſe children which are ſeen floating on the water have not been thrown into it till after their death; and this is likewiſe the caſe with thoſe which are found in the ſtreets, or lying near the public roads. The poverty of the parents ſuggeſts this diſmal reſource, becauſe their children are then buried at the expence of the public. Expoſing of children in public places is a cuſtom tolerated in China; and government employs as much vigilance to have them carried away in the morning, as it beſtows care on their education. This is certainly giving people intimation to expoſe their children in the night-time, and no doubt encourages the practice; but the dictates of humanity are here united to thoſe of ſound policy. No law in China authoriſes mutilation: there are indeed eunuchs in the empire, but their number is much leſs than what it is generally ſuppoſed to be by Europeans. The greater part of the eunuchs belonging to the emperor and empreſſes have no higher employment than that of ſweeping the courts of juſtice.”

95 Gazette of Peking.

Like the capital cities of European kingdoms, Peking, the metropolis of the Chineſe empire, is furniſhed with a gazette, which circulates into the remoteſt provinces, and which is even conſidered by adminiſtration as an eſſential part of the political conſtitution. It is printed daily at Peking, and contains an account of all thoſe objects to which the attention of adminiſtration is directed. In this gazette may be ſeen the names of all thoſe mandarins who are ſtripped of their employments, and the cauſes of their diſgrace; it mentions alſo the names of all thoſe delinquents who are puniſhed with death; of the officers appointed to fill the places of the diſgraced mandarins; the calamities which have afflicted any of the provinces; the relief given by government; and the expences incurred by adminiſtration for the ſubſiſtence of the troops, ſupplying the wants of the people, repairing or erecting public works; and, laſtly, the remonſtrances made to the ſovereign by the ſuperior tribunals, either with regard to his public deciſions or private conduct, and ſometimes even with regard to both. Nothing, however, is contained in this gazette that has not immediately come from the emperor, or been ſubmitted to his inſpection; and immediate death would be the conſequence of inſerting a falſehood in this miniſterial paper.

96 Seals of the emperor, mandarins, &c.

No law or ſentence, as has already been ſaid, is of any force, until the emperor's ſeal has been affixed to it. This is about 8 inches ſquare, and is made of fine jaſper, a kind of precious ſtone much eſteemed in China; of which only the emperor is allowed to have a ſeal. Thoſe given to princes as marks of honour are compoſed of gold; the ſeals of the viceroys and great mandarins, of ſilver; while thoſe of inferior mandarins and magiſtrates are made only of lead or copper. The ſize of thoſe ſeals is greater or ſmaller according to the rank their poſſeſſors hold in the tribunals or as mandarins; and when any of them happens to be worn out, intimation muſt be ſent to the next ſuperior tribunal; on which a new one is ſent, and the old one muſt then be delivered up. The commiſſion of every inſpector ſent into the provinces muſt alſo be confirmed by the emperor's ſeal. The duty of theſe officers is to examine into the conduct of governors, magiſtrates, and private individuals; and inſtances are recorded of emperors themſelves aſſuming the office of inſpectors in ſome of the provinces. Theſe officers are not only ſuperior to all the magiſtrates, but even to the viceroys of the provinces themſelves. When a ſuperior magiſtrate behaves ill to an inferior one, the former inſtantly becomes the priſoner of the inſpector, and is ſuſpended from his office until he has cleared himſelf from every imputation laid to his charge. The viceroy, however, is allowed to enjoy his office until the report of the inſpector has been tranſmitted to the emperor.

97 Power of the viceroys of provinces.

Theſe viceroys are diſtinguiſhed by the title of *Tſong-tou*, and are always mandarins of the firſt claſs, poſſeſſing an almoſt unlimited power within their diſtricts. They march abroad with all the pomp of royal magnificence, never quitting their palaces, on the moſt trifling occaſion, without a guard of 100 men. A viceroy is the receiver-general of all the taxes collected in the province, tranſmitting them to the capital, after having reſerved what he judges neceſſary for the demands of his diſtrict. All law-ſuits muſt be brought before his tribunal; and he has the power of paſſing ſentence of death, but it cannot be put in execution without being firſt carried to the emperor. Every three years he ſends to court a report of the conduct of the mandarins ſubordinate to him; and according to the contents they are either continued or diſgraced. Thoſe of whom he makes an unfavourable report are puniſhed in proportion to their delinquency; while, on the other hand, thoſe who have the good fortune to be well reported, are rewarded in a ſimilar proportion.

98 Degradation of mandarins.

The principal mandarins are ſometimes broke and diſmiſſed from all their employments, while others are only removed ſome degrees lower. Thoſe who have been degraded ten ſteps, run a great riſk of never being employed again. Theſe degraded mandarins are kept in perpetual remembrance of their misfortune, by being obliged to mention it in every public order they iſſue forth in their inferior ſtation; thus, "I, ſuch a mandarin, degraded one, two, three, *&c.* ſteps, command and order," *&c.* Over theſe inferior mandarins the inſpector of the province has a very unlimited authority, and can, by his own power, deprive them of their employments for a great offence; nor does he conſult the court, excepting where the immediate puniſhment of the criminal is not neceſſary. Every one of the mandarins, of whatever rank or denomination, is obliged, once in three years, to give in writing an exact account of the faults he has committed in the execution of his office. If he is a mandarin belonging to any of the four firſt claſſes, this confeſſion is examined at court; but if it is made by any of the inferior ones, it muſt be laid before the provincial tribunal of the governor. Government, however, is not ſatisfied even with this confeſſion; inquiry is made into the truth of it, and the conduct of the mandarin is ſcrutinized with the utmoſt ſeverity, the informations being ſubjected to the tribunal of mandarins; where they are carefully examined, the merits and demerits of thoſe ſubjected to this political inquiſition carefully balanced, and their names afterwards divided into three claſſes. The firſt conſiſts of thoſe for whom rewards and preferment are intended; the ſecond, for whom gentle reproof and admonition are thought neceſſary; and the third, of thoſe who are to be ſuſpended for ſome time, or removed altogether, from their offices. Of theſe laſt ſome are allowed to continue; but they receive no ſalary, and are not only deprived of all their emoluments, but even of their honours. If they have been guilty of any action tending to oppreſs the people, or to occaſion a famine or ſcarcity among the lower ranks, their puniſhment is not confined to diſmiſſion from their offices, but they are alſo criminally impeached. The family burying-place of every Chineſe is accounted ſacred; none dares cut down the trees with which it is overſhadowed until they become decayed with age; and even then, not until their condition has been atteſted by a mandarin: but for certain crimes againſt government or the people, the burying-place of a mandarin is raſed to the foundation. No kind of puniſhment, however, inflicted on a father, is ſuppoſed in the leaſt to affect the character of his ſon; and therefore, when the latter is aſked by the emperor concerning his family, he will perhaps

coolly

cooly anſwer, “ My father was diſgraced for ſuch a crime, my grandfather was beheaded for ſuch another,” without the acknowledgement being in the leaſt detrimental. On the contrary, by great and important ſervices, it is poſſible for him to wipe out theſe ſtains from the memory of his anceſtors.

Though the empire of China is governed by Tartar princes, the latter ſeem to beſtow much more care and attention on the Chineſe than their own natural ſubjects. Should any diſpute ariſe between a Chineſe and a Tartar, the former muſt have greatly deviated from the rules of juſtice, if he is not acquitted even by thoſe tribunals which are compoſed of half Chineſe and half Tartars. The ſlighteſt fault committed by a Tartar mandarin is always ſeverely puniſhed; but the puniſhment of the greateſt is often mitigated if the delinquent be a Chineſe; and the ſame ſeverity is exerciſed towards thoſe of the military department. Thoſe faults, however, are puniſhed with the greateſt ſeverity which hurt the intereſts of the people: for which reaſon they ſeldom fall a ſacrifice to that claſs of petty tyrants who in other countries prey upon and devour them. Every ſuperior mandarin is obliged to inform himſelf of the faults of his inferiors, and expoſe them; nay, he would be puniſhed for them himſelf if he did not.

99
Privileges of princes, &c. in China.

Very little regard, as we have already had occaſion to obſerve, is paid to hereditary right in China. Even the princes of the blood enjoy no other privilege by birth but that of wearing a yellow girdle; and the names of their children, with the exact time of their birth, are inſcribed in a yellow book appropriated to that purpoſe. Collateral princes are diſtinguiſhed by an orange girdle, and their children are marked in a book of a red colour. The ſurnames of the princes of the reigning family are determined by the emperor alone; the reſt not being allowed to aſſume any name that too much reſembles thoſe of the Moguls or Chineſe. The rank even of the emperor's ſons diminiſhes one degree every generation; ſo that, at the ſeventh, only the eldeſt branch has a title to wear the yellow girdle, the reſt being ſunk into the rank of plain citizens. An hereditary ſovereignty, however, paſſes from one eldeſt ſon to another; and this title cannot be forfeited, unleſs the poſſeſſor be guilty of ſome crime. In this caſe the emperor appoints to the ſucceſſion either one of his younger brothers or a couſin; but theſe muſt be always choſen from the ſame branch, as the lawful branch cannot be deprived of its right without the condemnation of all who compoſe it. The only hereditary authority of the other princes exiſts among thoſe troops called the *Tartar bands*. There they enjoy, without oppoſition, that rank which they derive from their birth, but in every thing elſe are on a level with others. They are ſubjected to a military examination at ſtated periods, and are always promoted or degraded according to the degree of ſkill they exhibit. The ſame trial is undergone by the heir apparent and his ſons; the only indulgence ſhown them being, that ſchools are appointed for their particular uſe. The princes are likewiſe indulged with a tribunal appropriated on purpoſe for them, and before which alone they can be tried. An inſult offered to a prince decorated with the yellow girdle is puniſhed with death; but if he has omitted to put it on, the aggreſſor eſcapes with a baſtinading. A prince may be put to death by the emperor's conſent; but he eſcapes every ſlighter corporal puniſhment by paying a fine. Untitled princes have very few privileges ſuperior to thoſe of common citizens; and are generally very poor, unleſs poſſeſſed of ſome lucrative office. Thus they are ſometimes reduced to the neceſſity of accepting the higheſt pay of a common ſoldier in the Tartar bands. When they, or any of their children, however, enter into the marriage ſtate, the emperor uſually makes them a preſent of 100 ounces of ſilver. He will alſo relieve them on other occaſions, aſſiſt their widows and orphans, *&c.* but in all this never departs from the moſt exact rules of economy; ſo that the mandarins in this reſpect are much better than the relations of the ſovereign himſelf.

100
F. Amiot's account of the ancient religion of China.

With regard to the ancient religion of China, F. Amiot informs us, that, after making every poſſible reſearch, comparing and reaſoning upon his obſervations, he at laſt concluded, that “ the Chineſe are a diſtinct people, who have ſtill preſerved the characteriſtic marks of their firſt origin; a people whoſe primitive doctrine will be found, by thoſe who take the trouble of inveſtigating it thoroughly, to agree in its eſſential parts with the doctrine of the choſen people, before Moſes, by the comand of God himſelf, had conſigned the explanation of it to the ſacred records; a people, in a word, whoſe traditional knowledge, when freed from whatever the ignorance or ſuperſtition of later ages has added to it, may be traced back from age to age, and from epocha to epocha, without interruption, for the ſpace of 4000 years, even to the renewal of the human race by the grandſon of Noah.” The *king*, or canonical books of the Chineſe, every where inculcate the belief of a Supreme Being, the author and preſerver of all things. Under him they mention the names of *Tien*, or Heaven; *Chang-tien*, or Supreme Heaven; *Chang-ti*, or Supreme Lord; and of *Hoang-chan-ti*, Sovereign and Supreme Lord: “ Names (ſays M. Groſier) correſponding to thoſe which we uſe when we ſpeak of God, the Lord, the Almighty, the Moſt High.”

According to the Chineſe books, the Supreme Being is the principle of every thing that exiſts, and the father of all living; he is eternal, immoveable, and independent; his power knows no bounds; his ſight equally comprehends the paſt, preſent, and the future, penetrating even into the inmoſt receſſes of the heart. Heaven and earth are under his government; all events, all revolutions, are the conſequences of his will; he is pure, holy, and impartial; wickedneſs offends his ſight; but he beholds with an eye of complacency the virtuous actions of men. Severe, yet juſt, he puniſhes vice in a ſtriking manner even on the throne, and often precipitates from thence the guilty, to place upon it the man who walks after his own heart, whom he hath raiſed from obſcurity. Good, merciful, and full of pity, he relents on the repentance of the wicked: public calamities, and the irregularities of the ſeaſons, are only ſalutary warnings, which his fatherly goodneſs gives to men to induce them to reform and amend.

The performance of religious worſhip at the proper and appointed times, has given occaſion to the great exact-

exactneſs with reſpect to the kalendar, which is remarkable throughout the empire of China; and all the celebrated emperors have begun their reigns with a reformation of it. Our hiſtorians, however, not contented with diſcovering in the Chineſe religion the fundamental principles of the ancient patriarchal religion, have alſo found in it evident ſymptoms of a knowledge of the Trinity as believed among Chriſtians. "Among the ancient Chineſe characters (ſays M. Groſier), which have eſcaped the ravages of time, we find the following △. According to the dictionary of *Kang-hi*, this ſignifies union; according to the *Choue-ouen* (that book ſo highly eſteemed in China) △ is three united in one; it derives it from the characters *jou* (to enter or penetrate), and *ye*, one; whence it concludes, that △ means three united, penetrated, or incorporated into one. According to another book, accounted a learned and accurate explanation of the ancient characters, '△ ſignifies ſtrict union, harmony, the chief good of man, of heaven, and of earth; it is the union of the three *tſai* (powers, principles, or intelligencies); for, united, they direct, create, and nouriſh together. The image 王 (three united in one figure) is not ſo obſcure in itſelf; however it is difficult to reaſon upon it without being deceived: on this ſubject it is difficult to ſpeak.'

"Father Amiot, ſpite of all the objections which the critics of Europe may make, ſeems to conjecture, that the character △ might have been, among the ancient Chineſe, the ſymbol of the moſt holy Trinity; 'and the more ſo (he adds), as the ancient books furniſh a number of texts, which give us reaſon to ſuppoſe them to have been poſſeſſed of ſome knowledge of this ſublime myſtery.' The book *See-ki* ſays, 'The emperor formerly offered up a ſolemn ſacrifice every three years to the Spirit Trinity and Unity, *Chin-ſan-ye*.' The following celebrated text of *Lao-tſe* has long been known in Europe. '*Tao* is one by nature: the firſt begot the ſecond; two produced the third; the three created all things.'

"F. Amiot quotes another paſſage, which appears to be no leſs ſingular. 'He who is, as it were, viſible, and cannot be ſeen, is named *Khi*; he who may be heard, yet ſpeaketh not to the ears, is called *Hi*; he whom, in a manner, we feel, yet cannot touch, is named *Ouei*. In vain do we interrogate our ſenſes reſpecting theſe three: our reaſon, which alone can give us any ſatisfaction, will tell us that they make only one. Above there is no light; below there is no darkneſs. He is eternal; there is no name which can be given him. He reſembles nothing that exiſts; he is an image without figure; a figure without matter: his light is ſurrounded by darkneſs. If we look up to him above, we behold no beginning; if we follow him, we diſcover no end. From what the *Tao* hath been at all times, conclude what he is, viz. that he is eternal: he is the beginning of wiſdom.' The commentaries which explain this paſſage ſpeak in ſuch ſtrong and preciſe terms, that F. Amiot forbears to quote them, leſt he might incur the cenſure of too many incredulous readers."

101
Sacrifices.

The ſacrifices of the Chineſe were firſt offered up in the open fields, or on ſome mountain, upon what they call the *Tan*, which ſignifies a quantity of ſtones thrown together in a round form, or ſimply a round heap of earth. A double fence, called *Kiao*, compoſed of turf and branches of trees, was raiſed around this; and, in the ſpace left between the two fences, two leſſer altars were erected on the right and left; upon which, immediately after the ſacrifice offered up to the *Tien*, they ſacrificed alſo to the *Cheng*, or good ſpirits of every rank, and to their virtuous anceſtors. The ſovereign alone had a right of ſacrificing upon this *Tan*; and the cuſtom of ſacrificing to inferior ſpirits, according to the Chineſe commentators, may be traced even to the days of *Fo-hi* himſelf. The ſame writers add, that, in addreſſing themſelves to the Chang-ti, they conſidered him as the ſovereign lord of the univerſe, clothed with all that power which was neceſſary to ſatisfy them with regard to the different objects of their requeſts; but that, in offering up their prayers to the inferior objects of worſhip, they only implored their protection and mediation with the Chang-ti.

While the empire was confined within narrow bounds, one mountain was ſufficient for the ſacrifices; but in proceſs of time it became neceſſary to conſecrate four others. Theſe were ſituated at the extremities of the empire, and were ſuppoſed to correſpond with the four quarters of the world; and the prince went ſucceſſively every year to one of theſe mountains to offer up ſacrifices; taking occaſion at the ſame time to ſhow himſelf to his people, and to inform himſelf of their wants. This cuſtom ſubſiſted for a long time; but at length it was found convenient to add a fifth mountain in the centre of the empire; and ever ſince theſe have been called the five *Yo*, or the five mountains of ſacrifice. This method of ſubjecting the emperor to regular annual journies could not but be attended with many inconveniences. It was found neceſſary on this account to conſecrate ſome ſpot in the neighbourhood of his palace, which might be ſubſtituted for the *Yo* upon all occaſions when the emperor could not repair to them. An edifice was therefore erected, which at once repreſented the *Kiao*, *Tan*, and the *Hall of Anceſtors*. This laſt was a neceſſary part of the edifice; becauſe it was incumbent on thoſe who offered up ſacrifices, firſt to repair to this hall, and acquaint their anceſtors with what they were about to perform; and thither alſo they returned after ſacrificing, to thank the ſame anceſtors for the protection they had received from the Chang-ti; after which they offered up a ſacrifice of thankſgiving in honour of them, and performed certain other ceremonies to ſhow their reſpect. The building contained five ſeparate halls, appropriated to different purpoſes: originally it had neither paintings nor ornaments of any kind, and a ſtair-caſe of nine ſteps conducted to the principal entrance. Afterwards, however, it was much more richly ornamented, each of the five halls being decorated with columns, over which others were placed that ſupported the ſecond roof. In ſucceeding times it was ſtripped of all its ornaments, with a view to bring back religion to its primitive ſimplicity. Its four gates were covered with fine moſs, repreſenting the branches of which the double fence of the ancient *Kiao* were formed. The ridge of the roof was covered with the ſame, and the whole was encompaſſed by a canal filled with water at the time of offering up the ſacrifices. To this a ſecond building was added, which they called the

the *temple of neatneſs*, and which was uſed only for purifications and ceremonies, the former being entirely conſecrated to the worſhip of the Chang-ti.

At preſent there are only two temples in Peking, named the *Tien-tan* and the *Ti-tan*; in the conſtruction of which all the elegance of Chineſe architecture is diſplayed. Theſe are both dedicated to the Chang-ti, but under different titles; in the one he is adored as the *eternal ſpirit*; in the other, as the creator and preſerver of the world. The ceremonies of the modern ſacrifices are greatly multiplied; and nothing can exceed the ſplendor and magnificence with which theſe ſolemnities are performed. Some time before the day appointed for the grand ceremony, the monarch, the grandees of the court, and all thoſe whom their employments qualify to aſſiſt at the ſolemnity, prepare themſelves by retirement, faſting, and continence; no audience is given by the emperor, and the tribunals are entirely ſhut; marriages, funerals, rejoicings, and entertainments of every kind, are then forbidden. At laſt, on the day appointed, the emperor appears attended by an innumerable multitude, and, his perſon ſurrounded by a vaſt number of princes, lords, and officers, while every part of the temple ſeems to correſpond with the magnificence of the ſovereign; all the vaſes and utenſils employed in the ſacrifices are of gold, and cannot be employed to any other purpoſe; even the inſtruments of muſic are of enormous magnitude, and never uſed any where elſe. All this grandeur, however, ſerves only to diſplay in a more eminent manner the humility and abaſement of the monarch during his devotion; at which time he rolls in the duſt, and ſpeaks of himſelf before the *Chang-ti* in terms of the moſt abject ſubmiſſion and humiliation.

102 Sect of Tao-ſſe.

The purity of the ancient Chineſe religion has, however, been long contaminated by many idolatrous and fanatical ſects. Among theſe, one named *Tao-ſse* was founded by a philoſopher called *Lao-kiun* or *Lao-tſe*, who was born 603 B. C. He died in an advanced age, leaving to his diſciples a book intitled *Tao-te*, being a collection of 5000 ſentences. His morality has a great reſemblance to that of Epicurus. It conſiſts principally in baniſhing all vehement deſires and paſſions capable of diſturbing the peace and tranquillity of the ſoul. According to him, the care of every wiſe man ought to be only to endeavour to live free from grief and pain, and to glide gently down the ſtream of life devoid of anxiety and care. To arrive at this happy ſtate, he adviſes his followers to baniſh all thoughts of the paſt, and to abſtain from every vain and uſeleſs inquiry concerning futurity, as well as all tormenting thoughts of ambition, avarice, &c. It was found by the diſciples of this philoſopher, however, that all theſe endeavours to obtain a perfect tranquillity of mind were vain, as long as the thoughts of death intervened; they therefore declared it poſſible to diſcover a compoſition from which drink might be made that would render mankind immortal. Hence they were led to the ſtudy of chemiſtry; and, like the weſtern alchemiſts, wearied themſeves in ſearch of the philoſopher's ſtone, until at laſt they gave themſelves up to all the extravagancies of magic.

The deſire of avoiding death, together with the credulity natural to unenlightened minds, quickly produced a number of converts to the ſect of *Tao-ſse*. Magical practices, the invocation of ſpirits, and the art of foretelling events by divination, quickly diffuſed themſelves over the empire, and the imbecillity of the emperors contributed to propagate the deception. Temples conſecrated to ſpirits quickly reared their heads in every corner of the empire; and two of the moſt celebrated of the ſect were authoriſed to maintain public worſhip there after the form which had been preſcribed by their maſter. At the ſame time they diſtributed, and ſold at a dear rate, images of the imaginary ſpirits with which they had peopled the heavens and the earth. Theſe were, by their command, worſhipped as ſo many deities independent of the Supreme Being; and, in like manner, ſeveral of the ancient emperors were invoked as gods.

Being patroniſed by the emperors of ſeveral dynaſties, this ſect became more and more powerful. At laſt they had the impudence to affix, during the night-time, to one of the gates of the imperial city, a book filled with myſtic characters and magical figures. At break of day they informed the emperor of the ſudden appearance of this book, and publicly declared that it was fallen from heaven. This trick eaſily impoſed upon the weak prince. He immediately repaired, with a numerous train, to the ſpot where the ſacred volume appeared; and having taken it into his hands in a reſpectful manner, carried it in triumph to his palace, where he ſhut it up in a golden box. Another emperor carried his reverence for the ſect to ſuch an height of impiety and extravagance, as to order a celebrated *Tao-ſse* to be publicly worſhipped under the name of *Chang-ti*. The ſect thus patroniſed by the princes, and accommodated to the credulity of the vulgar, continued to gain ground in ſpite of every oppoſition from the wiſer part of the people, and is ſtill very powerful in China. At preſent they offer up three different victims, a hog, a fowl, and a fiſh, to a ſpirit whom they invoke. Various ceremonies, ſuch as howling, drawing fantaſtical figures upon paper, making an hideous noiſe with kettles and drums, are uſed in their incantations; and though it may readily be believed that they are for the moſt part unſucceſsful, yet their credit is ſtill kept up by thoſe caſes in which they ſucceed by accident.

The chief of the *Tao-ſse* is inveſted by government with the dignity of grand mandarin, which is enjoyed by his ſucceſſors; he reſides in a ſumptuous palace in a town of Kiang-ſi; and the ſuperſtitious confidence of the people attracts an immenſe number thither from all parts of the empire. Some arrive in order to be cured of diſeaſes, others to get an inſight into futurity. The impoſtor diſtributes to them ſmall bits of paper filled with magical characters; and the ignorant wretches depart well ſatisfied, without grudging the expence of their journey, though ever ſo long.

103 Of the worſhippers of Fo.

A ſtill more pernicious and more widely diffuſed ſect is that of the idol *Fo*, which came orignally from India. The *Tao-ſse*, had promiſed to the brother of one of the emperors of China to introduce him to a communication with ſpirits. The credulous prince having heard of a great ſpirit named *Fo*, who reſided in India, prevailed on his brother to ſend an embaſſy thither. On the arrival of the ambaſſadors, however, they could find only two worſhippers of this diety, both of whom they brought to China. Several images of Fo were alſo collected at the ſame time; and theſe, together with ſome canonical books of the Indians, were placed on a white horſe, and carried in proceſſion to the imperial city.

This ſuperſtition was introduced into China about the 65th year of the Chriſtian æra, and ſoon made vaſt progreſs. One of its principal doctrines is that of the metempſychoſis, or tranſmigration of ſouls, of which M. Groſier thinks he was the inventor, and that Pythagoras, who travelled into ſeveral parts of India, had borrowed the doctrine from him. The account given of him by the bonzes is, that finding himſelf, at the age of 70, oppreſſed with infirmities, he called his diſciples together, and told them he was unwilling to leave the world without communicating the ſecret and hidden myſteries of his doctrine; which were, in ſhort, that all things had proceeded from a vacuum and nothing, and to that they muſt return. This doctrine produced a correſponding mode of action, or rather of inaction, in thoſe who believed it: for thus the great happineſs of man was made to conſiſt in abſolute annihilation; and therefore the nearer he could bring himſelf to this ſtate during life, the happier he was ſuppoſed to be.

The common doctrine, however, which admits of a diſtinction between good and evil, finds more proſelytes among the vulgar, whoſe ſituation in life will not allow them to ſpend their time in perpetual idleneſs. According to this, the righteous will be rewarded and the wicked puniſhed after death. They ſay alſo, that the god Fo came to ſave mankind, and to expiate their ſins; and that he alone can procure them a happy regeneration in the life to come. Five precepts are likewiſe inculcated on thoſe who adopt this doctrine: 1. Not to kill any living creature. 2. Not to take away the goods of another. 3. Not to pollute themſelves by uncleanneſs. 4. Not to lie; and, 5. Not to drink wine. Above all, they recommend to them to perform acts of mercy, to treat their bonzes well, build temples, &c.

The doctrine of metempſychoſis has introduced into China an infinite number of idols, who are all worſhipped on the ſuppoſition that the ſpirit of Fo has tranſmigrated into the animals they repreſent. Theſe idols, however, ſeem not to be worſhipped with great ſincerity; but, like the images of ſaints in the more ſuperſtitious countries of Europe, are beaten and thrown in the dirt when their votaries happen not to obtain their deſires, which they impute to the obſtinacy or weakneſs of the idol. Nay, M. Groſier gives an account of one man, who having ineffectually paid a ſum of money to the bonzes of a certain idol for the cure of his daughter, brought a formal accuſation againſt the idol itſelf; and in ſpite of all that the bonzes could ſay in its behalf, got its worſhip ſuppreſſed throughout the province.

104
Bad character of the bonzes.

The bonzes of China are repreſented as a moſt avaricious and hypocritical race of men, ready to practiſe every kind of villany, and even to ſubject themſelves to the moſt intolerable tortures, in order to obtain money from the compaſſion of the public when they cannot get it in any other way; and an edict of one of the emperors is cited by M. Groſier, by which great numbers of their religious houſes were ſuppreſſed. In order to perpetuate their ſect, they purchaſe young children, whom they take care to inſtruct in all the myſteries and tricks of their profeſſion; but excepting this, they are in general very ignorant, and few of them would be able to give any tolerable account of the tenets of their own ſect. They are not ſubject to a regular hierarchy, but acknowledge ſuperiors among them whom they call grand bonzes, who have the firſt place in all religious aſſemblies at which they happen to be preſent; and great profit is derived from certain religious clubs, both of men and women, at which the bonzes are always called to aſſiſt. Their wealth is likewiſe augmented by pilgrimages to certain places where there are temples more or leſs reverenced, and where a multitude of abſurd ceremonies are performed. Theſe bonzes, as may be eaſily imagined, are inveterate enemies to the progreſs of Chriſtianity, telling the moſt abſurd ſtories concerning the miſſionaries: as that they pluck out the eyes of their converts to conſtruct teleſcopes with, &c. The literati, however, and the more ſenſible part of the nation, hold them in the greateſt contempt.

105
Ridiculous ſuperſtition of the *fong-choui*.

We ſhall conclude this detail of the Chineſe religion with giving an account of one other ſuperſtition which ſeems peculiar to the nation. It is named *fong-choui*, which ſignifies wind and water. By this they mean the lucky or unlucky ſituation of a houſe, burying-place, &c. If any imprudent perſon has built a houſe cloſe to that of a Chineſe, in ſuch a manner that the angle formed by its roof flanks the wall or roof of the former houſe, the proprietor ever after lives in terror of utter ruin and deſtruction from the malignant influence of that angle. An implacable hatred inſtantly commences betwixt the two families, and often gives riſe to a law-ſuit, which furniſhes matter of diſcuſſion for ſome of the ſuperior tribunals. If no redreſs can be had at law, however, the Chineſe is then reduced to the neceſſity of erecting, on the top of his houſe, an enormous image of a dragon, or ſome other monſter, with its mouth gaping towards the angle, and, as it were, threatening to ſwallow it up; after which the apprehenſions of the proprietor begin to ſubſide, and tranquillity is reſtored to the family. In this manner the governor of *Kien-tchang* ſecured himſelf from the influence of the church of the Jeſuits, which, being built on an eminence, overlooked his palace. Not depending, however, entirely on the good offices of his tutelary dragon, he alſo took the wiſe precaution of altering his principal apartments, and raiſing, at the diſtance of 200 paces from the church, a kind of large facade three ſtories high. But unluckily the death of his ſucceſſor was attributed to this facade; for the mandarin being attacked with a diſorder in his breaſt, which made him ſpit up a white phlegm, this ſymptom was thought to be owing to the walls of the facade, which were very white, and which were forthwith painted black. The ſalutary precaution, however, happened to be taken too late; for the governor died notwithſtanding the black colour of the walls.

“ We ſhould never have done (ſays M. Groſier), were we to relate all the ſuperſtitious ideas of the Chineſe, reſpecting the lucky and unlucky ſituation of houſes, the quarter which doors ought to front, and the plan and day proper for conſtructing the ſtoves in which they cook their rice." But the object on which they employ their greateſt care is the choice of the ground and ſituation for a burying-place. Some quacks follow no other profeſſion than that of pointing out hills and mountains which have an aſpect favourable for works of that kind. When a Chineſe is perſuaded of the truth of ſuch information, there is no ſum which he would not give to be in poſſeſſion of the fortunate ſpot. The greater part of the Chineſe are of opinion that all the happineſs and misfortunes of life depend upon the *fong-choui*.

106 Jews and Mahometans in China.

A colony of Jews was eſtabliſhed in China about the year 206 B. C.; but they are now reduced to a ſmall number of families at Cai-fong, the capital of the province of Honan. The Mahometans have multiplied much more than the Jews. It is above 600 years ſince they firſt entered the empire, where they have formed different eſtabliſhments. At firſt their number was augmented only by marriages; but for ſome time paſt they have been more particularly attentive to the extending of their ſect and propogating their doctrine. The principal means employed for this purpoſe are, to purchaſe a great number of children brought up in idolatry, whom their poor parents are glad to part with; and theſe they circumciſe, and afterwards inſtruct in the principles of their religion. During the time of a famine which deſolated the province of Chang-tong, they purchaſed more than 10,000 of theſe children; for whom, when grown up, they procured wives, built houſes, and even formed whole villages of them. They are now become ſo numerous, that in the places where they reſide they entirely exclude every inhabitant who does not believe in their prophet, and frequent a moſque.

107 Ceremonies of marriage.

With regard to the manners of the Chineſe, they bear no reſemblance to thoſe of any other nation; and, if we may believe their hiſtorians, they are the ſame at this day that they were 4000 years ago. The women are condemned almoſt to perpetual impriſonment within the precincts of their own houſes, and are never ſeen even by their intended huſbands before marriage. He knows nothing of her looks or perſon but from the account of ſome female relation or confident, who in ſuch caſes acts the part of match-maker; though, if impoſed upon either with regard to her age or figure, he can have recourſe to a divorce. The ſame matrons who negociate the marriage, alſo determine the ſum which the intended huſband muſt pay to the parents of the bride: for in China a father does not give a dowry to his daughter; it is the huſband who gives a dowry to the wife. When the day appointed for the marriage is arrived, the bridge is placed in a chair or cloſe palanquin, the key of which is committed to the care of a truſty domeſtic, who muſt deliver it to none but the huſband. The latter richly dreſſed, waits at his gate for the arrival of the proceſſion. As ſoon as it approaches the key is put into his hands; he eagerly opens the chair, and for the firſt time perceives his good or bad fortune. If he is contented with his new ſpouſe, the bride deſcends and enters the houſe, where the marriage is concluded by feaſting and merriment as in other countries; but if the bridegroom is very much diſappointed, he ſuddenly ſhuts the chair, and ſends the bride home to her relations. To get rid of her in this manner, however coſts a ſum equal to what he originally gave in dowry to obtain her.

The Chineſe women, even of the firſt rank, ſeldom quit their apartment, which is ſituated in the moſt retired part of the houſe, and in which they are ſecluded from all ſociety but that of their domeſtics. The book of ceremonies requires that there ſhould be two apartments in every houſe; the exterior one for the huſband, the interior for the wife. They muſt even be ſeparated by a wall or wooden partition, the door of which is carefully guarded; nor is the huſband at liberty to enter the wife's apartment, or ſhe to quit it, without ſufficient reaſon. According to the ſame book, the prattling and loquacity of a woman are reckoned ſufficient grounds for a divorce. A woman, however, cannot be divorced on any account, if ſhe loſes her parents after marriage, or if ſhe has worn three years mourning for the loſs of her huſband, father, or mother.

A widow of any rank above the common, who has children, ſeldom enters a ſecond time into the marriage ſtate, though thoſe of the ordinary rank generally do. The poorer ſort are not at liberty to follow their own inclination; but are ſold for the behoof of the parents of the deceaſed. As ſoon as the bargain is concluded, a couple of porters bring a chair, which is guarded by a number of truſty people. In this the widow is ſhut up, and thus conducted to her new huſband.

"Maſters (ſays Mr Groſier), for the moſt part are very deſirous of promoting marriage among their ſlaves, whatever Mr *Paw* may ſay; who, without any foundation, has ventured boldly to aſſert the contrary. They have even very ſtrong motives to induce them to encourage theſe marriages; the children produced by them are ſtill their ſlaves; and beſides their becoming new property to them, the fathers and mothers are thus more ſtrongly attached to their ſervice."

108 Concubinage tolerated.

Concubinage is tolerated in China, though not authoriſed by any law. This privilege is granted only to the emperor, the princes of the blood, and mandarins; and none but the emperor is permitted to have more than one. The common people generally avail themſelves of the toleration granted them in this reſpect, and will have two or three concubines if they can afford it. They are, however, careful to excuſe themſelves as well as they can to their wives in this reſpect, pretending only a deſire of having many children, and a number of women to attend their wives. Others, deſirous of having a male child, which perhaps their lawful wife cannot have, take a concubine for this reaſon only, and diſmiſs her as ſoon as their wiſhes are accompliſhed: they then permit her to marry whom ſhe pleaſes, and frequently even provide a huſband for her themſelves. Theſe concubines are almoſt all procured from two cities named *Yang-tcheou* and *Sou-tcheou*, where they are educated, and taught ſinging, dancing, muſic, and every accompliſhment ſuitable to women of quality, or which can render them agreeable and pleaſing. The greater part of them are purchaſed in other places, to be again diſpoſed of; and this is the principal branch of trade carried on by theſe two cities. Unlawful intrigues are ſeldom heard of in China. Whoever ſeduces the wife of another is puniſhed with death: and the ſame puniſhment is generally inflicted on the perſon who debauches a young woman.

109 Education of children. From the accounts we have of the education of children in China, one might be apt to conclude, that, inſtead of being the ignorant ſuperſtitious race already deſcribed, they ought to be the moſt intelligent people in the world. The book of ceremonies directs the education of a child to commence as ſoon as it is born, and deſcribes exactly the qualities which its nurſe ought to have. She muſt ſpeak little, adhere ſtrictly to truth, have a mild temper, behave with affability to her equals, and with reſpect to her ſuperiors. The child is taught to uſe the right hand as ſoon as it can put its hand to its mouth, and then it is weaned. At ſix years of age, if a male, he is taught the numbers moſt in uſe, and made acquainted with the names of the principal parts of the world; at ſeven, he is ſeparated from his ſiſters, and no longer allowed to eat with them, nor to ſit down in their preſence; at eight, he is inſtructed in the rules of good breeding and politeneſs; at nine, he ſtudies the kalendar; at ten he is ſent to a public ſchool, where he learns to read, write, and caſt accounts; from 13 to 15 he is taught muſic, and every thing that he ſings conſiſts of moral precepts. It was formerly the cuſtom, that all the leſſons deſigned for the Chineſe youth were in verſe: and it is to this day lamented, that the ſame cuſtom is not followed, as their education has ſince been rendered much more difficult and laborious.

At the age of 15, the Chineſe boys are taught to handle the bow and arrow, and to mount on horſeback; at 20 they receive the firſt cap, if they are thought to deſerve it, and they are permitted to wear ſilk dreſſes ornamented with furs; but before that period they are not allowed to wear any other thing than cotton.

Another method of initiating children into the principles of knowledge in this empire is, by ſelecting a number of characters expreſſive of the moſt common objects, engraving or painting them ſeparately on ſome kind of ſubſtance, and, under the thing repreſented, putting the name, which points out to the children the meaning of the word.

As the Chineſe have no proper alphabet, they repreſent almoſt every thing by different characters. The labour of their youth, therefore, is intolerable; being obliged to ſtudy many thouſand characters, each of which has a diſtinct and proper ſignification. Some idea of their difficulties may be obtained from what we are told by F. Martini, who aſſures us, that he was under the neceſſity of learning 60,000 different characters before he could read the Chineſe authors with tolerable eaſe.

The book firſt put into the hands of the Chineſe children is an abridgment, which points out what a child ought to learn, and the manner in which he ſhould be taught. This volume is a collection of ſhort ſentences, conſiſting of three or four verſes each, all of which rhyme; and they are obliged to give an account in the evening of what they have learned in the day. After this elementary treatiſe, they put into their hands the four books which contain the doctrines of Confucius and Mencius. The ſenſe and meaning of the work is never explained to them until they have got by heart all the characters, that is to ſay, the *words* in the book: a method no doubt inconceivably diſguſting, and calculated utterly to deſtroy the genius of a boy, if he has any. While they are getting theſe characters by heart, indeed, they are likewiſe employed in learning to form them with a pencil. For this purpoſe they are furniſhed with large leaves of paper, on which are written or printed with red ink very big characters; and all they are required to do is to cover thoſe red characters with black ink, and to follow exactly their ſhape and figure: which inſenſibly accuſtoms them to form the different ſtrokes. After this they are made to trace other characters, placed under the paper on which they write. Theſe are black, and much ſmaller than the other. It is a great advantage to the Chineſe literati to be able to paint characters well; and on this account they beſtow great pains in forming the hands of young people. This is of the utmoſt conſequence to literary ſtudents in the examinations which they are obliged to undergo before they can be admitted to the firſt degree. Du Halde gives a remarkable inſtance, *viz.* that "a candidate for degrees having, contrary to order, made uſe of an abbrevation in writing the character *ma*, which ſignifies an horſe, had the mortification of ſeeing his compoſition, though in other reſpects excellent, rejected merely on that account; beſides being ſeverely rallied by the mandarin, who told him that a horſe could not walk unleſs he had all his legs."

After the ſcholar has made himſelf maſter of the characters, he is then allowed to compoſe; but the ſubject of his compoſition is pointed out to him only by one word. Competitions are likewiſe eſtabliſhed in China, but moſt of them are of a private nature. Twenty or thirty families, who are all of the ſame name, and who conſequently have only one hall for the names of their anceſtors, agree among themſelves to ſend their children twice a month to this hall in order to compoſe. Each head of a family in turn gives the ſubject of this literary conteſt, and adjudges the prize; but this coſts him a dinner, which he muſt cauſe to be carried to the hall of competition. A fine of about ten pence is impoſed on the parent of each ſcholar who abſents himſelf from this exerciſe.

Beſides theſe private competitions, every ſtudent is obliged to compete at leaſt twice a-year under the inſpection of an inferior mandarin of letters, ſtyled *Hio-kouan*. It frequently happens alſo, that the mandarins of letters order theſe ſtudents to be brought before them, to examine the progreſs they have made in their ſtudies, to excite a ſpirit of emulation among them, and make them give ſuch application as may qualify them for any employment in the ſtate. Even the governors of cities do not think it below their dignity to take this care upon themſelves; ordering all thoſe ſtudents who reſide near them to appear before their tribunal once a month: the author of the beſt compoſition is honoured with a prize, and the governor treats all the candidates on the day of competion at his own expence. In every city, town, and village in China, there are ſchoolmaſters who teach ſuch ſciences as are known in that country. Parents poſſeſſed of a certain fortune provide maſters for their children, to attend and inſtruct them, to form their minds to virtue, and to initiate them in the rules of good breeding and the accuſtomed ceremonies, as well as to make them acquainted

quainted with the laws and hiſtory, if their age will admit. Theſe maſters have for the moſt part attained to one or two degrees among the literati, and not unfrequently arrive at the firſt employments of the ſtate.

The education of the Chineſe women is confined to giving them a taſte for ſolitude, and accuſtoming them to modeſty and ſilence; and, if their parents are rich, they are likewiſe inſtructed in ſuch accompliſhments as may render them agreeable to the other ſex.

110
Dreſs.

There is little diſtinction in China between the ordinary dreſs of men and women. Rank and dignity are diſtinguiſhed by certain acceſſary ornaments: and the perſon would be ſeverely chaſtiſed who ſhould preſume to aſſume them without being properly authoriſed. The dreſs in general conſiſts of a long veſt which reaches to the ground. One part of this veſt, *viz.* that on the left ſide, folds over the other, and is faſtened to the right by four or five ſmall gold or ſilver buttons, placed at a little diſtance from one another The ſleeves are wide towards the ſhoulder, growing narrower as they approach the wriſt, where they terminate in the form of a horſe ſhoe, covering the hands entirely, and leaving nothing but the ends of the fingers to be ſeen. Round their middle they wear a large gridle of ſilk, the ends of which hang down to their knees. From this griddle is ſuſpended a ſheath, containing a knife and two of thoſe ſmall ſticks which they uſe as forks. Below this robe they wear a pair of drawers, in ſummer made of linen, and in winter of ſatin lined with fur, ſometimes of cotton, and in ſome of the northern provinces of ſkins. Theſe are ſometimes covered with another pair of white taffety. Their ſhirts are always very ſhort and wide, of different kinds of cloth, according to the ſeaſon. Under theſe they wear a ſilk net to prevent it from adhering to the ſkin. In warm weather they have their necks always bare; when it is cold, they wear a collar made of ſilk, ſable, or fox's ſkin, joined to their robe, which in winter is trimmed with ſheep's ſkin, or quilted with ſilk and cotton. That of people of quality is entirely lined with beautiful ſable ſkins brought from Tartary, or with the fineſt fox's ſkin, trimmed with ſable; and in the ſpring it is lined with ermine. Above their robe they wear alſo a kind of ſur-tout with wide ſleeves, but very ſhort, which is lined in the ſame manner. The emperor and princes of the blood only have a right to wear yellow; certain mandarins have liberty to wear ſatin of a red ground, but only upon days of ceremony; in general they are clothed in black, blue, or violet. The common people are allowed to wear no other colours but blue or black; and their dreſs is always compoſed of plain cotton cloth.

111
Chineſe obliged by the Tartars to cut off their hair.

Formerly the Chineſe were at great pains to preſerve their hair; but the Tartars, who ſubdued them, compelled them to cut off the greater part of it, and to alter the form of their clothes after the Tartar faſhion. This revolution in dreſs was not effected without bloodſhed, though the conqueror at the ſame time adopted in other reſpects the laws, manners, and cuſtoms of the conquered people. Thus the Chineſe are painted as if bald, but they are not ſo naturally; that ſmall portion of hair which they preſerve behind, or on the tops of their heads, is all that is now allowed them. This they wear very long, and plait like a tail. In ſummer they wear a kind of cap ſhaped like an inverted cone, lined with ſatin, and covered with ratan or cane very prettily wrought. The top terminates in a point, to which they fix a tuft of red hair, which ſpreads over it, and covers it to the brims. This hair grows between the legs of a kind of cow, and is capable of taking any colour, eſpecially a deep red. This ornament is much uſed, and any perſon who chooſes may wear it.

The mandarins and literati wear a cap of the ſame form as the foregoing, only it is lined with red ſatin, and covered on the outſide with white. A large tuft of the fineſt red ſilk is fixed over it, which is ſuffered to hang down or wave with the wind. People of diſtinction generally uſe the common cap when they mount on horſeback or during bad weather; being better calculated to keep off rain, and ſhelter thoſe who wear it from the rays of the ſun. For winter they have another cap bordered with ſable, ermine, or fox's ſkin, and ornamented with a tuft of ſilk like the former. In theſe fur-trimmings they are very curious, ſometimes expending 40 or 50 ounces of ſilver upon them.

The Chineſe people of rank never go abroad without boots made of ſatin, or ſome other ſilk, and ſometimes of cotton, but always dyed. They have neither heel nor top, and are made to fit the foot with the greateſt exactneſs. When they travel on horſeback, however, they have others made of the ſkin of a cow or horſe made very pliable. Their boot-ſtockings are of ſilk ſtuff, quilted and lined with cotton, reaching above the top of their boot, and ornamented with a border of velvet or cloth. In ſummer they wear a cooler kind, and in their houſes a ſort of ſlippers made of ſilk ſtuff. The common people are contented with black ſlippers made of cotton cloth. The fan is alſo a neceſſary appendage of the Chineſe dreſs, and is reckoned equally neceſſary with the boots.

The dreſs of the women conſiſts of a long robe quite cloſe at top, and long enough to cover even their toes, with ſleeves ſo long that they would hang down upon the ground, did they not take care to tuck them up; but their hands are ſeldom ſeen. The colour of their dreſſes is entirely arbitrary, but black and violet are generally choſen by thoſe advenced in life. The young ladies, like thoſe of Europe, make uſe of paint to give a bloom to their complections; but this, though not the ſame with the kind uſed in Europe, agrees with it in the effect of ſoon wrinkling the ſkin. Their general head-dreſs conſiſts in arranging their hair in ſeveral curls, among which are interſperſed ſmall tufts of gold or ſilver flowers. According to Du Halde, ſome of them ornament their heads with the image of a fabulous bird, concerning which many ſtories are told. This is made of copper or ſilver gilt, its wings extended and lying pretty cloſe to the head-dreſs, embracing the upper part of their temples, while the long ſpreading tail forms a kind of plume on the top of the head. Its body is directly over the head, and the neck and bill hang down, the former being joined to the body by a concealed hinge, in order that it may play freely, and move about on the leaſt motion of the head. The whole bird adheres to the head by means of the claws, which are fixed in the hair.

Ladies of quality ſometimes wear ſeveral of theſe birds made up into a ſingle ornament, the workmanſhip of which is very expenſive. Young ladies wear alſo a crown made of paſteboard, the fore-part of which riſes in a point above the forehead, and is covered with jewels. The reſt of the head is decorated with natural or artificial flowers, among which ſmall diamond pins are interſperſed. The head-dreſs of the ordinary claſs of women, eſpecially when they are advanced in years, conſiſts only of a piece of very fine ſilk wrapped round their heads.

112 Abſurd cuſtom of preventing the feet of female infants from growing.

All authors agree, that an abſurd cuſtom prevails throughout China of confining the feet of female infants in ſuch a manner that they are never allowed to grow to near their full ſize. The ſmallneſs of their feet is accounted ſuch a valuable beauty, that the Chineſe women never think they can pay too dear for it. As ſoon therefore as a female infant is born, the nurſe wraps up its feet in very tight bandages; and this torture muſt be endured until their feet have ceaſed to grow. So prevalent is the force of cuſtom, however, that as the child grows up ſhe voluntarily ſubmits to new tortures in order to accompliſh the purpoſe more effectually. Thus the Chineſe women are deprived almoſt entirely of the uſe of their feet; and are ſcarce able to walk, in the moſt aukward hobbling manner, for the ſhorteſt ſpace. The ſhoe of a full grown Chineſe woman will frequently not exceed ſix inches.

The Chineſe uſe white as the colour proper for mourning; and though a ſon cannot wear this while his father and mother are alive, he can uſe no other for three years after their death; and ever afterwards his clothes muſt be of one colour. The law has forbidden the uſe of ſilks and furs to children; and has even preſcribed the time when they are firſt to wear a cap. This is put upon their heads by the maſter of ceremonies himſelf, who addreſſes them in the following manner: "Conſider that you now receive the dreſs of thoſe who have attained to maturity, and that you ceaſe to be children; renounce therefore all childiſh thoughts and inclinations, aſſume a grave and ſerious deportment, apply with reſolution to the ſtudy of virtue and wiſdom, and endeavour to merit a long and happy life." "This ceremony (ſays M. Groſier), which may appear trifling, is attended with the happieſt effects. The Chineſe give a kind of importance to every thing which can inſpire youth with a taſte for morality and a love of good order. It might be uſeful to mankind at every fixed epocha of their lives, to remind them of thoſe new duties impoſed by each ſucceſſive change; but, by uniting the ſolemnity of a public ceremony to this inſtruction, it will make a deeper impreſſion, and remain much longer imprinted on their memories."

115 Exceſſive ceremoniouſneſs of the Chineſe.

Nothing can appear more irkſome to an European than the multitude of ceremonies uſed on all occaſions by the Chineſe. An invitation to an entertainment is not ſuppoſed to be given with ſincerity until it has been renewed three or four times in writing. A card is ſent on the evening before the entertainment, another on the morning of the appointed day, and a third when every thing is prepared and the gueſts ready to ſit down to the table. The maſter of the houſe always introduces his gueſts into the hall, where he ſalutes them one after another. He then orders wine to be brought him in a ſmall cup made of ſilver, porcelain, or precious wood, and placed upon a ſmall varniſhed ſalver. He lays hold of it with both his hands, makes a bow to all the ſurrounding gueſts, and advances towards the fore-part of the hall, which generally looks into a large court. He there raiſes his eyes and the cup towards heaven; after which he pours the wine on the ground. He afterwards pours ſome wine into a ſilver or porcelain cup, makes a bow to the moſt conſiderable perſon in company, and then goes to place the cup on the table before him; for in China every gueſt has a table for himſelf. The perſon for whom he intends this honour, however, generally ſaves him the trouble of placing the cup; calls for wine in his turn, and offers to place the cup on the maſter's table, who endeavours to prevent him; with a thouſand apologies and compliments according to the rules of Chineſe politeneſs. A ſuperior domeſtic conducts the principal gueſt to an elbow chair covered with rich flowered ſilk, where the ſtranger again begins his compliments, and begs to be excuſed from ſitting in ſuch an honourable ſeat, which neverthelefs he accepts of; and all the reſt of the gueſts do the ſame, otherwiſe the ceremonial would be gone through with each of them. The entertainment is concluded by ſome theatrical repreſentations, accompanied with the muſic of the country; which, however, would give but little pleaſure to an European. Beſides the gueſts, a certain number of people are admitted into the court in order to behold theſe theatrical repreſentations; and even the women are allowed to view them through a wicket, contrived ſo that they may behold them without being ſeen themſelves.

The entertainments of the Chineſe are begun, not by eating, but by drinking; and the liquor they drink muſt always be pure wine. The intendant, or *maître de hotel*, falling down on one knee, firſt invites the gueſts to take a glaſs; on which each of them lays hold, with both hands, of that which is placed before him, raiſing it as high as his forehead, then bringing it lower down than the table, and at laſt putting it to his mouth; they all drink together, and very ſlowly, taking three or four draughts. While they are drinking, the diſhes on each of the tables are removed, and others brought in. Each of the gueſts has twenty-four ſet before him in ſucceſſion: all of them fat, and in the form of ragouts. They never uſe knives in their repaſts; and two ſmall-pointed ſticks, ornamented with ivory or ſilver, ſerve them inſtead of forks. They never begin to eat, however, until they are invited by the *maître de hotel*; and the ſame ceremony muſt be gone through every time they are going to take a cup of wine or begin to a new diſh. Towards the middle of the entertainment the ſoup is brought in, accompanied with ſmall loaves or meat-pies. Theſe they take up with their ſmall ſticks, ſteep them in the ſoup, and eat them without waiting for any ſignal or being obliged to keep time with the reſt of the gueſts. The entertainment, however, continues in other reſpects with the utmoſt formality until tea is brought in; after which they retire from table and amuſe themſelves in another hall, or in the garden for a ſhort time, until the deſert be brought in. This, like the entertainment itſelf, conſts of 24 diſhes, which are made up of ſweatmeats, fruits differently prepared, hams and ſalted ducks which have been backed or dried in the ſun, with ſhell and other kinds of fiſh. The ſame ceremonies which preceded the repaſt are now renewed,

renewed, and every one ſits down at the ſame place he occupied before. Larger cups are then brought in, and the maſter invites the gueſts to drink more freely.

Theſe entertainments begin towards evening, and never end till midnight. A ſmall ſum of money is given to the domeſtics; when every one of the gueſts goes home in a chair preceded by ſeveral ſervants, who carry large lanthorns of oiled paper, on which are inſcribed the quality, and ſometimes the name, of the maſter. Without ſuch an attendance they would be taken up by the guard; and the day following they never fail to return a card of thanks to the officer.

Their method of drinking tea is not like that of other nations. A ſmall quantity of bohea, ſufficient to tinge the water and render it palatable (for they drink no green), is taken in the morning, and thrown into a veſſel adapted to the number in family. This ſtands till milk warm; in which ſtate it is kept the whole day, and a cup drank now and then without ſugar or milk, in order to exhilerate the ſpirits when exhauſted by fatigue: and if a ſtranger call by accident, or a viſitor by appointment, the firſt thing preſented, after the uſual ceremonies of meeting, is a very ſmall pipe filled with tobacco of their own growth and a cup of the tea already mentioned, or of ſome freſh made of better quality, together with ſweetmeats, &c. Tea is the daily beverage in China, and is drank by all ranks of people.

Some change has been made in the ceremonial of the Chineſe by the Tartar conqueſt, and ſome new diſhes alſo introduced by the ſame means; and here M. Groſier obſerves, that the Tartars are much better cooks than the Chineſe. All their diſhes are highly ſeaſoned; and by a variation in the proportions of their ſpiceries, they are able to form a variety of diſhes out of the ſame materials. None of their viands, however, are more eſteemed than ſtags ſinews, and the neſts of a particular ſpecies of birds, which have the property of giving a moſt agreeable reliſh to whatever is mixed with them. Other diſhes are introduced at theſe repaſts, which would be accounted very diſagreeable with us; ſuch as the fleſh of wild horſes, the paws of a bear, and the feet of ſeveral wild animals. The greater part of theſe proviſions are brought preſerved in ſalt from Siam, Camboya, and Tartary.

114 Chineſe wines. The wines of China have no reſemblance to ours either in taſte or quality, being procured from rice and not from the vine. A particular kind of rice is employed for making them, and the grain is ſteeped for 20 or 30 days in water, into which ingredients of a different nature are ſucceſſively thrown: they afterwards boil it; and as ſoon as it becomes diſſolved by the heat, it immediately ferments, and throws up a vaporous ſcum not unlike new wine. A very pure liquor is found under this ſcum, which is drawn off and put into veſſels well glazed; From the remaining lyes an inflammable ſpirit is made, little inferior, and ſometimes even ſuperior to the European. Another kind of wine is uſed by the Chineſe, or rather Tartars, called *lamb-wine*. It is very ſtrong, and has a diſagreeable ſmell; and the ſame may be believed of a kind of ſpirit diſtilled from the fleſh of ſheep; though this laſt is ſometimes uſed by the emperors.

Theſe entertainments exceed the bounds of ordinary repaſts; the Chineſe being naturally ſober, and thoſe in eaſy circumſtances living chiefly on pork, for which reaſon a great number of hogs are bred in the country. Their fleſh is much eaſier of digeſtion, and more agreeable to the taſte, than thoſe of Europe. The Chineſe hams are in high eſtimation. The common people live very poorly; being ſatisfied, in time of ſcarcity, with the fleſh of dogs, horſes, cats, and rats, which laſt are ſold publicly in the ſtreets.

115 Public feſtivals. There are ſeveral public feſtivals annually celebrated in China. One is that already mentioned, in which the emperor tills the ground with his own hands. This is alſo celebrated on the ſame day throughout the empire. In the morning the governor of every city comes forth from his palace crowned with flowers, and enters his chair amidſt the noiſe of different inſtruments which precede it; a great number of people attending, as is uſual on all ſuch occaſions. The chair is ſurrounded by litters covered with ſilk carpets, on which are repreſented either ſome illuſtrious perſons who have ſupported and encouraged agriculture, or ſome hiſtorical painting on the ſame ſubject. The ſtreets are hung with carpets, triumphal arches are erected at certain diſtances, lanthorns every where diſplayed, and all the houſes illuminated. During the ceremony a figure reſembling a cow, made of baked earth, with gilt horns, is carried in proceſſion, and of ſuch enormous magnitude that 40 men are ſcarce ſufficient to ſupport it. A child follows with one foot naked and the other ſhod, who is called the *ſpirit of labour and diligence*, and keeps continually beating the image with a rod to make it advance. Labourers, with their implements of huſbandry, march behind; and the proceſſion is cloſed by a number of comedians and people in maſks. The governor advances towards the eaſtern gate, and returns in the ſame manner. The cow is then ſtripped of its ornaments, a prodigious number of earthen calves taken from its belly and diſtributed among the people; after which the large figure is broken in pieces and diſtributed in the ſame manner. The ceremony is ended by an oration in praiſe of agriculture, in which the governor endeavours to excite his hearers to the practice of that uſeful art.

Other two feſtivals are celebrated in China with ſtill more magnificence than that above deſcribed. One of them is at the commencement of the year; the other is called the *feaſt of lanthorns*. During the celebration the former, all buſineſs, whether private or public, is ſuſpended, the tribunals are ſhut, the poſts ſtopped, preſents are given and received, and viſits paid. All the family aſſemble in the evening, and partake of a feaſt to which no ſtranger is admitted; though they become a little more ſociable on the following day.

The feaſt of lanthorns ought to take place on the 15th day of the firſt month, but uſually commences on the evening of the 13th, and does not end till that of the 16th. At that time every city and village, the ſhores of the ſea, and the banks of all the rivers, are hung with lanthorns of various ſhapes and ſizes; ſome of them being ſeen in the courts and windows of the pooreſt houſes. No expence is ſpared on this occaſion; and ſome of the rich people will lay out eight or nine pounds ſterling on one lanthron. Some of theſe are very large compoſed of ſix wooden frames either neatly painted or gilt, and filled up with pieces of fine tranſparent ſilk, upon which are painted flowers, animals, and human figures; others are blue, and made of a tranſparent kind of horn. Several lamps, and a great

great number of wax candles, are placed in the inſide: to the corners of each are fixed ſtreamers of ſilk and ſatin of different colours, with a curious piece of carved work on the top. They are likewiſe acquainted with our magic lanthorn, which they ſometimes introduce in this feſtival. Beſides this they have the art of forming a ſnake 60 or 80 feet in length, filled with lights from one end to the other; which they cauſe twiſt itſelf into different forms, and move about as if it was a real ſerpent. During the ſame feſtival all the varieties of the Chineſe fire-works, ſo juſtly admired, and which, ſome time ago at leaſt, ſurpaſſed every thing of the kind that could be done in Europe, are exhibited.

116
Magnificence of the viceroys.

Every public ceremony in China is carefully rendered as ſtriking as poſſible. A viceroy never quits his palace but with a royal train, dreſſed in his robes of ceremony, and carried in a chair elegantly gilt, which is born upon the ſhoulders of eight domeſtics; two drummers marching before the guards, and beating upon copper baſons to give notice of his approach. Eight other attendants carry ſtandards of wood varniſhed, upon which are inſcribed in large characters all his titles of honour. After theſe come 14 flags with the ſymbols of his office; ſuch as the dragon, tyger, phoenix, flying tortoiſe, &c. Six officers follow, each bearing a piece of board in ſhape like a large ſhovel, on which are written in large golden characters the qualities of the mandarin himſelf: two others carry, the one a large umbrella of yellow ſilk, and the other the cover in which the umbrella is kept. The firſt guards are preceded by two archers on horſeback; the latter are followed by others armed with a kind of weapons compoſed of hooked blades, fixed perpendicularly to long poles ornamented with four tufts of ſilk, placed at a ſmall diſtance above one another. Behind theſe are two other files of ſoldiers, ſome of whom carry large maces with long handles; others iron maces in the ſhape of a ſnake; others are armed with huge hammers; while thoſe behind them carry long battle-axes in the form of a creſcent: others follow, who have battle-axes of another kind; and behind theſe are ſome with the hooked weapons already deſcribed.

Behind theſe come ſoldiers armed with triple-pointed ſpears, arrows, or battle-axes; having in front two men who carry a kind of box containing the viceroy's ſeal. Then come two other drummers to give notice of his approach. Two officers follow, having on their heads felt-hats, adorned with plumes of feathers, and each armed with a cane to recommend regularity and good order to the ſurrounding multitude. Two others bear maces in the form of gilt dragons. Theſe again are followed by a number of magiſtrates and officers of juſtice; ſome of whom carry whips or flat ſticks, while others have chains, hangers, and ſilk ſcarfs. Two ſtandard-bearers and a captain command this company, which immmediately precedes the governor. His chair is ſurrounded by pages and footmen, and an officer attends him who carries a large fan in form of a ſcreen: he is followed by ſeveral guards differently armed, together with enſigns and other officers, who are alſo followed by a great number of domeſtics all on horſeback, carrying various neceſſaries for the uſe of the mandarin. If he marches in the night-time, inſtead of flambeaux, as are cuſtomary in Europe, large lanthorns, exceedingly pretty, are carried before him; on the tranſparent part of which are written, in very conſpicuous characters, his quality, titles, and rank, as mandarin. Theſe are alſo intended to give notice to the paſſengers to ſtop, and to thoſe who are ſitting to riſe up with reſpect; for whoever neglects either the one or the other is ſure to receive a ſevere baſtinading.

The emperor marches with ſtill more magnificence, in proportion to his ſuperior quality. The trumpets uſed in his proceſſion are about three feet long, eight inches in diameter at the lower extremity, and pretty much reſembling a bell in ſhape: their ſound is peculiarly adapted to that of the drums. His cavalcade is cloſed by 2000 mandarins of letters and as many of arms. Sometimes the great mandarins, as well as the emperor, travel in barks. Their attendance is then ſomewhat different, but the magnificence almoſt the ſame. The honours paid to a viceroy who has governed a province with equity are exceedingly great on his departure from it. He has ſcarcely left the capital of the province when he finds on the highway, for the ſpace of two or three leaugues, tables ranged at certain diſtances, each of which is ſurrounded with a long piece of ſilk that hangs down to the earth. On theſe wax candles are placed even in the open day; perfumes are burnt upon them; and they are loaded with a profuſion of victuals and various kinds of fruit, while tea and wine are prepared for him on others. The people throw themſelves on their knees as he paſſes, and bow their heads even to the earth; ſome ſhed tears, or pretend to do ſo; ſome preſent him wine and ſweetmeats; others frequently pull off his boots and give him new ones. Theſe boots, which he has perhaps uſed only for a moment, are conſidered as a valuable monument: thoſe firſt taken off are preſerved in a cage over the gate of the city; the reſt are carefully kept by his friends.

117
Knaviſh diſpoſition of the Chineſe.

Hitherto our author, M. Groſier, has ſeemed inclined to give a favourable idea of the Chineſe, and to cauſe us look upon them as many degrees ſuperior to ourſelves in the practice of virtue and morality; but when he comes to give an account of their dealings in trade, he is then obliged to confeſs that they are as diſhoneſt and knaviſh a race as any that exiſt. “The moſt frequented fairs of Europe (ſays he) afford but a faint idea of that immenſe numbers of buyers and ſellers with which the large cities of China are continually crowded. We may almoſt ſay, that the one half are employed in over-reaching the other. It is, above all, againſt ſtrangers that the Chineſe merchants exerciſe, without any ſenſe of ſhame, their inſatiable rapacity. Of this F. du Halde gives a ſtriking example, which might be ſupported by many others: ‘The captain of an Engliſh veſſel bargained with a Chineſe merchant at Canton for ſeveral bales of ſilk, which the latter was to provide againſt a certain time. When they were ready, the captain went with his interpreter to the houſe of the Chineſe merchant to examine whether they were ſound an in good condition. On opening the firſt bale, he found it according to his wiſh, but all the reſt were damaged and good for nothing. The captain on this fell into a great paſſion, and reproached the merchant in the ſevereſt terms for his diſhoneſty. The Chineſe, after having heard him for ſome time with great coolneſs, replied, ‘Blame, Sir, your knave of an interpreter: he aſſured me that you would not inſpect the bales.’

“The lower claſs of people are, above all, very dexterous

terous in counterfeiting and adulterating every thing they ſell. Sometimes you think you have bought a capon, and you receive nothing but ſkin; all the reſt has been ſcooped out, and the place ſo ingeniouſly filled, that the deception cannot be diſcovered till the moment you begin to eat it. The counterfeit hams of China have been often mentioned. They are made of a peice of wood cut in the form of a ham, and coated over with a certain kind of earth which is covered with hog's ſkin. The whole is ſo curiouſly painted and prepared, that a knife is neceſſary to detect the fraud. Mr Oſbeck relates, that having one day obſerved a blind man carrying about for ſale ſome of thoſe trees called by the Chineſe *Fo-kei*, he purchaſed one, which to appearance had fine double red and white flowers; but in a cloſer examination, he found that the flowers were taken from another tree, and that one calyx was ſo neatly fitted into the other, with nails made of bamboo, that he ſhould ſcarcely have diſcovered the deceit, had not the flowers begun to wither. The tree itſelf had buds, but not one open flower.

“ The robbers in China ſignalize themſelves alſo by their dexterity and ingenuity, which they diſplay in their profeſſion. They ſeldom have recourſe to acts of violence, but introduce themſelves into a houſe either privately or by forming ſome connection with the family. It is as difficult in China to avoid robbery as it is to apprehend the criminal in the fact. If we are deſirous of finding among the Chineſe openneſs of temper, benevolence, friendſhip, and, laſtly virtue, we muſt not ſeek for it in cities, but in the boſom of the country, among that claſs of men who have devoted themſelves to labour and agriculture. A Chineſe ruſtic often diſcovers moral qualities which would add a luſtre to the character of men of the moſt exalted rank. It appears that rural life naturally inſpires ſentiments of benevolence; by continually receiving the gifts of nature, the mind is enlarged, and men are inſenſibly accuſtomed to diffuſe them to thoſe around them.”

The internal commerce of China is much greater than that of all Europe; but its foreign trade is by no means equal to that of any of the grand European powers. Its internal commerce is greatly facilitated by the vaſt number of canals and rivers with which the country is interſected. The Chineſe, however, are not at all fitted for maritime commerce: Few of their veſſels go beyond the ſtraits of Sunda: their longeſt voyages to Malacca extend only as far as Acheen, towards the ſtraits of Batavia, and northward to Japan.

Their commerce with the laſt mentioned iſland, conſidering the articles of exchange which they procure at Camboya or Siam, produces them *cent. per cent.* Their trade with the Manillas brings only about 50 *per cent.* Their profit is more conſiderable about Batavia; and the Dutch ſpare no pains to invite them to traffic at their ſettlemeut. The Chineſe traders go alſo, tho' not very frequently, to Acheen, Malacca, Thor, Patan and Ligor, belonging to Siam and Cochin-china; from whence they bring gold and tin, together with ſome objects of luxury for the table. A great obſtacle to the foreign commerce of the Chineſe is their indifference about marine affairs, and the bad conſtruction of their veſſels. This they themſelves ackowledge: but ſay, that any attempt to remove it would be derogating from the laws, and ſubverting the conſtitution of the empire.

118 Burying-places deſcribed.

The burying-places in China are always ſituated at a ſmall diſtance from a city or town, and generally upon ſome eminence, having pines or cypreſſes uſually planted around them. The form of the tombs is various, according to the different provinces, and the ſituation of thoſe for whom they are intended. The coffins of the poor are placed under a ſhade covered with thatch, or incloſed in a ſmall building of brick in the form of a tomb. The tombs of the rich are ſhaped like a horſe-ſhoe, well whitened, and finiſhed with great taſte; but thoſe of the mandarins and people of quality are much more ſumptuous and elegant. A vault is firſt conſtructed, in which the coffin is ſhut up; over this vault is raiſed a pyramid of earth well beat together, about 12 feet in height and 10 in diameter. A layer of lime and ſand laid over this earth makes a kind of plaſter, which renders the whole very durable and ſolid; various kinds of trees being planted around it in regular order. Before it is placed a large and long table of white marble, on the middle of which are ſet a cenſer accompanied with two vaſes, and the ſame number of candleſticks of exquiſite workmanſhip. Beſides this, a great number of figures, repreſenting officers, eunuchs, ſoldiers, ſaddled horſes, camels, lions, tortoiſes, &c. are ranged round the tombs in different rows; which, F. du Halde aſſures us, produce a very ſtriking effect.

When a Chineſe dies in a province in which he was not born, his children have a right, nay it is their indiſpenſable duty, to tranſport the body to the burying place of their anceſtors. A ſon who ſhould be wanting in this reſpect, would be diſgraced, and his name never placed in the hall of his anceſtors. This is a vaſt building, conſidered as common to all the branches of the ſame family; and to which they all repair at a certain ſeaſon of the year. Sometimes they amount to ſeven or eight thouſand perſons, whoſe fortune, dignity, and rank in ſociety, are all very different; but there no diſtinction of rank is known; age only gives precedence, and the oldeſt always takes place of all the reſt, though he ſhould be the pooreſt in the company. The diſtinguiſhing ornament of this hall is a long table ſet againſt the wall, upon which is generally ſeen the image of one of their anceſtors, who has filled ſome office of diſtinction in the empire with honour to himſelf, or who has been rendered illuſtrious by his talents and abilities. Sometimes it only contains the names of men, women, and children belonging to the family inſcribed upon tablets, together with their age, the day of their death, and the dignities they enjoyed at that time. Theſe tablets are ranged in two rows upon ſteps, and are only about a foot high each. In the ſpring, and and ſometimes in the autumn, the relations of the deceaſed repair to this hall, where the only privilege enjoyed by the richeſt is that of preparing an entertainment, and treating the whole family at their own expences: but they never allow themſelves to taſte a bit of any thing until an offering has been firſt made to their anceſtors. This does not, however, excuſe them from viſiting the real tomb of their anceſtors once or twice a year, generally in the month of April. At this time they pluck the weeds and buſhes from around the tomb, renew their expreſſions of of grief, and conclude by placing upon it wine and proviſions, which ſerve to dine their aſſiſtants.

119 Funeral ceremonies.

The funeral ceremonies are conſidered by the Chineſe as the moſt important of any. A few moments after a perſon has expired, he is dreſſed out in his richeſt attire, and adorned with every badge of his dignity; after which he is placed in the coffin. The preparation of a coffin, in which his body may be incloſed after death, is one of the chief objects of attention to a Chineſe during his life, and great expence is often thrown out upon it; inſomuch that the poor will give all they are worth, and the rich expend a thouſand crowns, nay, a ſon will ſell himſelf for a ſlave in order to purchaſe a coffin for his father. Sometimes the coffin, when purchaſed with all this labour and expence, will remain twenty years uſeleſs in the family, and is conſidered as the moſt valuable piece of furniture in his poſſeſſion.

The manner of interment is as follows; Firſt they ſprinkle ſome lime in the bottom of the coffin; then they lay the body in it, taking care to place the head on a pillow, and to add a great deal of cotton that it may remain more ſteady, and be prevented from ſhaking. In this manner the body remains expoſed ſeven days; but the time may be reduced to three, if any weighty reaſon makes it neceſſary; and, during this interval, all the relations and friends, who are purpoſely invited, come and pay their reſpects to the deceaſed, the neareſt relations remaining in the houſe. The coffin is expoſed in the hall of ceremony, which is then hung with white, but ſome pieces of black or violet coloured ſilk are here and there interſperſed, as well as ſome other ornaments of mourning. Before the coffin is placed a table, on which ſtands the image of the deceaſed, or a carved ornament inſcribed with his name: and theſe are always accompanied with flowers, perfumes, and lighted wax candles.

In the mean time thoſe who enter the hall are accuſtomed to ſalute the deceaſed as if he were ſtill in life. They proſtrate themſelves before the table, and knock their foreheads ſeveral times againſt the earth; after which they place on the table ſome perfumes and wax candles provided for the purpoſe. The ſalutation which they have made to the deceaſed is returned by the eldeſt ſon accompanied by his brothers. The latter come forth from behind a curtain, which hangs on one ſide of the coffin, creeping along the ground until they reach the ſpot where thoſe ſtand whom they are going to ſalute; after which, without riſing up, they return to the place from whence they came. The women are alſo concealed behind the ſame curtain, from whence they every now and then ſend forth diſmal cries.

After a number of ceremonies and invitations, the funeral proceſſion at laſt commences. A troop of men march in a file, carrying different figures made of paſte-board, and repreſenting ſlaves, lions, tigers, horſes, &c. Others follow, marching in two files; ſome of which carry ſtandards, ſome flags or cenſers filled with perfumes; while melancholy and plaintive airs are played by others on different muſical inſtruments. Theſe muſicians immediately precede the coffin, which is covered with a canopy, in form of a dome, of violet-coloured ſilk: its four corners are ornamented with tufts of white ſilk very neatly embroidered, and covered at the top with net-work. The coffin is placed on the bottom of this machine, and is carried by 64 men. The eldeſt ſon, clothed in a frock of canvas, having his body bent and leaning on a ſtaff, follows near the coffin; and behind him his brothers and nephews, but none of them clothed in canvas. Then come the relations and friends, all clad in mourning, and followed by a great number of chairs covered with white ſtuff, which contain the wives and female ſlaves of the deceaſed. Theſe make great ſhow of ſorrow by their doleful cries; but M. Groſier obſerves, that in ſpite of all they can do, the lamentations of the Chineſe are ſo methodical, that an European would be apt to conclude that they were the effects of art rather than the natural effuſions of a mind agitated and oppreſſed with grief. When they arrive at the burying place, the coffin is depoſited in a tomb appropriated for it, not far from which there are tables arranged in different halls, and on which the aſſiſtants are entertained with great ſplendour. The entertainment is ſometimes followed by freſh marks of homage to the corpſe; but theſe are often changed into thanks to the eldeſt ſon; who, however, anſwers only by ſigns. But if the deceaſed was a grandee of the empire, a certain number of his relations never leave the tomb for a month or two. There they reſide in apartments purpoſely provided for them, and every day renew their marks of grief in company with the children of the deceaſed. The magnificence of theſe funeral ceremonies is proportioned to the wealth or dignity of the deceaſed. That of one of the brothers of the emperor was attended by 16,000 people, each of whom had a particular office aſſigned him relating to the ceremony.

120 Mourning.

Mourning continues in China for three years; and during all this time they are obliged to abſtain from the uſe of fleſh and wine; nor can they aſſiſt at any entertainment of ceremony, or attend any public aſſembly. At firſt they are not even permitted to go abroad; and when they do ſo, they are carried in a chair covered with a white cloth. Sometimes the filial piety of the Chineſe is carried to ſuch a length, that they preſerve the bodies of their deceaſed fathers in their houſes for three or four years; and thoſe who do ſo impoſe alſo upon themſelves a great number of other duties, uſing no other ſeat during the day but a ſtool covered with white ſerge, and no other bed but a plain mat made of reeds, which is placed near the coffin.

121 Diverſions of hunting and fiſhing.

According to M Groſier, the only diverſions of the Chineſe are thoſe of hunting and fiſhing, dancing not being practiſed, and gaming forbidden by law. Fiſhing is conſidered by them rather as an object of commerce and induſtry than amuſement. They catch fiſh by various methods; uſing nets in their great fiſheries, but lines in the private. In certain provinces alſo they uſe a certain kind of bird, whoſe plumage greatly reſembles that of a raven, but with a much longer bill, very ſharp and hooked. This method of fiſhing is practiſed in boats, of which great numbers may be ſeen on the river about ſun-riſing, with the fiſhing-birds perched on their prows. Theſe birds are taught to catch fiſh almoſt in the ſame manner that dogs purſue game. The fiſhermen, after making ſeveral turns with their boats, beat the water ſtrongly with one of their oars. This ſerves as a ſignal to the birds, who inſtantly plunge into the water, and diving, ſwallow as many

ſmall

ſmall fiſh as they can, repairing immediately afterwards to the boat, and carrying a large one by the middle in their bill. The ſmall ones are prevented from paſſing into the ſtomach by a ring placed on purpoſe to confine its gullet: and thus the fiſherman by ſtroaking its neck with the head downwards, makes the bird diſgorge all thoſe ſmall fiſh it has ſwallowed. When they have done fiſhing, the rings are taken off, and the birds allowed to feed. When the fiſh happens to be too large for a ſingle bird, the others have ſagacity enough to aſſiſt it; one taking it by the tail, another by the head, &c. and thus they tranſport it to their maſter.

Another method of fiſhing, practiſed only in China, is as follows: They nail a board, about two feet in breadth, which is covered with a white ſhining kind of varniſh, upon the edges of a long narrow boat, from one end to the other. This board is placed in ſuch a manner as to ſlope almoſt imperceptibly to the water. It is uſed only in the night-time, and is always turned towards the moon, that the reflection of light from the luminary may increaſe the ſplendor of the varniſh. The fiſh, in ſporting, often miſtake this varniſhed board for water; and endeavouring to throw themſelves into it, fall into the boat.

The ſoldiers have a particular method of fiſhing with a bow and an arrow; the latter of which is fixed to the bow by a ſtring, both to prevent it from being loſt, and to enable them to draw out the fiſh which the arrow has pierced: others make uſe of tridents to catch large fiſh which are ſometimes found in the mud.

Beſides theſe diverſions, the Chineſe have ſome ſtrolling players, but no regular theatres; they have likewiſe muſicians and ſingers, but no operas, or indeed any public ſpectacle worthy of notice.

122 Of the Chineſe language. The language of the Chineſe is not only very ancient, but, in M. Groſier's opinion, is ſtill ſpoken as in the moſt early ages without any variation. His reaſons for this opinion are, 1. We do not perceive in hiſtory, nor even in the moſt fabulous traditions, a ſingle fact tending to occaſion any doubt of the language ſpoken by the ancient Chineſe being different from that uſed at preſent. 2. China has never changed its inhabitants; and if revolutions have occaſioned any mixture of new languages, it appears that the ancient language has always been predominant, and that the new ſettlers have learned and ſpoken it, as the Marchew Tartars after their conqueſt. 3. The moſt intelligent and diſcerning of the literati agree, that the firſt chapters of the *Chou-king* were written under the reign of Yao 2300 years before Chriſt; and in theſe, ſeveral ſpeeches of the firſt emperors are related word for word; and it is not probable that the language of theſe princes was different from that of the hiſtorian. 4. A compliment paid to Yao by one of his ſubjects, with the anſwer of that prince, are ſtill preſerved, as well as two ſongs compoſed under the ſame reign. 5. The moſt ancient inſcriptions in China are all in the language ſpoken throughout the empire at this day. 7. The Chineſe have borrowed nothing from other nations; and their attachment to their own cuſtoms, and to antiquity, muſt undoubtedly be very unfavourable to any innovation. The language ſpoken by the vulgar, indeed, muſt have undergone ſome changes; but theſe may be accounted trivial, affecting only the pronunciation; which indeed appears to be varied in ſome few inſtances. It is certain, however, that the Chineſe players act theatrical pieces which were written 1000 years ago, and that theſe are ſtill underſtood throughout the empire.

The language of China has no alphabet; all the words which compoſe it conſiſt of one ſyllable only, and are very few in number. Theſe always remain the ſame, and continue monoſyllables even when two are joined together, being united in the ſame manner as the French words *bon* and *jour* are united to form *bon-jour*. Theſe monoſyllables never form but one ſound. When written by an European, they begin with the letters *ch*, *tch*, *f*, *g*, or *j*, *i*, *h*, *l*, *m*, *n*, *g*, *ng*, *p*, *ſ*, *ts*, *v*, *ou*; the final letters being *a*, *e*, *i*, *o*, *oi*, *ou*, *u*, *l*, *n*, *gn*. The middle of Chineſe words conſiſts of vowels and conſonants produceing only one ſound, and pronounced always as monoſyllables. The whole primary words of the language are in number only about 330, though ſome dictionaries make them 484. The ſenſe of theſe words, however, is varied by the accents and changes of the voice in pronouncing them almoſt *ad infinitum*. Two principal accents are known in China; the *ping*, that is *even*, without elevating or depreſſing the voice. This is divided into *tſing*, *clear*, and *tcho*, *obſcure*; or rather *open* and *mute*. The accent *tſe* is ſubdivided into *tchang*, ſharp, *kiu*, grave, and *jou* re-entering. The tone is *chang* when one raiſes the voice at the end of a word, as when the negative *no* is pronounced with great emphaſis and force; it is *kiu* when one depreſſes the voice with an air of timidity. When the accent is *jou*, the voice is drawn back as it were into the throat; and the aſpiration which takes place on certain words beginning with the letters *c*, *k*, *p*, *t*, ſtill adds to theſe varieties.

By theſe differences in pronunciation the ſignification of the words is totally changed: thus the word *tchu* pronounced by lengthening the *u*, and with a clear tone of voice, ſignifies maſter or lord: if it is pronounced in an uniform tone by lengthening the *u*, it ſignifies *hog*: when pronounced lightly, and with rapidity, it ſignifies *kitchen*; and when articulated with a ſtrong voice depreſſed towards the end, it ſignifies a *pillar*.

By the conjunction and modification of theſe different monoſyllables, a Chineſe can expreſs every thing he has occaſion for; and it may be eaſily ſeen what variety muſt reſult from this art of multiplying words. The Chineſe language therefore has words expreſſive of the ſmalleſt variation of circumſtance, and which cannot be expreſſed in the European languages without a circumlocution. Thus, inſtead of the five words, calf, bull, ox, heifer, cow, every time that a cow has a calf ſhe acquires a new name in the language of this empire; and ſtill another when ſhe becomes barren. An ox fed for ſacrifice has a particular name, which is changed when he goes to the altar. In like manner, a whole dictionary might be compoſed of the words that are employed to expreſs the different parts of the emperor's palace, and thoſe that are in a manner conſecrated to it; others being employed when the palaces of princes or mandarins are ſpoken of. Thus the number of their characters are augmented beyond all bounds, ſo that the greater part of their literati ſpend all their lives in ſtudying them.

In the Chineſe there are four different languages. 1. The *Kou-ouen*, or claſſical language. This is not ſpoken at preſent, though it is generally believed to have been the language of the early ages. It is ſo laconic, and the ideas are ſo crowded, that it is very difficult to be underſtood; however, the literati, who can read and underſtand it, are much delighted with it. 2. The *Ouen-tchang* is the language uſed in compoſitions where a noble and elevated ſtyle is requiſite. It is never ſpoken, but certain ſentences and complimentary expreſſions are ſometimes borrowed from it. It approaches near to the laconic brevity and majeſtic ſublimity of the *Kou-ouen*, and is equally proper for every kind of ſubject, excepting only the ambiguities of metaphyſics, and the formal rugged diction uſed in treating of the abſtract ſciences.

3. The *Kouan-ha* is the language of the court, of people in office, and of the literati. It admits of ſynonymous expreſſions to moderate the brevity of monoſyllables; of pronouns and relatives; prepoſitions, adverbs, and particles; to ſupply the want of caſes, moods, tenſes, and numbers, which have place in other languages.

4. *Hiang-tan* is a kind of corrupted language, or provincial dialect, ſpoken by the lower claſſes in China; and of which every province, city, and almoſt every village, has its own. Beſides the ſenſe of the words, which is changed in a great variety of places, they are ſo altered by diverſity of pronunciation as to be almoſt unintelligible.

123 Chineſe writing. There are five kinds of writing mentioned by the Chineſe literati; the moſt modern of which is a method of tracing out the characters with a pencil. This is difficult, and requires much experience; at any rate, it disfigures the characters greatly, and is therefore only uſed in the preſcriptions of phyſicians, prefaces to books, and inſcriptions of fancy. The tracing of characters with neatneſs and accuracy, however, as we have already had occaſion to obſerve, is greatly admired in China. They are often preferred to the moſt elegant painting; and ſome will give a moſt exorbitant price for a page of an old book, if it happens to be neatly written. They pay particular attention to well-formed characters even in the moſt common books; and if any of the leaves happen to fall off, will replace them with the greateſt attention. To apply them to any vile purpoſe, tread them under foot, &c. would be reckoned an unpardonable violation of decency and politeneſs; nay, it often happens, that workmen, ſuch as maſons and joiners, dare not tear a printed leaf of paper fixed to the wall.

124 Of their poetry. Punctuation was not formerly uſed in China, nor are points as yet employed in works of an elevated ſtyle, or ſuch as are to be preſented to the emperor. Poetry is ſeldom any object of attention, though the taſte for it ſeems to be pretty general in China. Their verſification has its rules, and is no leſs difficult than that of other nations. Only the moſt harmonious, energetic, and pictureſque words, are to be employed, and they muſt always be uſed in the ſame ſenſe in which they were uſed by the ancients. Each verſe can contain only a certain number of words; all of which muſt be ranged according to the rules of quantity, and terminate in rhyme. The number of verſes in a ſtrophe is not determined; but they muſt be uniform, and preſent the ſame diſtribution of rhymes. The ſmall number of poetical expreſſions contained in the Chineſe language has rendered it neceſſary to extend the poetical licence to a great length in this reſpect. The Chineſe poets are allowed to employ a blank verſe in every four. They are acquainted with moſt kinds of poetry in uſe among us. They have ſtanzas, odes, elegies, idylls, eclogues, epigrams, ſatires, and even *bouts rimes*. The common people have alſo ballads and ſongs peculiar to themſelves. Some of the moſt diſtinguiſhed of the literati have even thought it of importance enough to turn the moſt celebrated maxims of morality, with the rules of civility, into verſe. Their poetry is ſeldom diſgraced by any kind of obſcenity; and indeed any ſuch thing would be ſeverely puniſhed by government. That ſevere attention with which every thing tending to corrupt the morals is watched in China, prohibits not only poems of this kind, but likewiſe romances of all ſorts. The police, however, permits ſuch novels as have an uſeful tendency, and in which nothing is introduced prejudicial to ſound morality. Every author who writes againſt government is puniſhed with death, as well as all thoſe who have had any hand in the printing or diſtribution of his works.

125 Chineſe paper. The art of making paper and printing have been long known among the Chineſe. That kind of paper now in uſe was firſt manufactured about 105 years before the Chriſtian æra. Before that period they uſed cloth, and various kinds of ſilk ſtuff, inſtead of paper; and to this day they ſtill preſerve a cuſtom of writing the praiſes of the dead upon large pieces of ſilk, which are ſuſpended on one ſide of the coffin, and carried in funeral proceſſions; and of ornamenting their apartments with maxims and moral ſentences written in the ſame manner. In ages ſtill more early, they wrote with a kind of ſtyle upon pieces of bamboo, or even upon plates of metal. The firſt paper was invented by a mandarin. He took the bark of trees, hemp, and old pieces of ſilk-ſtuff, boiling them together until they were reduced to a kind of paſte, of which he formed his paper; which by degrees was brought to perfection, and the art of whitening and giving it a luſtre found out. A great number of different ſubſtances are now uſed in this empire for making paper; ſuch as the bamboo, reed, the cotton ſhrub, the bark of the plant called *kou-chu*, and of the mulberry tree; hemp, the ſtraw of wheat and rice, parchment, the cods of the ſilk worm, and ſeveral other ſubſtances unknown in Europe. In this manufacture the bark of trees and ſhrubs is uſed, and the woody ſubſtance of the bamboo and cotton tree, after it has been macerated and reduced to a thin paſte. Moſt of the Chineſe paper, however, is attended with the diſadvantage of being very ſuſceptible of moiſture, readily attracts the duſt, and worms inſenſibly get into it: to prevent which inconveniences, it is neceſſary to beat the books often, and expoſe them to the ſun. That made of cotton is the prettieſt, and moſt uſed of any. All of them, however, are much ſofter and ſmoother than ours; which is abſolutely neceſſary for their method of writing with a pencil, in order that it may run with freedom, which it could not do upon ours. It is formed into ſheets of an enormous ſize; ſo that it would be no difficult matter to procure from the manufactories of this empire ſheets of paper 30 or 40 feet long.

126 Ink. The Chineſe ink came originally from Corea; and it was not until the year 900, that they hit upon the me-

thod of making it to perfection. The beſt is made in *Hoei-tcheou* in the province of *Kiangnan*; but its compoſition is a ſecret, which the workmen conceal not only from ſtrangers, but from their fellow-citizens. When a Chineſe has occaſion to write, he places upon his table a piece of poliſhed marble, having a cavity at one of its extremities to contain a little water. In this he dips the end of his cake of ink, and rubs it upon the ſmooth part of the marble; and as he preſſes more or leſs ſtrongly, the liquor acquires a deeper or lighter tinge of black. When he has done writing, the ſtone is carefully waſhed; for it would be diſhonoured by allowing the leaſt ſpot to remain. The pencils uſed in writing are commonly made of the fur of a rabbit, and conſequently very ſoft.

127 Their method of printing. The Chineſe method of printing is exceedingly different from ours; and indeed it would be in a manner impoſſible to have moveable types for ſuch a number of characters as their language requires. The whole work which they intend to print is therefore engraved upon blocks of wood; and their method of proceeding is as follows. They firſt employ an excellent writer, who tranſcribes the whole upon very thin paper. The engraver glues each of the leaves of the manuſcript upon a piece of plank made of any hard wood; he then traces over with a graver the ſtrokes of the writing, carves out the characters in relief, and cuts down the intermediate part of the wood. Thus each page of a book requires a ſeparate plank; and the exceſſive multiplication of theſe is no doubt a very great inconvenience, one chamber being ſcarce ſufficient to preſerve thoſe employed for a ſingle book. The advantages are, that the work is thus free from typographical errors, and the author has no occaſion to correct the proofs. Thus alſo the bookſellers in China have a decided advantage over thoſe of Europe, as they are able by this method of printing to throw off copies according to their ſale, without running the riſk of being ruined by too large an addition. In this method the beauty of the work depends entirely upon the ſkill of the writer previouſly employed. The engravers are exceedingly dexterous, and imitate every ſtroke ſo exactly, that it is ſometimes difficult to diſtinguiſh a printed work from one that is only written.

The method of printing in China is not by a preſs as in Europe, as neither their wooden planks nor their ſoft paper could ſuſtain ſo much preſſure. They firſt place the plank level, and then fix it in that poſition. The printer is provided with two bruſhes, and, with the hardeſt, daubs the plank with ink; and one daubing is ſufficient for four or five leaves. After a leaf has been adjuſted upon the plank, the workman takes the ſecond bruſh, which is ſofter than the former, and of an oblong figure, and draws it gently over the paper, preſſing it down a little, that it may receive the ink. The degree of preſſure is to be regulated by the quantity of ink upon the plank: and in this manner one man is able to throw off almoſt 10,000 copies a-day. The ink uſed for printing is different from that formerly deſcribed, and which is uſed in writing. The leaves, on account of the thinneſs of the paper, are printed only upon one ſide; on which account each leaf of a book is double, ſo that the fold ſtands uppermoſt, and the opening is towards the back, where it is ſtitched. Hence the Chineſe books are not cut on the edges, but on the back. They are generally bound in grey paſteboard, which is very neat; and thoſe who wiſh to have them more elegantly done, get the paſteboard covered with ſatin, flowered taffety, and ſometimes with gold and ſilver brocade. Their books are neither gilt nor coloured on the edges like ours.

128 Vaſt quantity of ſilk produced. The art of manufacturing ſilk, according to the beſt authorities, was communicated by the Chineſe to the Perſians, and from them to the Greeks. The art has been known in this empire from the remoteſt antiquity; and the breeding of ſilk-worms and making of ſilk was one of the employments even of the empreſſes in very early ages.

The moſt beautiful ſilk in the whole empire is that of *Tche-kiang*, which is wrought by the manufactories of Nankin. From theſe are brought all the ſtuffs uſed by the emperor, and ſuch as he diſtributes in preſents to his nobility. A great number of excellent workmen are alſo drawn to the manufactories of Canton by the commerce with Europe and other parts of Aſia. Here are manufactured ribbons, ſtockings, and buttons. A pair of ſilk ſtockings here coſt little more than 6s. ſterling.

The quantity of ſilk produced in China ſeems to be almoſt inexhauſtible; the internal conſumption alone being incredibly great, beſides that which is exported in the commerce with Europe and the reſt of Aſia. In this empire all who poſſeſs a moderate fortune wear ſilk clothes; none but the lower claſs of people wearing cotton ſtuffs, which are commonly dyed blue. The principal ſtuffs manufactured by them are plain and flowered gauzes, of which they make ſummer dreſſes, damaſk of all colours; ſtripped and black ſatins; napped, flowered, ſtriped, clouded, and pinked taffeties; crapes, brocades, pluſh, different kinds of velvet, and a multitude of other ſtuffs unknown in Europe. They make particular uſe of two kinds; one named *touan-tſe*, a kind of ſatin much ſtronger, but, which has leſs luſtre, than that of Europe; the other a kind of taffety, of which they make drawers and linings. It is woven exceedingly cloſe, and is yet ſo pliable that it may be rumpled and rubbed between the hands without any creaſe; and even when waſhed like cotton-cloth, it loſes very little of its luſtre. They manufacture alſo a kind of gold brocades, but of ſuch a ſlight nature, that they cannot be worn in clothes: they are fabricated by wrapping fine ſlips of gilt paper round the threads of ſilk.

129 Porcelain. Porcelain is another great branch of Chineſe manufacture, and employs a vaſt number of workmen. The fineſt is made in a village called *King-te-ching* in the province of *Kiang-ſi*. Manufactories have alſo been erected in the provinces of Fo kien and Canton, but their produce is not eſteemed, and one which the emperor cauſed to be erected at Peking, in order to be under his own inſpection, miſcarried entirely.

The Chineſe divide their porcelain into ſeveral claſſes, according to its different degrees of fineneſs and beauty. The whole of the firſt is reſerved for the uſe of the emperor, ſo that none of it ever comes into the hands of other perſons, unleſs it happen to be cracked or otherwiſe damaged in ſuch a manner as to be unworthy of being preſented to the ſovereign. Among that ſent to the emperor, however, there is ſome porcelain of an in-

inferior quality, which he diſpoſes of in preſents. There is ſome doubt, therefore, whether any of the fineſt Chineſe porcelain was ever ſeen in Europe. Some value, however, is now put upon the European porcelain by the Chineſe themſelves.

130
Glaſs of little eſtimation.

The uſe of glaſs is very ancient in China, though it does not appear that great value was ever put upon this kind of ware, the art of manufacturing it having been frequently loſt and revived again in this empire. They greatly admire the workmanſhip of the European cryſtal, but prefer their own porcelain, which ſtands hot liquors, and is much leſs liable to be broken. The little eſtimation in which this ſubſtance was held, is even mentioned by their own writers in ſpeaking of the falſe pearls, mirrors and other toys which were made in former ages. The remembrance of a very large glaſs veſſel, however, which was made in 627, is ſtill preſerved; and of which it was ſaid that a mule could as eaſily enter it as a gnat could enter a pitcher. In order to tranſport this monſtrous veſſel from the place where it was manufactured to the emperor's palace, it was neceſſary to incloſe it in a net, the four corners of which were fixed to four carriages. The ſame indifference with regard to glaſs is ſtill entertained by the preſent emperors; however, a glaſs-houſe is eſtabliſhed at Peking, where a number of vaſes and other works are made; and theſe are ſo much the more difficult in the execution, as none of them are blown. This manufactory, as well as many others, is conſidered only as an appendage of the court, deſtined for the purpoſes of pomp and magnificence.

131
Medicine.

132
Method of diſcovering if a man has died a voluntary death.

Moſt of the Chineſe medicine is abſolute quackery; their ſkill in anatomy is not only very limited, but mixed with ſuch a number of falſehoods, as render it in a manner abſolutely uſeleſs. Their materia medica conſiſts moſtly of herbs, of which tea is one. To this they aſcribe great and wonderful virtues, eſpecially if it has been gathered on any of the ſummits of a mountain called *Mong-chan*. The only thing regarding this ſcience, which merits any attention, is the method they are ſaid to poſſeſs of diſcovering whether a man has hanged or drowned himſelf, or had that violence committed upon him by others. In order to diſcover this, the body is firſt taken from the earth, and waſhed in vinegar. After this a large fire is kindled in a pit dug on purpoſe, ſix feet long, three wide, and the ſame depth. This fire is continually augmented, until the ſurrounding earth becomes as hot as an oven; the remaining fire is then taken out, a large quantity of wine is poured into it, and it is covered with a hurdle made of oſier twigs, upon which the body is ſtretched out at full length. A cloth is thrown over both in the form of an arch, in order that the ſteam of the wine may act upon it in every direction. At the end of two hours the cloth is taken off; and if any blows have been given, they then appear upon the body in whatever ſtate it may be. The Chineſe likewiſe aſſert, that if the blows given have been ſo ſevere as to occaſion death, this trial makes the marks appear upon the bones, though none of them ſhould be broken or apparently injured. The wine uſed in theſe trials is only a kind of beer made from rice and honey.

133
Of their muſic.

With regard to the muſic of the Chineſe, we have the ſame ſtories related as of the Greeks and Egyptians, viz. that in former ages the muſicians could make brute animals leap at the ſound of their inſtruments. Our author, M. Groſier, indeed, does not quote any Chineſe author who aſſerts that the ancient muſic could make trees dance, or ſtones arrange themſelves into a city; but he quotes them, aſſerting, "that the muſicians could call down ſuperior ſpirits of every age from the etherial regions; raiſe up the manes of departed beings; inſpire men with a love of virtue; and lead them to the practice of their duty." Effects of this ſupernatural kind are attributed to the ſacred muſic by the inſpired writers; as in the caſe of Saul, out of whom an evil ſpirit departed at the ſound of David's harp; and of Eliſha, who was inſpired with the ſpirit of prophecy at the ſound of a muſical inſtrument. It is probable therefore, that the relations both of the Greeks and Chineſe are founded upon facts of this kind; and we cannot from thence infer, that the muſic of early ages was at all ſuperior to that which followed. According to thoſe who have employed much time in theſe reſearches, the ancient Chineſe were acquainted with the diviſion of the octave into twelve ſemitones; and that before the time of Pythagoras, or even Mercury himſelf; that the lyre of Pythagoras, his invention of the diatonic tetrachords, and the formation of his grand ſyſtem, were merely borrowed from the ancient Chineſe. In ſhort, it is maintained, that the Greeks, even Pythagoras himſelf, did nothing but apply to ſtrings that theory which the Chineſe had before formed, and applied to pipes.

At preſent the Chineſe are not acquainted with the uſe of our muſical notes; they have not that diverſity of ſigns which diſtinguiſh the different tones, and the gradual elevation or depreſſion of the voice, nor any thing to point out the various modifications of ſound to produce harmony. They have only a few characters to mark the principal notes; and all the airs they learn are repeated merely by rote. The emperor Kang-hi was therefore greatly aſtoniſhed at the facility with which an European could catch and remember an air the firſt time he heard it. In 1679 he ſent for Fathers Grimaldi and Pereira, to play ſome tunes on the harpſichord, of which they had before made him a preſent. He was greatly entertained with their muſic, but altogether aſtoniſhed when he found that F. Pereira could take down a Chineſe air while the muſicians were playing it, and then repeat the whole without omitting a ſingle note. Having made ſeveral trials of this kind in order to ſatisfy himſelf, he beſtowed the higheſt encomiums upon the European muſic, and the means furniſhed by it to facilitate and leſſen the labour of the memory. "I muſt confeſs (ſays he) that the European muſic is incomparable, and that the like of this F. Pereiri is not to be found in my whole kingdom."

134
Muſical inſtruments.

The Chineſe have always diſtinguiſhed eight different ſounds; and they believe that nature, in order to produce theſe, formed eight different kinds of ſonorous bodies. The order in which they diſtribute theſe ſounds, and the inſtruments they have contrived to produce them, are, 1. The ſound of ſkin produced by drums. 2. That of ſtone produced by the *king*. 3. The ſound of metal by bells. 4. That of baked earth by the *huien*. 5. Of ſilk by the *kin* and *che*. 6. Of

wood

wood by the *yu*, and *tchou*. 7. Of the bamboo by the *koan*, and different flutes. 8. That of a gourd by the *cheng*.

The drums were originally compoſed of a box made of baked earth, and covered at the extremities with the ſkin of ſome animal; but on account of the brittleneſs of baked earth, wood was ſoon ſubſtituted in its ſtead. Greater part of theſe inſtruments are ſhaped like our barrels, but ſome are cylindric.

The inſtruments formed of the ſonorous ſtones are called *king*, diſtinguiſhed into *tſe-king* and *pien-king*. The *tſe-king* conſiſts only of one ſtone, and therefore produces only one note. The *pien-king* conſiſts of 16 ſtones ſuſpended together, and thus forming an inſtrument capable of producing all the tones admitted into the muſic of the ancient Chineſe. They are cut into the form of a carpenter's ſquare; their tone is flattened by diminiſhing their thickneſs, and is made ſharper by abridging their length.

135 Bells of immenſe ſize. The bells in China have always been made of a mixture of tin and copper. They are of different ſhapes, and thoſe of the ancients were not round, but flatted, and in the lower part reſembling a creſcent. An inſtrument, correſponding to the *king* already mentioned, is compoſed of 16 bells of different ſizes. Some of their bells uſed on public occaſions are of enormous magnitudes. One at Peking is deſcribed as 13½ feet in diameter, 12½ in height, and 42 in circumference; the weight being upwards of 120,000 pounds. It is uſed for announcing the hours or watches of the night; and its ſound, which is prodigiouſly loud and ſtrong, has a moſt awful effect in the night-time, by reverberating round the walls and the echo of the ſurrounding country. There are ſeveral others likewiſe of a vaſt ſize in the ſame city; one of which deſerves greatly to be admired on account of the beautiful characters with which it is covered: and which are as neat and perfect as if traced out by the hand of the fineſt writer, or formed by means of a ſtamp upon wax. F. le Comte tells us, that in all the cities of China there are bells for marking the hours and watches of the night. They generally divide the night into five watches, beginning at ſeven or eight in the evening. On the commencement of the firſt they give one ſtroke, which is repeated a moment after; and thus they continue for two hours till the beginning of the ſecond: they then give two ſtrokes, which are repeated at equal intervals till the beginning of the third watch; and thus they proceed to the fourth and fifth, always increaſing the number of the ſtrokes. For the ſame purpoſe alſo they uſe enormous drums, which they beat in a ſimilar manner. F. Magaillans mentions one at Peking upwards of 40 feet in circumference.

The inſtrument called *huien*, which is made of baked earth is highly eſteemed by the Chineſe on account of its antiquity. It is diſtinguiſhed into two kinds, the great and ſmall; the former being of the ſize of a gooſe's egg; the latter of that of a hen's. It has ſix holes, and a ſeventh for the mouth

The *kin* and *tche* have been known from the remoteſt antiquity. The kin has ſeven ſtrings made of ſilk, and is diſtinguiſhed into three kinds, differing only in ſize. The body is formed of a kind of wood varniſhed black, and its whole length about five feet five inches. The *che* is about nine feet in length, has 25 ſtrings, and is divided into 25 kinds. F. Amiot aſſures us, that we have no inſtrument in Europe which deſerves to be preferred to it.

The inſtruments which emit the ſound of wood are the *tchou*, the *yu*, and the *tchoung-tou*. The firſt is ſhaped like a buſhel, and is beat on the inſide with a hammer; the ſecond, which repreſents a tyger ſquatting, is made to ſound by ſcraping its back gently with a rod; the third is a collection of twelve pieces of boards tied together, which are uſed for beating time, by holding them in the right hand, and knocking them gently againſt the palm of the left.

Many inſtruments are conſtructed of the bamboo. Theſe conſiſt of pipes joined together, or ſeparate, and pierced with more or fewer holes. The principal of all theſe wind inſtruments is the *cheng*, which emits the ſound of a gourd. This is formed by cutting off the neck of a gourd, and reſerving only the lower part. To this a cover is fitted, having as many holes as are equal to the number of ſounds required. In each of theſe holes a pipe made of bamboo is fixed, and ſhorter or longer according to the tone intended. The mouth of the inſtrument is formed of another pipe ſhaped like the neck of a gooſe; which is fixed to the gourd on one ſide, and ſerves to convey the air to all the pipes it contains. The ancient *cheng* varied in the number of their pipes; thoſe uſed at preſent have only 13.

136 Chineſe painting. The painting of the Chineſe is undoubtedly inferior to that of the Europeans, though we are not by any means to judge of the abilities of the painters of this empire by the performances which are brought to Europe. M. Groſier remarks, that the works of the eminent Chineſe painters are never brought to Canton, becauſe they cannot find purchaſers among the European merchants. The latter delight only in obſcene pictures, which are not permitted by government, nor indeed will any artiſt of character execute them, though they prevail upon ſome of the inferior daubers to gratify them in this reſpect. It ſeems, however, to be univerſally agreed, that the Chineſe have no notion of correctneſs or perſpective, and little knowledge of the proportions of the human body, though it cannot be denied that they excel in painting flowers and animals. In theſe they pride themſelves in a ſcrupulouſly exact imitation of nature, inſomuch that it is no uncommon thing to hear a painter aſk his pupil how many ſcales there are between the head and tail of a carp.

Painting was formerly much eſteemed in China, but has now fallen into diſrepute on account of its political inutility. The cabinets and galleries of the emperor, however, are filled with European paintings, and the celebrated artiſts Caſtiglioni and Attiret were both employed; but their offer of erecting a ſchool of painting was rejected, leſt they ſhould by this means revive the taſte for that art which it had been formerly thought prudent to ſuppreſs.

Painting in freſco was known in China long before the Chriſtian aera; and, like the Grecians, the Chineſe boaſt much of their celebrated painters of antiquity. Thus we are told of a door painted by Fan-hien, which was ſo perfect an imitation, that the people who entered the temple where it was attempted to go out by it, unleſs prevented by thoſe who had ſeen it before.

The preſent emperor has in his park an European village painted in freſco, which produces the moſt agreeable deception. The remaining part of the wall repreſents a landſcape and little hills, which are ſo happily blended with the diſtant mountains, that nothing can be conceived more agreeable. This was the production of Chineſe painters, and executed from deſigns ſketched out for them.

137 Engraving. Engraving in three, four, or five colours, is very ancient among the Chineſe, and was known in this empire long before its diſcovery in Europe.

138 Sculpture. Sculpture is very little known in this empire; nor is there a ſingle ſtatue in any of the ſquares or public edifices of Peking, not even in the emperor's palace. The only real ſtatues to be met with in the empire are thoſe which, for the ſake of ceremonious diſtinction, are uſed to ornament the avenues leading to the tombs of princes and men of great rank; or thoſe that are placed near the emperor's coffin, and that of his ſons and daughters in the interior part of the vault, where their remains are depoſited.

139 Architecture. The Chineſe architecture is entirely different from that of the Greeks or Romans: but nevertheleſs has certain proportions of its own, and a beauty peculiar to itſelf. The habitations of the emperor are real palaces, and announce in a ſtriking manner the majeſty and grandeur of the maſter who inhabits them. All the miſſionaries who had acceſs to the inſide of the emperor's palace at Peking, agreed, that if each of its parts, taken ſeparately, does not afford ſo much delight to the eye as ſome pieces of the grand architecture of Europe, the whole preſents a ſight ſuperior to any thing they had ever ſeen before. In the Chineſe architecture, when a pillar is two feet diameter at the baſe, its height muſt be 14 feet: and by meaſures of this kind the height of every building is determined.

Almoſt all the houſes and buildings in China are conſtructed of wood. One reaſon of this may be the dread of earthquakes; but, beſides this, ſuch buildings are rendered eligible by the heat and dampneſs of the ſouthern provinces, and the exceſſive cold in the northern, which would render ſtone houſes almoſt uninhabitable. Even at Peking, where the rains are but of ſhort duration, it is found neceſſary to cover the ſmall marble ſtair-caſes belonging to the imperial palace with pieces of felt: the humidity of the air moiſtens and ſoaks into every thing. During winter the cold is ſo exceedingly ſevere, that no window can be opened to the north; and water continues conſtantly frozen to the depth of a foot and a half for more than three months. For the ſame reaſons a variety of ſtories are not uſed in the Chineſe buildings; as neither a ſecond nor third ſtory would be habitable during the great heats of ſummer or the rigorous cold of winter. Though Peking is ſituated in the northern part of the empire, the heat there, during the dog-days, is ſo intolerably ſcorching, that the police obliges tradeſmen and ſhopkeepers to ſleep in the open air in the piazzas of their houſes, leſt they ſhould be ſtifled by retiring into their inner apartments. The habitations of people of rank, or of thoſe of eaſy circumſtances, generally conſiſt of five large courts, incloſed with buildings on every ſide. The method of building with ſeveral ſtories was, however, followed for ſeveral centuries, when the court reſided in the ſouthern provinces; and the taſte for this kind of building was carried to ſuch an height, that immenſe edifices were erected from 150 to 200 feet in height, and the pavilions or towers at the extremities roſe upwards of 300 feet. This kind of building, however, at length became diſguſting; though, either to preſerve the remembrance of it, or for the ſake of variety, there are ſtill ſome buildings to be ſeen ſeveral ſtories high in the palaces belonging to the emperor.

140 Bridges. A multiplicity of bridges are rendered neceſſary in China by the vaſt number of canals and rivers which interſect the empire. Anciently, however, the Chineſe bridges were much more ingenious as well as magnificent than they are at preſent. Some of them were ſo contrived that they could be erected in one day to ſupply the place of others which might happen to be broken down, or for other purpoſes. At that time they had bridges which derived their name from their figure; as *reſembling the rainbow; draw-bridges, bridges to move with pullies, compaſs-bridge*, &c. with many others entirely unknown at preſent. The building of bridges indeed was once a luxurious folly of the emperors; ſo that they were multiplied from whim or caprice, without any neceſſity, and without uſe. Still, however, many of them are extremely beautiful and magnificent. The arches of ſome are very lofty and acute, with eaſy ſtairs on each ſide, the ſteps of which are not quite three inches in thickneſs, for the greater facility of aſcending and deſcending: others have no arches, but are compoſed of large ſtones, ſometimes 18 feet in length, placed tranſverſely upon piles like planks. Some of theſe bridges are conſtructed of ſtone, marble, or brick; others of wood; and ſome are formed of a certain number of barks joined together by very ſtrong iron chains. Theſe are known by the name of floating bridges, and ſeveral of them are to be ſeen on the large rivers Kiang and Hoang-ho.

141 Ship-building. For ſeveral centuries the Chineſe have made no progreſs in ſhip-building. Their veſſels have neither mizen, bowſprit, nor top maſt. They have only a main and fore-maſt, to which is ſometimes added a ſmall top gallant-maſt. The main-maſt is placed almoſt in the ſame part of the deck as ours; but the fore-maſt ſtands much farther forward. The latter is to the former in the proportion of two to three; and the main-maſt is generally two-thirds of the length of the veſſel. They uſe mats for ſails, ſtrengthening them with whole bamboos equal in length to the breadth of the ſail, and extended acroſs it at the diſtance of a foot from one another. Two pieces of wood are fixed to the top and bottom of the ſail; the upper ſerves as a ſail-yard; and the lower, which is about five or ſix inches in thickneſs, keeps the ſail ſtretched when it is neceſſary to hoiſt or lower it. This kind of ſail may be folded or unfolded like a ſcreen. For caulking their veſſels they do not uſe pitch, but a particular kind of gum mixed with lime, which forms a compoſition of ſuch excellent quality, that one or two wells in the hold are ſufficient to keep the veſſel dry. They have not yet adopted the uſe of pumps, and therefore draw up the water with buckets. Their anchors are made of the hard wood called *iron-wood*, which they ſay is much

ſuperior

ſuperior to the metal, becauſe the latter ſometimes bend, but the former never do.

The Chineſe pretend to have been the firſt inventors of the mariner's compaſs, but ſeem to have little inclination to improve ſuch an important machine: however, they are well acquainted with the art of manœuvring a veſſel, and make excellent coaſting pilots, though they are bad ſailors in an open ſea.

China-Root, in the materia medica, the root of a ſpecies of SMILAX, brought both from the Eaſt and Weſt Indies; and thence diſtinguiſhed into oriental and occidental. Both ſorts are longiſh, full of joints, of a pale-reddiſh colour, with no ſmell, and very little taſte. The oriental, which is the moſt eſteemed, is conſiderably harder and paler-coloured than the other. Such ſhould be choſen as is freſh, cloſe, heavy, and upon being chewed appears full of a fat unctuous juice. It is generally ſuppoſed to promote inſenſible perſpiration and the urinary diſcharge, and by its unctuous quality to obtund acrimonious juices. China-root was firſt brought into Europe in the year 1535, and uſed as a ſpecific againſt venereal and cutaneous diſorders. With this view it was made uſe of for ſome time; but has long ſince given place to more powerful medicines.

China-Ware. See PORCELAIN.

CHINCA, a ſea-port town of Peru in South America, ſituated in an extenſive valley of the ſame name, in W. Long. 76. 0. S. Lat. 13. 0.

CHINCOUGH, a convulſive kind of cough to which children are generally ſubject. See MEDICINE-*Index*.

CHINESE, in general denotes any thing belonging to China, or its inhabitants.

Chinese Swanpan. See SWANPAN.

CHINKAPIN. See FAGUS.

CHINNOR, a muſical inſtrument among the Hebrews, conſiſting of 32 chords. Kircher has given a figure of it, which is copied on Plate CXXXV.

CHINON, an ancient town of Tourain in France, remarkable for the death of Henry II. king of England, and for the birth of the famous Rabelais. It is ſeated on the river Vienne, in a fertile and pleaſant country, in E. Long. 0. 18. N. Lat. 47. 2.

CHIO, or CHIOS, an Aſiatic iſland lying near the coaſt of Natolia, oppoſite to the peninſula of Ionia. It was known to the ancients by the name of Æthalia, Macris, Pithynſa, &c. as well as that of Chios. According to Herodotus, the iſland of Chios was peopled originally from Ionia. It was at firſt governed by kings; but afterwards the government aſſumed a republican form, which by the direction of Iſocrates was modelled after that of Athens. They were, however, ſoon enſlaved by tyrants, and afterwards conquered by Cyrus king of Perſia. They joined the other Grecians in the Ionian revolt; but were ſhamefully abandoned by the Samians, Leſbians, and others of their allies; ſo that they were again reduced under the yoke of the Perſians, who treated them with the utmoſt ſeverity. They continued ſubject to them till the battle of Mycale, when they were reſtored to their ancient liberty: this they enjoyed till the downfal of the Perſian empire, when they became ſubject to the Macedonian princes. In the time of the emperor Veſpaſian the iſland was reduced to the form of a Roman province; but the inhabitants were allowed to live according to their own laws under the ſuperintendance of a praetor. It is now ſubject to the Turks, and is called *Scio*. See that article.

CHIOCOCCA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatae*. The corolla is funnel-ſhaped and equal; the berry unilocular, diſpermous, inferior.

CHIONANTHUS, the SNOW-DROP or FRINGE TREE: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the 44th order, *Sepiariae*. The corolla is quadrifid, with the ſegments very long; the fruit is a plum. There is but one ſpecies particularly deſcribed by botaniſts, viz. the *Virginica*. It is common in Virginia and South Carolina, where it grows by the ſides of rivulets. It riſes to the height of ten feet; the leaves are as large as thoſe of the laurel, but much thinner. The flowers come out in May, and are of a pure white; from whence it has the name of the *ſnow-drop tree*. They hang down in large branches, and are cut into narrow ſegments; from which it has got its other name of the *fringe-tree*. After the flowers are fallen off, the fruit appears, which grows to the ſize of a ſloe, having a ſtone in the middle. The plants are propagated, in Britain, from ſeeds ſown on a hot-bed, and kept in a ſtove. Some have been raiſed from layers; but this method is very precarious, and therefore the other is to be preferred. The ſeeds are procured from America, for they never come to perfection in Britain.

CHIONE, in fabulous hiſtory, was daughter of Daedalion, of whom Apollo and Mercury became enamoured. To enjoy her company, Mercury lulled her to ſleep with his caduceus; and Apollo, in the night, under the form of an old woman, obtained the ſame favours as Mercury. From this embrace Chione became mother of Philammon and Autolycus; the former of whom, as being ſon of Apollo, became an excellent muſician; and the latter was equally notorious for his robberies, of which his father Mercury was the patron. Chione grew ſo proud of her commerce with the gods, that ſhe even preferred her beauty to that of Juno; for which impiety ſhe was killed by the goddeſs and changed into a hawk.——Another of the ſame name was daughter of Boreas and Orithyia, who had Eumolphus by Neptune. She threw her ſon into the ſea; but he was preſerved by his father.

CHIOS. See CHIO and SCIO

CHIOURLIC, an ancient town of Turkey in Europe, and in Romania, with a ſee of a Greek biſhop. It is ſeated on a river of the ſame name, in E. Long. 7. 47. N. Lat. 41. 18.

CHIOZZO, an ancient and handſome town of Italy, in the territory of Venice, and in a ſmall Iſland, near the Lagunes, with a podeſta, a biſhop's ſee, and a harbour defended by a fort. E. Long. 12. 23. N. Lat. 45. 17.

CHIPPENHAM, a town of Wiltſhire, ſeated on the river Avon. It is a good thoroughfare town; has a handſome ſtone-bridge over the river, conſiſting of 16 arches; and ſends two members to parliament. There

There is here a manufacture of the beſt ſuperfine woollen cloth in England. W. Long. 2. 12. N. Lat. 51. 25.

CHIPPING, a phraſe uſed by the potters and china-men to expreſs that common accident both of our own ſtone and earthen ware, and the porcelain of China, the flying off of ſmall pieces, or breaking at the edges. Our earthen wares are particularly ſubject to this, and are always ſpoiled by it before any other flaw appears in them. Our ſtone-wares eſcape it better than theſe; but not ſo well as the porcelain of China, which is leſs ſubject to it than any other manufacture in the world. The method by which the Chineſe defend their ware from this accident, is this: They carefully burn ſome ſmall bamboo canes to a ſort of charcoal, which is very light, and very black; this they reduce to a fine powder, and then mix it into a thin paſte, with ſome of the varniſh which they uſe for their ware: they next take the veſſels when dried, and not yet baked, to the wheel; and turning them ſoftly round, they, with a pencil dipt in this paſte, cover the whole circumference with a thin coat of it; after this, the veſſel is again dried; and the border made with this paſte appears of a pale greyiſh colour when it is thoroughly dry. They work on it afterwards in the common way, covering both this edge and the reſt of the veſſel with the common varniſh. When the whole is baked on, the colour given by the aſhes diſappears, and the edges are as white as any other part; only when the baking has not been ſufficient, or the edges have not been covered with the ſecond varniſhing, we ſometimes find a duſky edge, as in ſome of the ordinary thick tea-cups. It may be a great advantage to the Engliſh manufactures to attempt ſomething of this kind. The willow is known to make a very light and black charcoal; but the elder, though a thing ſeldom uſed, greatly exceeds it. The young green ſhoots of this ſhrub, which are almoſt all pith, make the lighteſt and the blackeſt of all charcoal; this readily mixes with any liquid, and might be eaſily uſed in the ſame way that the Chineſe uſe the charcoal of the bamboo cane, which is a light hollow vegetable, more reſembling the elder ſhoots than any other Engliſh plant. It is no wonder that the fixed ſalt and oil contained in this charcoal ſhould be able to penetrate the yet raw edges of the ware, and to give them in the ſubſequent baking a ſomewhat different degree of vitrification from the other parts of the veſſel; which, though, if given to the whole, it might take off from the true ſemivitrified ſtate of that ware, yet at the edges is not to be regarded, and only ſerves to defend them from common accidents, and keep them entire. The Chineſe uſe two cautions in this application: the firſt in the preparation; the ſecond in the laying it on. They prepare the bamboo canes for burning into charcoal, by peeling off the rind. This might eaſily be done with the elder ſhoots, which are ſo ſucculent, that the bark ſtrips off with a touch. The Chineſe ſay, that if this is not done with their bamboo, the edges touched with the paſte will burſt in the baking: this does not ſeem indeed very probable; but the charcoal will certainly be lighter made from the peeled ſticks, and this is a known advantage. The other caution is, never to touch the veſſel with hands that have any greaſy or fatty ſubſtance about them; for if this is done, they always find the veſſel crack in that place.

CHIROGRAPH, was anciently a deed which, requiring a counterpart, was engroſſed twice on the ſame piece of parchment, counterwiſe; leaving a ſpace between, wherein was written CHIROGRAPH; through the middle whereof the parchment was cut, ſometimes ſtraight, ſometimes indentedly; and a moiety given to each of the parties. This was afterwards called *dividenda*, and *chartæ diviſæ*; and was the ſame with what we now call *charter-party*. See CHARTER-*Party*. The firſt uſe of theſe chirographs, in Britain, was in the time of Henry III.

CHIROGRAPH was alſo anciently uſed for a fine; and the manner of engroſſing the fines, and cutting the parchment in two pieces, is ſtill retained in England, in the office called the *chirographer's office*.

CHIROGRAPHER *of* FINES, an officer in the common pleas, in England, who engroſſes FINES acknowledged in that court into a perpetual record (after they have been examined, and paſſed by other officers), and writes and delivers the indentures thereof to the party. He makes two indentures; one for the buyer, the other for the ſeller; and a third indented piece, containing the effect of the fine, and called *the foot of the fine*; and delivers it to the *cuſtos brevium*.—The ſame officer alſo, or his deputy, proclaims all fines in court every term, and indorſes the proclamations on the backſide of the foot; keeping, withal, the writ of covenant, and the note of the fine.

CHIROMANCY, a ſpecies of divination drawn from the lines and lineaments of a perſon's hand; by which means, it is pretended, the diſpoſitions may be diſcovered. See DIVINATION, nº 9.

CHIRON, a famous perſonage of antiquity; ſtyled by Plutarch, in his dialogue on muſic, "*The wiſe Centaur.*" Sir Iſaac Newton places his birth in the firſt age after Deucalion's deluge, commonly called the *Golden Age*; and adds, that he formed the conſtellations for the uſe of the Argonauts, when he was 88 years old; for he was a practical aſtronomer, as well as his daughter Hippo: he may, therefore, be ſaid to have flouriſhed in the earlieſt ages of Greece, as he preceded the conqueſt of the Golden Fleece, and the Trojan war. He is generally called the ſon of Saturn and Phillyra; and is ſaid to have been born in Theſſaly among the CENTAURS, who were the firſt Greeks that had acquired the art of breaking and riding horſes: whence the poets, painters, and ſculptors, have repreſented them as a compound of man and horſe; and perhaps it was at firſt imagined by the Greeks, as well as the Americans, when they firſt ſaw cavalry, that the horſe and the rider conſtituted the ſame animal.

Burney's Hiſt. of Muſic.

Chiron was repreſented by the ancients as one of the firſt inventors of medicine, botany, and *chirurgery*; a word which ſome etymologiſts have derived from his name. He inhabited a grotto or cave in the foot of Mount Pelion, which, from his wiſdom and great knowledge of all kinds, became the moſt famous and frequented ſchool throughout Greece. Almoſt all the heroes of his time were fond of receiving his inſtructions; and Xenophon, who enumerates them, names the following illuſtrious perſonages among his diſciples: Cephalus, Æſculapius, Melanion, Neſtor, Amphiaraus,

phiaraus, Peleus, Telamon, Meleager, Theſeus, Hippolitus, Palamedes, Ulyſſes, Mneſthens, Diomedes, Caſtor and Pollux, Machaon and Podalirius, Antilochus, Æneas, and Achilles. From this catalogue it appears, that Chiron frequently inſtructed both fathers and ſons; and Xenophon has given a ſhort eulogium on each, which may be read in his works, and which redounds to the honour of the preceptor. The Greek hiſtorian, however, has omitted naming ſeveral of his ſcholars, ſuch as Bacchus, Phœnix, Cocytus, Aryſtæus, Jaſon, and his ſon Medeus, Ajax, and Proteſilaus. Of theſe we ſhall only take notice of ſuch as intereſt Chiron more particularly. It is pretended that the Grecian Bacchus was the favourite ſcholar of the Centaur; and that he learned of this maſter the revels, orgies, bacchanalia, and other ceremonies of his worſhip. According to Plutarch, it was likewiſe at the ſchool of Chiron that Hercules ſtudied muſic, medicine, and juſtice; though Diodorus Siculus tells us, that Linus was the muſic-maſter of this hero. But among all the heroes, who have been diſciples of this Centaur, no one reflected ſo much honour upon him as Achilles, whoſe renown he in ſome meaſure ſhared; and to whoſe education he in a particular manner attended, being his grandfather by the mother's ſide. Apollodorus tells us, that the ſtudy of muſic employed a conſiderable part of the time which he beſtowed upon his young pupil, as an incitement to virtuous actions, and a bridle to the impetuoſity of his temper. One of the beſt remains of antique painting now exiſting, is a picture upon this ſubject, dug out of the ruins of Herculaneum, in which Chiron is teaching the young Achilles to play on the lyre. The death of this philoſophic muſician was occaſioned, at an extreme old age, by an accidental wound in the knee with a poiſoned arrow, ſhot by his ſcholar Hercules, at another. He was placed after his death by Muſæus among the conſtellations, through reſpect for his virtues, and in gratitude for the great ſervices which he had rendered the people of Greece. Sir Iſaac Newton ſays*, in proof of the conſtellations being formed by Chiron and Muſæus for the uſe and honour of the Argonauts, that nothing later than the expedition was delineated on the ſphere; according to the ſame author, Chiron lived till after the Argonautic expedition, in which he had two grandſons. The ancients have not failed to attribute to him ſeveral writings; among which, according to Suidas, are *precepts*, υποθηκας, in verſe, compoſed for the uſe of Achilles, and a medicinal treatiſe on the *diſeaſes incident to horſes* and other quadrupeds, ἱππατριχον; the lexicographer even pretends, that it is from this work the Centaur derived his name. Fabricius gives a liſt of the works attributed to Chiron, and diſcuſſes the claims which have been made for others to the ſame writings; and in vol. xiii. he gives him a diſtinguiſhed place in his catalogue of ancient phyſicians.

CHIRONIA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 20th order, *Rotaceæ*. The corolla is wheel-ſhaped; the piſtil declining downwards; the ſtamina placed in the tube of the corolla; the antheræ in their laſt ſtage ſpiral; the ſeed-caſe bilocular. There are eight ſpecies, of which the *fruteſcens* is the moſt remarkable. It is a native of the cape of Good Hope. The root is fibrous, and ſpreads near the ſurface of the ground. The ſtalks are round, and inclining to be ligneous, but are of a very ſoft texture; theſe riſe from two to three feet high, ſending out ſeveral branches which grow erect, and are garniſhed with ſucculent leaves an inch or more in length, and about an eighth of an inch in breadth. At the end of each ſhoot the flowers are produced, which are tubulous, and ſpread open at the top; they are of a bright red colour; and when there are a large number of flowers open on the ſame plant, they make a fine appearance. The flowers are produced from June to autumn; and the ſeeds ripen in October. The plants are propagated by ſeeds, which muſt be ſown in pots filled with light ſandy earth, and plunged in a moderate hot-bed. In ſummer they may be inured to the open air; but muſt always be ſheltered in winter.

CHIRONOMY, in antiquity, the art of repreſenting any paſt tranſaction by the geſtures of the body, more eſpecially by the motions of the hands: this made a part of liberal education; it had the approbation of Socrates, and was ranked by Plato among the political virtues.

CHIROTONY, among eccleſiaſtical writers, denotes the impoſition of hands uſed in conferring prieſtly orders. However, it is proper to remark, that chirotony was a method of electing magiſtrates by holdin up the hands.

CHIRURGEON, or SURGEON. See SURGEON.

CHIRURGERY. See SURGERY.

CHISLEY-LAND, in agriculture, a ſoil of a middle nature between ſandy and clayey land, with a large admixture of pebbles.

CHISON, KISON, or KISSON, (Judges iv. and v.), a river of Galilee; ſaid to riſe in mount Tabor, to run by the town of Naim, and to fall into the Mediterranean between mount Carmel and Ptolemais, 1 Kings xviii. 40.

CHISSEL, or CHISEL, an inſtrument much uſed in ſculpture, maſonry, joinery, carpentry, &c.

There are chiſſels of different kinds; though their chief difference lies in their different ſize and ſtrength, as being all made of ſteel well ſharpened and tempered: but they have different names, according to the different uſes to which they are applied.—The chiſſels uſed in carpentry and joinery are, 1. The former; which is uſed firſt of all before the paring-chiſſel, and juſt after the work is ſcribed. 2. The paring-chiſſel; which has a fine ſmooth edge, and is uſed to pare off or ſmooth the irregularities which the former makes. This is not ſtruck with a mallet as the former is, but is preſſed with the ſhoulder of the workman. 3. Skew-former: this is uſed for cleanſing acute angles with the point or corner of its narrow edge. 4. The mortiſe-chiſſel; which is narrow, but very thick and ſtrong, to endure hard blows, and it is cut to a very broad baſil. Its uſe is to cut deep ſquare holes in the wood for mortiſes. 5. The gouge, which is a chiſſel with a round edge; one ſide whereof ſerves to prepare the way for an augre, and the other to cut ſuch wood as is to be rounded, hollowed, &c. 6. Socket-chiſſels, which are chiefly uſed by carpenters, &c. have their

* *Chronol.* p. 151.

ſhank made with a hollow ſocket at top, to receive a ſtrong wooden ſprig, fitted into it with a ſhoulder. Theſe chiſſels are diſtinguiſhed, according to the breadth of the blade, into half-inch chiſſels, three quarters of an inch chiſſels, &c. 7. Ripping-chiſſels; which is a ſocket-chiſſel of an inch broad, having a blunt edge, with no baſil to it. Its uſe is to rip or tear two pieces of wood aſunder, by forcing in the blunt edge between them.

CHITON, in zoology, a genus of the order of vermes teſtaceæ. The name *chiton* is from χιτων, *Lorica*, a coat of mail. The ſhell is plated, and conſiſts of many parts lying upon each other tranſverſely: the inhabitant is a ſpecies of the DORIS. They are common on the ſhores of Scarborough, Aberdeen, and Lochbroom. See ſeveral ſpecies repreſented of their natural ſize on Plate CXXXVIII.

CHITTIM (anc. geog.), according to Le Clerc, Calmet, and others, was the ſame with Macedonia, peopled by Kittim the ſon of Javan and grandſon of Noah.

CHITTRICK's MEDICINE FOR THE STONE. This medicine was ſome years ago kept as a ſecret, and had great reputation as a lithontriptic, which indeed in many caſes it ſeems to deſerve. It was diſcovered by Dr Blackrie, to be no other than ſoap-lye; and the following receipt for uſing it was procured by General Dunbar: "Take one tea-ſpoonful of the ſtrongeſt ſoap-lye, mixed in two table-ſpoonfuls of ſweet milk, an hour before breakfaſt and at going to bed. Before you take the medicine, take a ſup of pure milk, and immediately after you have ſwallowed the medicine take another. If you find this agrees with you for two or three days, you may add half as much more to the doſe."

1 Definition.

CHIVALRY, (from *cheval*, "a horſe);" an abſtract term, uſed to expreſs the peculiar privileges, obligations, and turn of mind, with all the other diſtinguiſhing characteriſtics of that order of men who flouriſhed in Europe in the dark ages, during the vigour of the feudal ſyſtems of government, under the name of *Knights*, or *Knights Errant*.

2 Difficulty of tracing the origin of chivalry.

To aſcertain the period at which the order ſprung up, and the circumſtances to which its origin was owing, is no eaſy taſk. In the hiſtory of ſociety, ſuch a multiplicity of collateral facts appear interwoven together, and cauſes and effects run into each other by a gradation ſo imperceptible; that it is exceedingly difficult, even for the niceſt eye, to diſcern cauſes from their immediate effects, or to diſtinguiſh to which among a number of collateral circumſtances the origin of any particular event is to be referred. The age to which we muſt look for the origin of chivalry was ſingularly rude and illiterate. Even the principal events of that period, emigrations, wars, and the eſtabliſhment of ſyſtems of laws and forms of government, have been but imperfectly, and in many inſtances unfaithfully, recorded. But the tranſactions which took place in the ordinary courſe of civil and domeſtic life, and which, though leſs ſtriking, muſt have always prepared the way for the more remarkable events, have been generally thought unworthy of tranſmiſſion to poſterity, and have very ſeldom found an hiſtorian. Add to theſe difficulties which oppoſe our reſearches on this ſubject, that the nations of Europe were in that age a mixed multitude, conſiſting of the aboriginal inhabitants, who, though either ſubdued by the Roman arms, or at leaſt compelled to retire to the woods and mountains, ſtill obſtinately retained their primitive manners and cuſtoms; Roman colonies, and ſuch of the original inhabitants of the countries in which theſe were eſtabliſhed, as had yielded not only to the arms of the Romans, but alſo to the influence of their laws, arts, and manners; and the barbarians, who proceeding from the northern regions of Aſia and Europe, the wilds of Scythia and Germany, diſſolved the fabric of the Roman empire, and made themſelves lords of Europe. Amid this confuſion of nations, inſtitutions and cuſtoms, it becomes almoſt impoſſible to trace any regular ſeries of cauſes and effects.

Yet as the hiſtory of that period is not entirely unknown to us, and the obſcure and imperfect records in which it is preſerved, while they commemorate the more remarkable events, throw a faint light on the cuſtoms, manners, and ordinary tranſactions of the age; we can at leaſt collect ſome circumſtances, which, if they did not of themſelves give riſe to the inſtitution of chivalry, muſt certainly have co-operated with others to that end. We may even be allowed, if we proceed with due diffidence and caution, to deduce, from a conſideration of the effect, ſome inferences concerning the cauſe; from thoſe particulars of its hiſtory which are known to us, we may venture to carry imagination backwards, under a proper reſtraint, to thoſe, which are hid under the darkneſs of a rude and illiterate age.

3 Diſtinction of ranks an eſſential part of the mechaniſm of ſociety.

Diſtinction of ranks appear to be eſſentially neceſſary to the exiſtence of civil order. Even in the ſimpleſt and rudeſt ſocial eſtabliſhments, we find not merely the natural diſtinctions of weak and ſtrong, young and old, parent and child, huſband and wife; theſe are always accompanied with others which owe their inſtitution to the invention of man, and the conſent, either tacit or formal, of the ſociety among whom they prevail. In peace and in war, ſuch diſtinctions are equally neceſſary: they conſtitute an eſſential and important part of the mechaniſm of ſociety.

4 The early pre-eminence of the military character.

One of the earlieſt artificial diſtinctions introduced among mankind, is that which ſeparates the bold and ſkilful warrior from thoſe whoſe feebleneſs of body and mind renders them unable to excel in dexterity, ſtratagem, or valour. Among rude nations, who are but imperfectly acquainted with the advantages of ſocial order, this diſtinction is more remarkably eminent than in any other ſtate of ſociety. The ferocity of the human character in ſuch a period produces almoſt continual hoſtilities among neighbouring tribes: the elements of nature, and the brute inhabitants of the foreſt, are not yet reduced to be ſubſervient to the will of man; and theſe, with other concomitant circumſtance, render the warrior, who is equally diſtinguiſhed by cunning and valour, more uſeful and reſpectable than any other character.

5 Subordinate diſtinctions of rank introduced into ſociety.

On the ſame principles, as the boundaries of ſociety are enlarged, and its form becomes more complex, the claſſes into which it is already diſtinguiſhed are again ſubdivided. The invention of arts, and the acquiſition of property, are the chief cauſes of theſe new diſtinctions which now ariſe among the orders of ſociety;

and they extend their influence equally through the whole ſyſtem. Difference of armour, and different modes of military diſcipline, produce diſtinction of orders among thoſe who practiſe the arts of war; while other circumſtances, originating from the ſame general cauſes, occaſion ſimilar changes to take place amid the ſcenes of peace.

6
The diſtinction introduced into the military order by the uſe of cavalry.

None of the new diſtinctions which are introduced among men, with reſpect to the diſcipline and conduct of war, in conſequence of the acquiſition of property and the invention of arts, is more remarkable than that occaſioned by the uſe of horſes in military expeditions, and the training of them to the evolutions of the military art. Fire-arms, it is true, give to thoſe who are acquainted with them a greater ſuperiority over thoſe to whom their uſe is unknown than what the horſeman poſſeſſes over him who fights on foot. But the uſe of fire-arms is of ſuch importance in war, and the expence attending it ſo inconſiderable, that wherever theſe have been introduced, they have ſeldom been confined to one particular order in an army; and therefore they produce indeed a remarkable, though tranſient, diſtinction among different nations; but eſtabliſh no permanent diſtinctions in the armies of any one nation. But to maintain a horſe, to equip him with coſtly furniture, to manage him with dexterity and vigour, are circumſtances which have invariably produced a ſtanding and conſpicuous diſtinction among the military order, wherever bodies of cavalry have been formed. The Roman *equites*, who, though they became at length a body of uſurers and farmers-general, were originally the only body of cavalry employed by the ſtate, occupied a reſpectable rank between the ſenators and the plebeians; and the elegance and humanity of their manners were ſuitable to their rank. In ancient Greece, and in the celebrated monarchies of Aſia, the ſame diſtinction prevailed at a ſimilar period.

7
Military diſtinctions among the ancient Germans.

Since the circumſtances and principles on which this diſtinction depends are not ſuch as muſt be confined in their influence to one particular nation, or one region of the globe, we may hope to trace their effects among the ſavage warriors of Scythia and Germany, as well as among the Greeks or Romans. From the valuable treatiſe of Tacitus *de moribus Germanorum*, we learn, that among the German warriors a diſtinction ſomewhat of this nature *did* actually ſubſiſt; not ſo much indeed a diſtinction between the warrior who fought on horſeback and thoſe who fought on foot, as between thoſe whom vigour of body and energy of mind enabled to brave all the dangers of war, and ſuch as, from the imbecility of youth, the infirmities of age, or the natural inferiority of their mental and bodily powers, were unequal to ſcenes of hardſhip and deeds of valour. The youth was not permitted to take arms and join his warlike countrymen in their military expeditions whenever he himſelf thought proper. There was a certain age before which he could not be inveſted with armour. When he had attained that period, if not found deficient in ſtrength, activity, or courage, he was formally honoured with the ſhield and the lance, called to the duties, and admitted to all the privileges, of a warrior.

8
Reſpectability of the women among the Germans.

Another fact worthy of notice reſpecting the manners of the barbarians of Germany before they eſtabliſhed themſelves in the cultivated provinces of the Roman empire is, that their women, contrary to what we find among many other rude nations, were treated with an high degree of reſpect. They did not generally vie with the men in deeds of valour, but they animated them by their exhortations to diſtinguiſh themſelves in the field; and virgins eſpecially were conſidered with a ſacred veneration, as endowed with prophetic powers, capable to foreſee events hid in the womb of futurity, and even to influence the will of the deities. Hence, though domeſtic duties were their peculiar province, yet they were not harſhly treated nor confined to a ſtate of ſlavery. There appears indeed a ſtriking analogy between the condition of the women among the rude ſoldiers of Sparta and the rank which they occupied among the warlike cantons of Germany. Perhaps, indeed, the German were ſtill more honourable than the Spartan women; as they were taught to wield the magic weapons of ſuperſtition, which in Greece were appropriated to the prieſts.

It appears, therefore, that, in the foreſts of Germany at leaſt, if not in the more northern regions of Aſia and Europe, the conquerors of the Roman empire, before they penetrated into its provinces, treated their women with a degree of reſpect unknown to moſt of the nations of antiquity; that the character of the warrior was likewiſe highly honourable, being underſtood to unite all thoſe qualities which were in the higheſt eſtimation; and that it was only at a particular age, and with certain forms, that the youth were admitted to bear arms.

9
Changes in the manners of the barbarians after they ſettled in the Roman empire, which gave riſe to chivalry.

When thoſe nations ſallied from their deſerts and foreſts, over-ran the Roman empire, and eſtabliſhed themſelves in its provinces, the change which took place on their circumſtances was remarkable; and by a natural influence, it could not but produce an equally remarkable change on their habits, cuſtoms, and manners. The great outlines might ſtill remain; but they could not now fail to be filled up in a different manner. Here, however, the records of hiſtory are peculiarly imperfect. We have no Cæſar or Tacitus to ſupply facts or direct our reaſonings; the Gothic nations had not yet learned to read and write; and the Romans were ſo depreſſed under the ſenſe of their own miſeries, as to be negligent of the changes which happened around them. But as ſoon as the light of hiſtory begins again to dawn, we find that the leading features of the barbarian character were not effaced, but only modified in a particular manner, in conſequence of their mixing among a more poliſhed people, becoming acquainted with the luxuries of life, and acquiring extenſive power and property.

Thoſe who fought on horſeback now began to be diſtinguiſhed with peculiar honours. The manners of the warrior too were become more cultivated, and his ſpirit more humane. Leiſure and opulence, with the influence of a poliſhed people, even though in a ſtate of ſlavery, taught thoſe barbarians to aſpire after more refined pleaſures and more ſplendid amuſements than thoſe which they had been before ſatisfied with. The influence of chriſtianity too, which, though groſsly corrupted, was ſtill favourable to the ſocial happineſs of mankind, concurred to poliſh their manners and exalt their character. Hence, in the end of the tenth and in the beginning of the eleventh century, we ſee knight-errantry, with that romantic gallantry, piety, and humanity, by which it was principally diſtinguiſhed, make its appearance. At the court of every prince, count, or baron, jouſts and tournaments became the favourite amuſements. At thoſe entertainments, ſkill in arms, devotion to the fair, and generous courteſy, were all at once cultivated. About this period began the cruſades; and theſe, to which alone ſome have referred the origin of chivalry, though they could not give riſe to what was already in exiſtence, yet moulded the form and directed the ſpirit of the inſtitution in ſuch a manner, as to raiſe it, by a rapid progreſs from infancy, as it were, to full vigour and maturity. Its character, as it appeared when fully formed, is well deſcribed by an eloquent hiſtorian in the following manner:

Gibbon, vol. vi. p. 26.

“ Between the age of Charlemagne and that of the cruſades, a revolution had taken place among the Spaniards, the Normans, and the French, which was gradually extended to the reſt of Europe. The ſervice of the infantry was degraded to the plebeians; the cavalry formed the ſtrength of the armies, and the honourable name of *miles*, or ſoldier, was confined to the gentlemen who ſerved on horſeback, and were inveſted with the character of knighthood. The dukes and counts, who had uſurped the rights of ſovereignty, divided the provinces among their faithful barons: the barons diſtributed among their vaſſals the fiefs or benefices of their juriſdiction; and theſe military tenants, the peers of each other and of their lord, compoſed the noble or equeſtrian order, which diſdained to conceive the peaſant or burgher as of the ſame ſpecies with themſelves. The dignity of their birth was preſerved by pure and equal alliances; their ſons alone who could produce four quarters or lines of anceſtry, without ſpot or reproach, might legally pretend to the honour of knighthood; but a valiant plebeian was ſometimes enriched and ennobled by the ſword, and became the father of a new race. A ſingle knight could impart, according to his judgment, the character which he received; and the warlike ſovereigns of Europe derived more glory from this perſonal diſtinction than from the luſtre of their diadem. This ceremony was in its origin ſimple and profane; the candidate, after ſome previous trial, was inveſted with his ſword and ſpurs; and his cheek and ſhoulder were touched with a ſlight blow as the emblem of the laſt affront which it was lawful for him to endure. But ſuperſtition mingled in every public and private action of life: In the holy wars, it ſanctified the profeſſion of arms; and the order of chivalry was aſſimilated in its rights and privileges to the ſacred orders of prieſthood. The bath and white garment of the novice, were an indecent copy of the regeneration of baptiſm: his ſword, which he offered on the altar, was bleſſed by the miniſters of religion; his ſolemn reception was preceded by faſts and vigils; and he was created a knight in the name of God, of St George, and of St Michael the archangel. He ſwore to accompliſh the duties of his profeſſion; and education, example, and the public opinion, were the inviolable guardians of his oath. As the champion of God and the ladies, he devoted himſelf to ſpeak the truth; to maintain the right; to protect the diſtreſſed; to practiſe *courteſy*, a virtue leſs familiar to the ancients; to purſue the infidels; to deſpiſe the allurements of eaſe and ſafety; and to vindicate in every perilous adventure the honour of his character. The abuſe of the ſame ſpirit provoked the illiterate knight to diſdain the arts of induſtry and peace; to eſteem himſelf the ſole judge and avenger of his own injuries; and proudly to neglect the laws of civil ſociety and military diſcipline. Yet the benefits of this inſtitution, to refine the temper of barbarians, and to infuſe ſome principles, of faith, juſtice, and humanity, were ſtrongly felt, and have been often obſerved. The aſperity of national prejudice was ſoftened; and the community of religion and arms ſpread a ſimilar colour and generous emulation over the face of Chriſtendom. Abroad, in enterpriſe and pilgrimage; at home, in martial exerciſe, the warriors of every country were perpetually aſſociated; and impartial taſte muſt prefer a Gothic tournament to the Olympic games of claſſic antiquity. Inſtead of the naked ſpectacles which corrupted the manners of the Greeks, and baniſhed from the ſtadium the virgins and matrons, the pompous decoration of the liſts was crowned with the preſence of chaſte and high-born beauty, from whoſe hands the conqueror received the prize of his dexterity and courage. The ſkill and ſtrength that were exerted in wreſtling and boxing, bear a diſtant and doubtful relation to the merit of a ſoldier; but the tournaments, as they were invented in France, and eagerly adopted both in the eaſt and weſt, preſented a lively image of the buſineſs of the field. The ſingle combats, the general ſkirmiſh, the defence of a paſs or caſtle, were rehearſed as in actual ſervice; and the conteſt, both in real and mimic war, was decided by the ſuperior management of the horſe and lance. The lance was the proper and peculiar weapon of the knight: his horſe was of a large and heavy breed; but his charger, till he was rouſed by the approaching danger, was uſually led by an attendant, and he quietly rode a pad or palfrey of a more eaſy peace. His helmet and ſword, his greaves and buckler, it would be ſuperfluous to deſcribe; bnt I may remark, that at the period of the cruſades, the armour was leſs ponderous than in latter times; and that, inſtead of a maſſy cuiraſs, his breaſt was defended by an hauberk or coat of mail. When their long lances were fixed in the reſt, the warriors furiouſly ſpurred their horſes againſt the foe; and the light cavalry of the Turks and Arabs could ſeldom ſtand againſt the direct and impetuous weight of their charge. Each knight was attended to the field by his faithful ſquire, a youth of equal birth and ſimilar hopes; he was followed by his archers and men at arms; and four, or five, or ſix ſoldiers, were computed as the furniture of a complete *lance*. In the expeditions to the neighbouring kingdoms or the Holy Land, the duties of the feudal tenure no longer ſubſiſted; the voluntary ſervice of the knights and their followers was either prompted by zeal or attachment, or purchaſed with rewards and promiſes; and the numbers of each ſquadron were meaſured by the power, the wealth, and the fame of each independent chieftain. They were diſtinguiſhed by his banner, his armorial coat, and his cry of war; and the moſt ancient families of Europe muſt ſeek in theſe atchievements the origin and proof of their nobility.”

The reſpectable author of the Letters on Chivalry and Romance, traces, with great ingenuity and erudition, a ſtrong reſemblance between the manners of the age of chivalry and thoſe of the old heroic ages delineated by Homer.

10 The reſemblance between heroic and Gothic manners.

There is, ſays he, a remarkable correſpondence between the manners of the old heroic times, as painted by their great romancer Homer, and thoſe which are repreſented to us in the modern books of knight-errantry. A fact of which no good account can be given, but by another not leſs certain; that the political ſtates of Greece, in the earlieſt periods of its ſtory, was ſimilar in many reſpects to that of Europe, as broken by the feudal ſyſtem into an infinite number of petty independent governments.

Some obvious circumſtances of agreement between the heroic and Gothic manners may be worth putting down.

1. The military enthuſiaſm of the barons is but of a piece with the fanaticiſm of the heroes. Hence the ſame particularity of deſcription in the accounts of battles, wounds, deaths, in the Greek poet as in the Gothic romancers. Hence that minute curioſity in the diſplay of their dreſſes, arms, accoutrements. The minds of all men being occupied with warlike images and ideas, were much gratified by thoſe details, which appear cold and unaffecting to modern readers.

We hear much of knights-errant encountering giants and quelling ſavages in books of chivalry. Theſe giants were oppreſſive feudal lords; and every lord was to be met with, like the giant, in his ſtrong-hold or caſtle. Their dependents of a lower form, who imitated the violence of their ſuperiors, and had not their caſtles but lurking places, were the ſavages of romance. The greater lord was called a giant for his power; the leſs, a ſavage for his brutality.

2. Another terror of the Gothic ages was monſters, dragons, and ſerpents. Their ſtories were received in thoſe days for ſeveral reaſons: 1. From the vulgar belief of enchantments: 2. From their being reported on the faith of eaſtern tradition, by adventurers from the Holy Land: 3. In ſtill later times from the ſtrange things told and believed on the diſcovery of the new world.

In all theſe reſpects, Greek antiquity reſembles the Gothic. For what are Homer's Læſtrigon's and Cyclops, but bands of lawleſs ſavages, with each of them a giant of enormous ſize at their head? And what are the Grecian Bacchus, Hercules, and Theſeus, but knights-errant, the exact counterparts of Sir Launcelot and Amadis de Gaul?

3. The oppreſſion with which it was the glory of the knights to avenge, were frequently carried on, as we are told, by the *charms and enchantments of women*. Theſe charms, we may ſuppoſe, are often metaphorical; as expreſſing only the blandiſhments of the ſex. Sometimes they are taken to be real, the ignorance of thoſe ages acquieſcing in ſuch conceits. And are not theſe ſtories matched by thoſe of Calypſo and Circe, the enchantreſſes of the Greek poet?

4. Robbery and piracy were honourable in both: ſo far were they from reflecting any diſcredit on the ancient and modern *redreſſers of wrongs*. What account can be given of this, but that, in the feudal times, and in the early days of Greece, when government was weak, and unable to redreſs the injuries of petty ſovereigns, it would be glorious for private adventurers to undertake this work; and, if they could accompliſh it in no other way, to pay them in kind by downright plunder and rapine?

5. Baſtardy was in credit with both. They were extremely watchful over the chaſtity of their own women; but ſuch as they could ſeize upon in the enemies quarter, were lawful prize. Or if, at any time, they tranſgreſſed in this ſort at home, the fault was covered by an ingenious fiction. The offspring was reputed divine. Their greateſt heroes were the fruit of goddeſſes approached by mortals; juſt as we hear of the doughtieſt knights being born of fairies.

6. With the greateſt fierceneſs and ſavageneſs of character, the utmoſt generoſity, hoſpitality, and courteſy, were imputed to the heroic ages. Achilles was at once the moſt relentleſs, vindictive, implacable, and the friendlieſt of men. We have the very ſame repreſentation in the Gothic romances. As in thoſe lawleſs times, dangers and diſtreſſes of all kinds abounded, there would be the ſame demand for compaſſion, gentleneſs, and generous attachment to the unfortunate, thoſe eſpecially of their own clan, as of reſentment, rage, and animoſity againſt their enemies.

7. Again, the martial games celebrated in ancient Greece, on great and ſolemn occaſions, had the ſame origin and the ſame purpoſe as the tournaments of the Gothic warriors.

8. Laſtly, the paſſions for adventures ſo natural in their ſituation, would be as naturally attended with the love of praiſe and glory. Hence the ſame encouragement, in the old Greek and Gothic times, to panegyriſts and poets. In the affairs of religion and gallantry, indeed, the reſemblance between the hero and the knight is not ſo ſtriking. But the religious character of the knight was an accident of the times and no proper effect of his civil condition. And that his devotion for the fair ſex ſhould ſo far ſurpaſs that of the hero, is a confirmation of the ſyſtem here advanced. For the conſideration had of the females in the feudal conſtitution, will of itſelf account for this deference. It made them capable of ſucceeding to fiefs, as well as the men. And does not one ſee, on the inſtant, what reſpect and dependence this privilege would draw upon them?

It was of mighty conſequence who ſhould obtain the favour of a rich heireſs. And though, in the ſtrict feudal times, ſhe was ſuppoſed to be in the power and at the diſpoſal of her ſuperior lord, yet this rigid ſtate of things did not laſt long. Hence we find ſome diſtreſſed damſel was the ſpring and mover of every knight's adventure. She was to be reſcued by his arms, or won by the fame and admiration of his proweſs. The plain meaning of all which was this: That as, in theſe turbulent times, a protector was neceſſary to the weakneſs of the ſex, ſo the courteous and valorous knight was to approve himſelf qualified for that purpoſe.

It may be obſerved, that the two poems of Homer were intended to expoſe the miſchiefs and inconveniences ariſing from the political ſtate of Old Greece: the *Iliad*, the diſſentions that naturally ſpring up among independent chiefs; and the *Odyſſey* the inſolence of their greater ſubjects, more eſpecially when unreſtrained by the preſence of their ſovereign. And can any thing more exactly reſemble the condition of the

the feudal times, when, on occaſion of any great enterpriſe, as that of the cruſades, the deſigns of the confederate Chriſtian ſtates were perpetually fruſtrated, or interrupted at leaſt, by the diſſentions of their leaders; and their affairs at home, as perpetually diſtreſſed and diſordered by the rebellious uſurpations of their greater vaſſals? Jeruſalem was to the European what Troy had been to the Grecian princes. See the article KNIGHT.

CHIVALRY, in law, is uſed for a tenure of lands by knight's ſervice; whereby the knight was bound to perform ſervice in war unto the king, or the meſne lord of whom he held by that tenure. And chivalry was either general or ſpecial: *general*, when it was only in the feoffment that the tenant held *per ſervitium militare*, without any ſpecification of ſergeantry, eſcuage; &c.; *ſpecial*, when it was declared particularly by what kind of knight ſervice the land was held.

For the better underſtanding of this tenure it hath been obſerved, that there is no land but is holden mediately or immediately of the crown by ſome ſervice; and therefore all freeholds that are to us and our heirs, are called *feuda* or *feoda*, "fees;" as proceeding from the king for ſome ſmall yearly rent, and the performance of ſuch ſervices as were originally laid upon the land at the donation thereof. For as the king gave to the great nobles his immediate tenants, large poſſeſſions for ever, to hold of him for this or that ſervice or rent; ſo they in time parcelled out to ſuch others as they liked the ſame lands for rents and ſervices as they thought good: and theſe ſervices were by Littleton divided into two kinds, *chivalry* and *ſocage*; the firſt whereof was martial and military, the other ruſtical. Chivalry, therefore, was a tenure of ſervice, whereby the tenant was obliged to perform ſome noble or military office unto his lord: and it was of two kinds, either *regal*, that is, held only by the king; or *common*, where held of a common perſon. That which might be held only of the king was called *ſervitium*, or *ſergeantia*; and was again divided into *grand* and *petit* ſerjeanty. The grand ſerjeanty was where one held lands of the king by ſervice, which he ought to do in his own perſon; as to bear the king's banner or ſpear, to lead his hoſt, to find men at arms to fight, &c. Petit ſerjeanty was when a man held lands of the king, to yield him annually ſome ſmall thing towards his wars, as a ſword, dagger, bow, &c. Chivalry that might be holden of a common perſon was termed *ſcutagium*, "eſcuage;" that is, ſervice of the ſhield; which was either uncertain or certain.

Eſcuage uncertain, was likewiſe two-fold: firſt, where the tenant was bound to follow his lord, going in perſon to the king's wars, either himſelf, or ſending a ſufficient man in his place, there to be maintained at his expence, ſo long as was agreed upon between the lord and his firſt tenant at the granting of the fee; and the days of ſuch ſervice ſeem to have been rated by the quantity of land ſo holden: as if it extended to a whole knight's fee, then the tenant was to follow his lord 40 days; and if but to half a knight's fee, then 20 days; if a fourth part, then 10 days, &c. The other kind of this eſcuage was called *caſtle-ward*, where the tenant was obliged, by himſelf or ſome other, to defend a caſtle as often as it ſhould come to his turn. And theſe were called *eſcuage uncertain*; becauſe it was uncertain how often a man ſhould be called to follow his lord to the wars, or to defend a caſtle, and what his charge would be therein.

Eſcuage certain, was where the tenure was ſet at a certain ſum of money to be paid in lieu of ſuch ſervice; as that a man ſhould pay yearly for every knight's fee 20s. for half a knight's fee 10s. or ſome like rate; and this ſervice, becauſe it is drawn to a certain rent, groweth to be of a mixed nature, not merely ſocage, and yet ſocage in effect, being now neither perſonal ſervice nor uncertain. The tenure called chivalry had other conditions annexed to it: but there is a great alteration made in theſe things by the ſtat. 12. Car. 2. c. 24. whereby tenures by knight's ſervice of the king, or any other perſon *in capite*, &c. and the fruits and conſequences thereof, are taken away and diſcharged; and all tenures are to be conſtrued and adjudged to be free and common ſocage, &c.

Court of CHIVALRY, a court formerly held before the lord high conſtable and earl marſhal of England jointly, and having both civil and criminal juriſdiction: but ſince the attainder of Stafford Duke of Buckingham under Henry VIII. and the conſequent extinguiſhment of the office of lord high conſtable, it hath uſually, with reſpect to civil matters, been heard before the earl marſhal only. This court, by ſtat. 13. Rich. II. c. 2. hath cognizance of contracts and other matters touching deeds of arms and war, as well out of the realm as in it. And from its ſentences lies an immediate appeal to the king in perſon. This court was in great reputation in the times of pure chivalry; and afterwards during the Engliſh connections with the continent, by the territories which their princes held in France: but it is now grown almoſt entirely out of uſe, on account of the feebleneſs of its juriſdiction, and want of power to enforce its judgments; as it can neither fine nor impriſon, not being a court of record.

1. The *civil* juriſdiction of this court of chivalry is principally in two points; the redreſſing injuries of honour, and correcting encroachments in matters of coat armour, precedency, and other diſtinctions, of families. As a court of honour, it is to give ſatisfaction to all ſuch as are aggrieved in that point; a point of a nature ſo nice and delicate, that its wrongs and injuries eſcape the notice of the common law, and yet are fit to be redreſſed ſomewhere. Such, for inſtance, as calling a man a *coward*, or giving him the lie; for which, as they are productive of no immediate damage to his perſon or property, no action will lie in the courts at Weſtminſter: and yet they are ſuch injuries as will prompt every man of ſpirit to demand ſome honourable amends; which by the ancient law of the land, was given in the court of chivalry. But modern reſolutions have determined, that how much ſoever a juriſdiction may be expedient, yet no action for words will at preſent lie therein. And it hath always been moſt clearly holden, that as this court cannot meddle with any thing determinable by common law, it therefore can give no pecuniary ſatisfaction or damages; in as much as the quantity and determination thereof is ever of common law cognizance. And therefore this court of chivalry can at moſt order reparation in point of honour; as, to

compel

compel the defendant *mendacium ſibi ipſi imponere*, or to take the lie that he has given upon himſelf, or to make ſuch other ſubmiſſion as the laws of honour may require. As to the other point of its civil juriſdiction, the redreſſing of uſurpations and encroachments in matters of heraldry and coat-armour; it is the buſineſs of this court, according to Sir Matthew Hale, to adjuſt the rights and armorial enſigns, bearings, creſts, ſupporters, pennons, &c.; and alſo rights of places, precedence, where the king's patent or act of parliament, which cannot be over-ruled, by this court, have not already determined it. The proceedings of this court are by petition in a ſummary way: and the trial not by a jury of twelve men, but by witneſſes, or by combat. But as it cannot impriſon, not being a court of record; and as, by the reſolutions of the ſuperior courts, it is now confined to ſo narrow and reſtrained a juriſdiction; it has fallen into contempt. The marſhalling of coat-armour, which was formerly the pride and ſtudy of all the beſt families in the kingdom, is now greatly diſregarded; and has fallen into the hands of certain officers and attendants upon this court, called *heralds*, who conſider it only as a matter of lucre, and not of juſtice: whereby ſuch falſity and confuſion have crept into their records (which ought to be the ſtanding evidence of families, deſcents, and coat armour), that though formerly ſome credit has been paid to their teſtimony, now, even their common ſeal will not be received as evidence in any court of juſtice in the kingdom. But their original viſitation books, compiled when progreſſes were ſolemnly and regularly made into every part of the kingdom, to inquire into the ſtate of families, and to regiſter ſuch marriages and deſcents as were verified to them upon oath, are allowed to be good evidence of pedigrees.

2. As a *criminal* court, when held before the lord high conſtable of England jointly with the earl marſhal, it had juriſdiction over pleas of life and member, ariſing in matters of arms and deeds of war, as well out of the realm as within it. But the criminal as well as civil part of its authority is fallen into entire diſuſe: there having been no permanent high conſtable of England (but only *pro hac vice*, at coronations and the like), ſince the attainder and execution of Stafford Duke of Buckingham, in the 13th year of Henry VIII.; the authority and charge, both in war and peace being deemed too ample for a ſubject; ſo ample, that when the chief juſtice Fineux was aſked by King Henry VIII. how far they extended? he declined anſwering; and ſaid, the deciſion of that queſtion belonged to the law of arms, and not to the law of England.

CHIVES, in botany, are ſlender thread-like ſubſtances, generally placed within the bloſſom, and ſurrounding the POINTALS. They are formed of the woody ſubſtance of the plant.

CHIUM MARMOR, in the natural hiſtory of the ancients, the name of a black marble, called alſo the *lapis opſidianus*. It is very hard, and of a fine black; and, beſide the many uſes which the ancients put it to, is well known among our goldſmiths by the name of the *touchſtone*; moſt of them being furniſhed with nothing better for this purpoſe than a piece of this: though the baſaltes, which might be had plentifully enough, is greatly preferable for thoſe uſes; any black marble, however, that is tolerably hard, will do. There is a very fine and elegantly ſmooth marble, of a compact texture, and fine gloſſy black, but ſhowing no glittering particles when freſh broken, as moſt of the black marbles do. It is extremely hard, and cuts with difficulty, but is capable of the higheſt poliſh of any marble. The ancients had it from Ethiopia and the iſland of Chios; we have it from Italy.

CHIUM Vinum, *Chian Wine*, or wine of the growth of the iſland of Chios, now Scio, is commended by Dioſcorides as affording good nouriſhment, fit to drink, leſs diſpoſed to intoxicate, endued with the virtue of reſtraining defluxions, and a proper ingredient in ophthalmic medicines. Hence Scribonius Largus directs the dry ingredients in collyria for the eyes to be made up with Chian wine.

CHIUN, or CHEVAN, in Hebrew antiquity. We meet with this word in the prophet Amos, cited in the Acts of the Apoſtles. St Luke reads the paſſage thus: "Ye took up the tabernacle of Moloch, and the ſtar of your god Remphan, figures which ye made to worſhip them." The import of the Hebrew is as follows: "Ye have borne the tabernacle of your kings, and the pedeſtal (the *chiun*) of your images, the ſtar of your gods, which ye made to yourſelves." The Septuagint in all probability read *Repham* or *Revan*, inſtead of *Chiun* or *Chevan*, and took the pedeſtal for a god.

Some ſay that the Septuagint, who made their tranſlation in Egypt, changed the word *Chiun* into that of *Remphan* becauſe they had the ſame ſignification. M. Baſnage, in his book intitled *Jewiſh Antiquities*, after having diſcourſed a good deal upon *Chion* or *Remphan*, concludes that Moloch was the ſun, and *Chion*, *Chiun*, or *Remphan*, the moon.

CHLAMYS, in antiquity, a military habit worn by the ancients over the tunica. It belonged to the patricians, and was the ſame in the time of war that the toga was in the time of peace. This ſort of gown was called *picta*, from the rich embroidery with figures in Phrygian work; and *purpurea*, becauſe the groundwork was purple. The chlamydes of the emperors were all purple, adorned with a golden and embroidered border.

CHLOEIA, in antiquity, a feſtival celebrated at Athens in honour of Ceres, to whom, under the name Χλοη, *i. e. Graſs*, they ſacrificed a ram.

CHLORA, in botany, a genus of the monogynia order, belonging to the octandria claſs of plants. The calyx is octophyllous, the corolla monopetalous and octofid; the capſule unilocular, bivalved, and polyſpermous.

CHLOROSIS, in medicine, a diſeaſe, commonly called the *green-ſickneſs*, incident to young girls. See (the Index ſubjoined to) MEDICINE.

CHOCOLATE, in commerce, a kind of paſte or cake prepared of certain ingredients, the baſis of which is cacao. See CACAO.

The Indians, in their firſt making of chocolate, uſed to roaſt the cacao in earthen pots; and having afterwards cleared it of the huſks, and bruiſed it between two ſtones, they made it into cakes with their hands. The Spaniards improved this method: when the cacao is properly roaſted and well cleaned, they pound it in a mortar, to reduce it into a coarſe maſs, which they afterwards grind on a ſtone till it be of the utmoſt fineneſs: the paſte being ſufficiently ground, is put quite hot into tin moulds, in which it congeals in a very little time. The form of theſe moulds is arbitrary: the cylindrical ones, holding two or three pounds, are the moſt proper; becauſe the bigger the cakes are, the longer they will keep. Obſerve, that theſe cakes are very liable to take any good or bad ſcent, and therefore they muſt be carefully wrapt up in paper, and kept in a dry place. Complaints are made, that the Spaniards mix with the cacao nuts too great a quantity of cloves and cinnamon, beſides other drugs without number, as muſk, ambergreaſe, &c. The grocers of Paris uſe few or none of theſe ingredients: they only chooſe the beſt nuts, which are called *caracca*, from the place from whence they are brought; and with theſe they mix a very ſmall quantity of cinnamon, the freſheſt vanilla, and the fineſt ſugar, but very ſeldom any cloves. In England, the chocolate is made of the ſimple cacao, excepting that ſometimes ſugar and ſometimes vanilla is added.

Chocolate ready made, and cacao paſte, are prohibited to be imported into Britain from beyond the ſeas. If made and ſold in Great Britain, it pays inland duty 1s. 6d. *per lb.* avoirdupoiſe: it muſt be incloſed in papers containing one pound each, and produced at the exciſe-office to be ſtamped. Upon three days notice given to the officer of exciſe, private families may make chocolate for their own uſe, provided no leſs than half an hundred weight of nuts be made at one time.

The chocolate made in Portugal and Spain is not near ſo well prepared as the Engliſh, depending perhaps on the machine employed there, *viz.* the double cylinder, which ſeems very well calculated for exact triture. If perfectly prepared, no oil appears on the ſolution. London chocolate gives up no oil like the foreign; and it alſo may, in ſome meaſure, depend on the thickneſs of the preparation. The ſolution requires more care than is commonly imagined. It is proper to break it down, and diſſolve it thoroughly in cold water by milling it with the chocolate ſtick. If heat is applied, it ſhould be done ſlowly: for, if ſuddenly, the heat will not only coagulate it, but ſeparate the oil; and therefore much boiling after it is diſſolved, is hurtful. Chocolate is commonly required by people of weak ſtomachs; but often rejected for want of proper preparation. When properly prepared, it is eaſily diſſolved; and an excellent food where a liquid nutrient vegetable one is required, and is leſs flatulent than any of the farinacea.

Mr Henly, an ingenious electrician, has lately diſcovered that chocolate, freſh from the mill, as it cools in the tin-pans into which it is received, becomes ſtrongly electrical; and that it retains this property for ſome time after it has been turned out of the pans, but ſoon loſes it by handling. The power may be once or twice renewed by melting it again in an iron ladle, and pouring it into the tin pans as at firſt; but when it becomes dry and powdery, the power is not capable of being revived by ſimple melting: but if a ſmall quantity of olive oil be added, and well mixed with the chocolate in the ladle, its electricity will be completely reſtored by cooling it in the tin-pan as before. From this experiment he conjectures, that there is a great affinity between phlogiſton and the electric fluid, if indeed they be not the ſame thing.

Chocolate-Nut Tree. See Cacao.

CHOENIX, χοινιξ, an ancient dry meaſure, containing the 48th part of a *medimnus*, or ſix buſhels.

CHOERILUS, a tragic poet of Athens about the 64th Olympiad. He wrote 150 tragedies, of which 13 had obtained the prize.—An hiſtorian of Samos.—Two other poets, one of whom was very intimate with Herodotus. He wrote a poem on the victory which the Athenians had obtained over Xerxes; and on account of the excellence of the compoſition he received a piece of gold for each verſe from the Athenians. The other was one of Alexander's flatterers and friends.

CHOERINÆ, in antiquity, a kind of ſea-ſhells, with which the ancient Greeks uſed to give their ſuffrage or vote.

CHOIR, that part of the church or cathedral where choiriſters ſing divine ſervice; it is ſeparated from the chancel where the communion is celebrated, and alſo from the nave of the church where the people are placed: the patron is ſaid to be obliged to repair to the choir of the church. It was in the time of Conſtantine that the choir was ſeparated from the nave. In the twelfth century they began to incloſe it with walls; but the ancient baluſtrades have ſince been reſtored, out of a view to the beauty of architecture.

Choir in nunneries, is a large hall adjoining to the body of the church, ſeparated by a grate, where the nuns ſing the office.

CHOISI (Francis Timoleon de), dean of the cathedral of Bayeux, and one of the forty of the French academy, was born at Paris in 1644. In 1685, he was ſent with the chevalier de Chamont to the king of Siam, and was ordained prieſt in the Indies by the apoſtolical vicar. He wrote a great number of works, in a polite, florid, and eaſy ſtile; the principal of which are, 1. Four dialogues on the Immortality of the Soul, *&c.* 2. Account of a voyage to Siam. 3. An Eccleſiaſtical Hiſtory, in 11 vols. 4to. 4. Life of David, with an interpretation of the Pſalms. 5. Life of Solomon, *&c.* he died at Paris, in 1724.

CHOLEDOCHUS, in anatomy, a term applied to a canal or duct, called alſo *ductus communis;* formed of the union of the porus bilarius and ductus cyſticus. The word comes from χολη, *choler;* and δεχομαι, *I receive*, or *contain*.

The choledochus ductus paſſing obliquely to the lower-end of the duodenum, ſerves to convey the bile from the liver to the inteſtines. See Anat. nº 97.

CHOLER. See Bile.

CHOLERA morbus, a ſudden eruption or overflowing of the bile or bilious matters both upwards and downwards. See (the *Index* ſubjoined to) Medicine.

CHOMER, or Omer. See Corus.

CHONDRILLA, in botany, a genus of the polygamia equalis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ.* The receptacle is naked; the calyx calyculated; the pappus ſimple and ſtalked; the florets in a manifold ſeries.

CHONDROPTERYGII, in ichthyology, a term

formerly applied to the order of fiſhes now called *amphibia nantes* by Linnæus. See AMPHIBIA.

CHOP-CHURCH, or CHURCH-CHOPPER, a name, or rather nick-name, given to parſons who make a practice of exchanging benefices. See PERMUTATION.

Chop-church occurs in an ancient ſtatute as a lawful trade or occupation; and ſome of the judges ſay it was a good addition. Brook holds that it was no occupation, but a thing permiſſible by law.

CHOPIN, or CHOPINE, a liquid meaſure uſed both in Scotland and France, and equal to half their pint. See PINT and MEASURE.

CHOPIN (Rene), a famous civilian born at Bailleul in Anjou in 1537. He was advocate in the parliament of Paris, where he pleaded for a long time with great reputation. He at laſt ſhut himſelf up in his cloſet; and compoſed many works, which have been collected together, and printed in 6 vols, folio. He died at Paris in 1606.

CHORAL, ſignifies any perſon that, by virtue of any of the orders of the clergy, was in ancient times admitted to ſit and ſerve God in the choir.

Dugdale, in his hiſtory of St Paul's Church, ſays, that there were with the chorus formerly ſix vicars choral belonging to that church.

CHORASSAN, or KHORASSAN, a province of Perſia adjoining to Uſbec Tartary. This was the ancient Bactria, and the birth-place of Kouli Khan.

CHORAX, or CHARAX. See CHARACENE.

CHORAZIM, or CHORAZIN, (Luke, Mathew), a town of Galilee: whoſe wretched incredulity Chriſt deplores: now deſolate, at two miles diſtance from Capernaum.

CHORD, or CORD, primarily denotes a ſlender rope or cordage *. The word is formed of the Latin, *chorda*, and that from the Greek, χορδη, *a gut*, whereof ſtrings may be made.

CHORD, in geometry, a right line drawn from one part of an arch of a circle to another. Hence,

CHORD of an Arch, is a right line joining the extremities of that arch.

CHORD, in muſic, the union of two or more ſounds uttered at the ſame time, and forming together an entire harmony.

The natural harmony produced by the reſonance of a ſounding body, is compoſed of three different ſounds, without reckoning their octaves; which form among themſelves the moſt agreeable and perfect chord that can poſſibly be heard: for which reaſon they are called, on account of their excellence, *perfect chords*. Hence, in order to render this harmony complete, it is neceſſary that each cord ſhould at leaſt conſiſt of three ſounds. The trio is likewiſe found by muſicians to include the perfection of harmony; whether becauſe in this all the cords, and each in its full perfection, are uſed; or, becauſe upon ſuch occaſions as render it improper to uſe them all, and each in its integrity, arts have been ſucceſsfully practiſed to deceive the ear, and to give it contrary perſuaſion, by deluding it with the principal ſounds of each *chord*, in ſuch a manner as to render it forgetful of the other ſounds neceſſary to their completion. Yet the octave of the principal ſound produces new relations, and new conſonances, by the completion of the intervals: they commonly add this octave, to have the aſſemblage of all the conſonances in one and the ſame *chord*; (See CONSONANCE.) Moreover, the addition of the diſſonance (ſee DISCORD), producing a fourth ſound ſuperadded to the perfect chord, it becomes indiſpenſibly neceſſary, if we would render the cord full, that we ſhould include a fourth part to expreſs this diſſonance. Thus the ſeries of chords can neither be complete nor connected but by means of four parts.

Chords are divided into perfect and imperfect. The *perfect chord* is that which we have lately deſcribed; which is compoſed of the fundamental ſound below, of its third, is fifth, and its octave: they are likewiſe ſubdivided into major and minor, according as the thirds which enter into their compoſition are flat or ſharp: (See INTERVAL.) Some authors likewiſe give the name of *perfect* to all chords, even to diſſonances, whoſe fundamental ſounds are below. Imperfect *chords* are thoſe in which the ſixth, inſtead of the fifth, prevails, and in general all thoſe whoſe loweſt are not their fundamental ſounds. Theſe denominations, which had been given before the fundamental baſs was known, are now moſt unhappily applied: thoſe of chords *direct* and *reverſed*, are much more ſuitable in the ſame ſenſe.

Chords are once more divided into conſonances and diſſonances. The chords denominated *conſonances*, are the perfect chord, and its derivatives: every other chord is a *diſſonance*.

A table of both, according to the ſyſtem of M. Rameau, may be ſeen in Rouſſeau's Muſical Dictionary, vol. I. p. 27.

After the table to which our readers have been remitted, Rouſſeau adds the following obſervations, which are at the ſame time ſo juſt and ſo important, that we ſhould be very ſorry if they eſcape the reader's attention.

At the words *harmony, fundamental baſs, compoſition*, &c. he promiſes to treat concerning the manner of uſing all the chords to form regular harmony; and only adds, in this place, the ſubſequent reflections.

1. It is a capital error to imagine, that the methods of inverting the ſame chord are in all caſes equally eligible for the harmony and for the expreſſion. There is not one of theſe different arrangements but had its proper character. Every one feels the contraſt between the ſoftneſs of the falſe fifth, and the grating ſound of the tritone, though the one of theſe intervals is produced by a method of inverting the other. With the ſeventh diminiſhed, and the ſecond redundant, the caſe is the ſame with the interval of the ſecond in general uſe, and the ſeventh. Who does not feel how much more vocal and ſonorous the fifth appears when compared with the fourth? The *chord* of the great ſixth, and that of the leſſer ſixth minor, are two forms of the ſame fundamental *chord*: but how much leſs is the one harmonious than the other? On the contrary, the *chord* of the leſſer ſixth major is much more pleaſing and cheerful than that of the falſe fifth. And only to mention the moſt ſimple of all *chords*, reflect on the majeſty of the perfect chord, the ſweetneſs of that which is called the chord of the ſixth, and the inſipidity of that which is compoſed of

* See *Cordage*.

a ſixth and a fourth; all of them, however, compoſed of the ſame ſounds. In general, the redundant intervals, the ſharps in the higher part, are proper by their ſeverity to expreſs violent emotions of mind, ſuch as anger and the rougher paſſions. On the contrary, flats in the higher parts, and diminiſhed intervals, form a plaintive harmony, which melts the heart. There are a multitude of ſimilar obſervations, of which when a muſician knows how to avail himſelf, he may command at will the affections of thoſe who hear him.

2. The choice of ſimple intervals is ſcarcely of leſs importance than that of the *chords*, with regard to the ſtations in which they ought to be placed. It is, for inſtance, in the lower parts that the fifth and octave ſhould be uſed in preference; in the upper parts, the third and ſixth are more proper. If you tranſpoſe this order, the harmony will be ruined even tho' the ſame *chords* are preſerved.

3. In a word, the *chords* are rendered ſtill more harmonious, by being approximated and only divided by the ſmalleſt practicable intervals, which are more ſuitable to the capacity of the ear than ſuch as are remote. This is what we call *contracting* the harmony, an art which few compoſers have ſkill and abilities enough to put in practice. The limits in the natural compaſs of voices, afford an additional reaſon for leſſening the diſtance of the intervals, which compoſe the harmony of the chorus, as much as poſſible. We may affirm, that a chorus, is improperly compoſed, when the diſtance between the *chords* increaſes; when thoſe who perform the different parts are obliged to ſcream; when the voices riſe above their natural extent, and are ſo remotely diſtant one from the other that the perception of harmonical relations between them is loſt.

We ſay likewiſe, that an inſtrument is in *concord* when the intervals between its fixed ſounds are what they ought to be; we ſay in this ſenſe, that the *chords* of an inſtrument are true or falſe, that it preſerves or does not preſerve its *chords*. The ſame form of ſpeaking is uſed for two voices which ſing together, or for two ſounds which are heard at the ſame time, whether in uniſon or in parts.

Chords, or *Cords, of Muſical inſtruments*, are ſtrings, by the vibration of which the ſenſation of ſound is excited, and by the diviſions of which the ſeveral degrees of tone are determined.

CHORDEE, in medicine and ſurgery, a ſymptom attending a gonorrhœa, conſiſting in a violent pain under the frenum, and along the duct of the urethra during the erection of the penis, which is incurvated downwards. Theſe erections are frequent and involuntary.

CHOREA Sancti Viti. See *Vitus's Dance*.

CHOREPISCOPUS, an officer in the ancient church, about whoſe function the learned are extremely divided, The word comes from χωρος, a *region, little country*, and επισκοπος, *a biſhop*, or *overſeer*.

The chorepiſcopi were ſuffragan or local biſhops, holding a middle rank between biſhops and preſbyters, and delegated to exerciſe epiſcopal juriſdiction within certain diſtricts, when the boundaries of particular churches, over with ſeparate biſhops preſided, were conſiderably enlarged. It is not certain when this office was firſt introduced: ſome trace it to the cloſe of the firſt century; others tell us, that chorepiſcopi were not known in the eaſt till the beginning of the fourth century: and in the weſt about the year 439. They ceaſed both in the eaſt and weſt in the tenth century.

Chorepiscopus is alſo the name of a dignity ſtill ſubſiſting in ſome cathedrals, particularly in Germany; ſignifying the ſame with *chori epiſcopus*, or "biſhop of the choir." The word, in this ſenſe, does not come from χωρος, *place*, but χορος, *quoir*, &c. In the church of Cologne, &c. the firſt chanter is called *chorepiſcopus*.

CHOREUS, Χορειος, a foot in the ancient poetry, more commonly called *trochæus*. See Trochee.

CHORIAMBUS, in ancient poetry, a foot conſiſting of four ſyllables, whereof the firſt and laſt are long, and the two middle ones are ſhort; or, which is the ſame thing, it is made up of a trochæus and iambus; ſuch is the word *nobilitas*.

CHORION, in anatomy, the exterior membrane which inveſts the foetus in the uterus. See Foetus.

CHOROBATA, or Chorobates, a kind of water level among the ancients, of the figure of the letter T, according to Vitruvius's deſcription.

CHOROGRAPHY, the art of making a map of ſome country or province.

Chorography differs from geography, as the deſcription of a particular country is different from that of the whole earth; and from topography, as the deſcription of a country is different from that of a town or diſtrict. See the articles Geography, Topography, and Map.

CHOROIDES, or Choroeides, in anatomy, a term applied to ſeveral parts of the body; bearing ſome reſemblance to the chorion. The word is formed from χοριον, *chorion*, and ειδος, *likeneſs*.

Choroides is particularly uſed for the inner membrane which immediately inveſts the brain; ſo called as being intermingled with a great number of blood-veſſels, like the *chorion*: but more uſually denominated the *pia mater*, or *meninx tenuis*.

Plexus or *Lacis Choroides*, is a knot of veins and arteries in the anterior ventricle of the brain, woven out of the branches of the carotid.

Choroides is alſo applied to the inner and poſterior tunic of the eye, immediately under the ſclerotica. It is ſoft, thin, and black; and its inner or concave ſurface is very ſmooth and poliſhed. It has its name from its being interſperſed with veſſels.

CHORUS, in dramatic poetry, one or more perſons preſent on the ſtage during the repreſentation, and ſuppoſed to be by-ſtanders without any ſhare in the action.

Tragedy in its origin was no more than a ſingle chorus, who trod the ſtage alone, and without any actors, ſinging dithyrambics or hymns in honour of Bacchus. Theſpis, to relieve the chorus, added an actor, who rehearſed the adventures of ſome of their heroes; and Æſchylus, finding a ſingle perſon too dry an entertainment, added a ſecond, at the ſame time reducing the ſinging of the chorus, to make more room for the recitation. But when once tragedy began to be formed, the recitative, which at firſt was intended only as an acceſſory part to give the chorus a breathing time, became a principal part of the tragedy. At length, however, the chorus became inſerted and incorporated into the action: ſometimes it was to ſpeak; and then their chief, whom they called *coryphæus*, ſpoke in behalf of the reſt: the ſinging was performed by the whole company; ſo that when the coryphæus ſtruck into a ſong, the chorus immediately joined him.

The chorus ſometimes alſo joined the actors in the courſe of the repreſentation, with their plaints and lamentations on account of any unhappy accidents that befel them: but the proper function, and that for which it ſeemed chiefly retained, was to ſhow the intervals of the acts: while the actors were behind the ſcenes, the chorus engaged the ſpectators; their ſongs uſually turned on what was exhibited, and were not to contain any thing but what was ſuited to the ſubject, and had a natural connection with it; ſo that the chorus concurred with the actors for advancing the action. In the modern tragedies the chorus is laid aſide, and the fiddles ſupply its place M. Dacier looks on this retrenchment as of ill conſequence, and thinks it robs tragedy of a great part of its luſtre; he therefore judges it neceſſary to re-eſtabliſh it, not only on account of the regularity of the piece, but alſo to correct, by prudent and virtuous reflections, any extravagances that might fall from the mouths of the actors when under any violent paſſion.

M. Dacier obſerved alſo, that there was a chorus, or grex, in the ancient comedy: but this is ſuppreſſed in the new comedy, becauſe it was uſed to reprove vices by attacking particular perſons; as the chorus of the tragedy was laid aſide to give the greater probability to thoſe kinds of intrigue which require ſecrecy.

Chorus, in muſic, is when, at certain periods of a ſong, the whole company are to join the ſinger in repeating certain couplets or verſes.

CHOSE, *(Fr.)* "a thing;" uſed in the common law with divers epithets; as *choſe local, choſe tranſitory*, and *choſe in action*. Choſe local is ſuch a thing as is annexed to a place, as a mill and the like; choſe tranſitory, is that thing which is moveable, and may be taken away, or carried from place to place; and choſe in action is a thing incorporeal, and only a *right*, as an obligation for debt, annuity, &c. And generally all cauſes of ſuit for any debt, duty, or wrong, are to be accounted choſes in action: and it ſeems, choſe in action may be alſo called *choſe in ſuſpence*; becauſe it hath no real exiſtence, or being, nor can properly be ſaid to be in our poſſeſſion.

CHOSROES I. the Great, king of Perſia, after his father Cabades, A. D. 532. He made peace with the Romans; but broke it the third year, and forced Juſtinian to a diſadvantageous peace. Afterward, he was ſo ſwelled with his victories, as to bid the emperor's ambaſſador follow him for audience to Cæſarea: but Tiberius ſent an army under Juſtinian; who made himſelf maſter of the country, and put Choſroes to death in 586.

Chosroes II. His ſubjects put his father Hormiſdas in priſon, and the ſon upon the throne of Perſia. He uſed his father tenderly at firſt; but afterwards cauſed him to be put to death. This, together with his killing ſome of the nobility, obliged him to fly: he gave his horſe the bridle, which carried him into a town of the Romans, where Mauricius the emperor received him kindly, and ſent an army under Narſes, which ſet him again upon the throne. He took Jeruſalem; after this he made himſelf maſter of Libya and Egypt, and carried Carthage. Heraclius ſued for peace; which was offered him on condition, *That he and his ſubjects ſhould deny Jeſus Chriſt*: Hereupon Heraclius attacked him with ſucceſs, and put him to flight. His own ſon purſued him, and he was ſtarved in priſon in 627.

CHOUCH, in ornithology, the trivial name of a ſpecies of Corvus.

CHOUS, in the eaſtern military orders, the title of the meſſengers of the divan of Janiſaries. There are ſeveral degrees of honour in this poſt. When a perſon is firſt advanced to it, he is called a *cuchuk*, or little *chous*; after this he is advanced to be the *alloy chous*; that is, the meſſenger of ceremonies; and from this, having paſſed through the office of *petelma*, or procurator of the effects of the body, he is advanced to be the *bas chous*.

CHOWDER-beer, a provincial phraſe of Devonſhire, in England, denoting a cheap and eaſily prepared drink, highly commended for preventing the ſcurvy in long voyages, or for the cure of it where it may have been contracted. It is prepared in the following manner: Take twelve gallons of water, in which put three pounds and a half of black ſpruce: boil it for three hours, and having taken out the fir or ſpruce, mix with the liquor ſeven pounds of melaſſes, and juſt boil it up; ſtrain it through a ſieve, and when milk warm put to it about four ſpoonfuls of yeſt to work it. In two or three days ſtop the bung of the caſk; and in five or ſix days, when fine, bottle it for drinking. Two gallons of melaſſes are ſufficient for an hogſhead of liquor; but if melaſſes cannot be procurod, treacle or coarſe ſugar will anſwer the purpoſe.

CHREMNITZ, the principal of the nine-towns in Upper Hungary, ſituated about 68 miles north-eaſt of Preſburg, and ſubject to the houſe of Auſtria. E. Long. 19. N. Lat. 48. 45.

CHRENECRUDA, a term occurring in writers of the middle age, and expreſſing a cuſtom of thoſe times; but its ſignification is doubtful. It is mentioned in *Lege Salica*, Tit. 61. which ſays, he who kills a man, and hath not wherewithal to ſatisfy the law or pay the fine, makes oath that he has delivered up every thing he was poſſeſſed of; the truth of which muſt be confirmed by the oaths of 12 other perſons. Then he invites his next relations by the father's ſide to pay off the remainder of the fine, having firſt made over to them all his effects by the following ceremony. He goes into his houſe, and taking in his hand a ſmall quantity of duſt from each of the four corners, he returns to the door, and with his face inwards throws the duſt with his left hand over his ſhoulders upon his neareſt of kin. Which done, he ſtrips to his ſhirt; and coming out with a pole in his hand, jumps over the hedge. His relations, whether one or ſeveral, are upon this obliged to pay off the compoſition for the murder. And if theſe (or any one of them) are not able to pay, *iterum ſuper illum chrenecruda, qui pauperior eſt, jactat, et ille totam legem componat.* Whence it appears, that *chrenecruda jactare,* is the ſame with throwing the duſt, gathered from the four corners of the houſe. Goldaſtus and Spelman tranſlate it *viridem herbam,* "green graſs," from the German *gruen kraut,* or from the Dutch *groen,* "green," and *gruid,* "graſs." Wendelinus is of a contrary opinion, who thinks that by this word *denotari purificationis approbationem,* from *chrein,* "pure, chaſte, clean;" and *keuren,* "to prove;" ſo that it muſt refer to the oaths of the twelve jurors. Be this as it will, king Childebert reformed this law by a decree, chap. 15. both becauſe it favoured of pagan ceremonies, and becauſe ſeveral perſons were thereby obliged to make over all their effects: *De chrenecruda lex quam paganorum tempore obſervabant, deinceps nunquam valeat, quia per ipſam cecidit multorum poteſtas.*

CHRISM (from χριω, *I anoint*), oil conſecrated by the biſhop, and uſed in the Romiſh and Greek churches, in the adminiſtration of baptiſm, confirmation, ordination, and extreme unction, which is prepared on holy Thurſday with much ceremony. In Spain it was anciently the cuſtom for the biſhop to take one third of a ſol for the chriſm diſtributed to each church, on account of the balſam that entered its compoſition.

Du Cange obſerves, that there are two kinds of chriſm; the one prepared of oil and balſam, uſed in baptiſm, confirmation, and ordination; the other of oil alone, conſecrated by the biſhop, uſed anciently for the catechumens, and ſtill in extreme unction. The Maronites, before their reconciliation with Rome, beſides oil and balſam, uſed muſk, ſaffron, cinnamon, roſes, white frankincenſe, and ſeveral other drugs mentioned by Rynaldus, in 1541, with the doſes of each. The Jeſuit Dandini, who went to mount Libanus in quality of the pope's nuncio, ordained, in a ſynod held there in 1596, that chriſm for the future ſhould be made only of two ingredients, oil and balſam; the one repreſenting the human nature of Jeſus Chriſt, the other his divine nature. The action of impoſing the chriſm is called *chriſmation*: this the generality of the Romiſh divines hold to be the next matter of the ſacrament of confirmation.

The chriſmation in baptiſm is performed by the prieſt; that in confirmation by the biſhop; that in ordination, &c. is more uſually ſtyled *unction.*

Chrism Pence, Chrismatis Denarii, or *Chrismales Denarii,* a tribute anciently paid to the biſhop by the pariſh-clergy, for their chriſm, conſecrated at Eaſter for the enſuing year: this was afterwards condemned as ſimoniacal.

CHRISOM, Chrismale, was anciently the face-cloth or piece of linen laid over the child's head when it was baptized. Whence, in the bills of mortality, children who die in the mouth are called *chriſoms.* The time between the child's birth and baptiſm was alſo called *chriſomus.*

CHRIST, an appellation ſynonymous with *Meſſiah,* uſually added to Jeſus: and, together therewith, denominating the Saviour of the world. See Christianity and Messiah.

The word χριςος ſignifies *anointed,* from χριω, *inungo,* "I anoint." Sometimes the word *Chriſt* is uſed ſingly, by way of *antonomaſis,* to denote a perſon ſent from God, as an anointed prophet, king, or prieſt.

Order of Christ, a military order, founded by Dionyſius I. king of Portugal, to animate his nobles againſt the Moors.—The arms of this order are gules, patriarchal croſs, charged with another croſs argent: they had their reſidence at firſt at Caſtromarin; afterwards they removed to the city of Thomar, as being nearer to the Moors of Andaluſia, and Eſtremadura.

Christ is alſo the name of a military order in Livonia, inſtituted in 1205 by Albert biſhop of Riga. The end of this inſtitution was to defend the new Chriſtians, who were converted every day in Livonia, but were perſecuted by the heathens. They wore on their cloaks a ſword with a croſs over it, whence they were alſo denominated *brothers of the ſword.*

Christ-Burgh, a town of Poland, near the lake Drauſen, and about three Poliſh miles from Marienburgh.

Christ-Church, a borough-town of Hampſhire, in England, 30 miles ſouth-weſt of Wincheſter, near the ſea-coaſt. W. Long. 2. N. Lat. 50. 40. It ſends two members to parliament.

Christ-Thorn, in botany. See Rhamnus.

CHRISTIAN. See Christianity and Christians.

Moſt Christian King, one of the titles of the king of France.

The French antiquaries trace the origin of this appellation up to Gregory the Great, who, writing a letter to Charles Martel, occaſionally gave him that title, which his ſucceſſors have ſince retained.

Christian Religion, that inſtituted by Jeſus Chriſt. See Christianity.

1 Origin of the word.

CHRISTIANITY, the religion of Chriſtians. The word is analogically derived, as other abſtracts from their concretes, from the adjective *Chriſtian.* This again is derived from the name Χριςος, *Chriſtus,* from the word χριω, *I anoint.* Chriſt is called *the anointed,* from a cuſtom which extenſively prevailed in antiquity, and was originally ſaid to be of divine inſtitution, of anointing perſons in the ſacerdotal or regal character, as a public ſignal of their conſecration to their important offices, and as a teſtimony that heaven itſelf was the guarantee of that relation which then commenced between the perſons thus conſecrated and their ſubordinates.

2 By what name the apoſtles were firſt diſtinguiſhed.

The diſciples of Jeſus, after the death of their teacher, had for ſome time been called *Nazarenes,* from Nazareth in Galilee where he dwelt; which afterwards became the deſignation of a particular ſect. They, who adopted the principles and profeſſed the religion which he taught, were firſt diſtinguiſhed by the name of *Chriſtians* at Antioch. That profeſſion, and thoſe doctrines, we now proceed to delineate with as much perſpicuity as the limits of our plan will admit, yet with the conciſeneſs which a work ſo multiform and extenſive requires.

3 Delineation of Chriſtianity.

When a Chriſtian is interrogated concerning the nature and foundation of his faith and practice, his ultimate reference, his laſt appeal, is to the facts, the doctrines, and the injunctions, contained in the books of the Old and New Teſtament. From theſe, therefore, and from theſe alone, muſt every fair account, or the materials of which it is compoſed, be extracted or deduced. Other formularies, or confeſſions of faith, may, according to the Chriſtian, deſerve more or leſs attention, as they are more or leſs immediately contained or implied in the ſcriptures. But whatever is not actually expreſſed in, or deduced by fair and neceſſary conſequence from, theſe writings, muſt be regarded as merely human; and can have no other title to our aſſent and obſervation than what they derive from their conformity with the ſcriptures, with the dictates and feelings of a reformed and cultivated mind, or with thoſe meaſures which are found expedient and uſeful in human life. But as thoſe books, from whence the Chriſtian inveſtigates his principles of belief and rules of conduct, have been variouſly interpreted by different profeſſors and commentators, theſe diverſities have given birth to a multiplicity of different ſects. It cannot, therefore, be expected, that any one who undertakes to give an account of Chriſtianity, ſhould comprehend all the writings and opinions which have been propagated and exhibited by hiſtorical, ſyſtematical, or polemical authors. Theſe, if at all contained in ſuch a work as this, ſhould be ranged under their proper articles, whether ſcientifical, controverſial, or biographical. It is our preſent buſineſs, if poſſible, to confine ourſelves to a detail of ſuch facts and doctrines as in the ſtrict and primitive ſenſe of the word, are *catholic*, or in other expreſſions, to ſuch as uniformly have been, and ſtill are, recogniſed and admitted by the whole body of Chriſtians.

4
Account of Chriſtianity, whence deducible.

We have already ſaid that theſe, or at leaſt the greateſt number of them, appeal to the ſcriptures of the Old and New teſtament as the ultimate ſtandard, the only infallible rule of faith and manners. If you aſk them, by what authority theſe books claim an abſolute right to determine the conſciences and underſtandings of men with regard to what they ſhould believe and what they ſhould do? they will anſwer you, that all ſcripture, whether for doctrine, correction, or reproof, was given by immediate inſpiration from God.

5
The nature of its evidences.

If again you interrogate them how thoſe books, which they call *Scripture*, are authenticated? they reply, that the evidences by which the Old and New Teſtament are proved to be the Word of God, are either external or internal. The *external* may again be divided into direct or collateral. The direct evidences are ſuch as ariſe from the nature, conſiſtency, and probability, of the facts; and from the ſimplicity, uniformity, competency, and fidelity, of the teſtimonies by which they are ſupported. The collateral evidences, are either the ſame occurences ſupported by Heathen teſtimonies, or others which concur with and corroborate the hiſtory of Chriſtianity. Its *internal* evidences ariſe either from its exact conformity with the character of God, from its aptitude to the frame and circumſtances of man, or from thoſe ſupernatural convictions and aſſiſtances which are impreſſed on the mind by the immediate operation of the divine Spirit. Theſe can only be mentioned in a curſory manner in a detail ſo conciſe as the preſent.

6
How Chriſtianity is ſupported by facts.

Such facts as are related in the hiſtory of his religion, the Chriſtian aſſert to be not only conſiſtent each with itſelf, but likewiſe one with another. Hence it is, that, by a ſeries of antecedents and conſequences, they corroborate each other, and form a chain which cannot be broken but by an abſolute ſubverſion of all hiſtorical authenticity. Nor is this all: for, according to him, the facts on which Chriſtianity is founded, not only conſtitute a ſeries of themſelves, but are likewiſe in ſeveral periods the beſt reſources for ſupplying the chaſms in the hiſtory of our nature, and preſerving the tenor of its annals entire. The facts themſelves are either natural or ſupernatural. By natural facts we mean ſuch occurrences as happen or may happen from the various operations of mechanical powers, or from the interpoſition of natural agents without higher aſſiſtants. Such are all the common occurrences of hiſtory, whether natural, biographical, or civil. By ſupernatural facts, we mean ſuch as could not have been produced without the interpoſition of Deity, or at leaſt of powers ſuperior to the laws of mechaniſm or the agency of embodied ſpirits. Among theſe may be reckoned the immediate change of water into wine, the inſtantaneous cure of diſeaſes without the intervention of medicine, the reſuſcitation of the dead, and others of the ſame kind. In this order of occurrences may likewiſe be numbered the exertions and exhibitions of prophetic power, where the perſons by whom theſe extraordinary talents were diſplayed could neither by penetration nor conjecture unravel the mazes of futurity, and trace the events of which they ſpoke from their primary cauſes to their remote completions. So that they muſt have been the paſſive organs of ſome ſuperior Being, to whom the whole concatenation of cauſes and effects which operate from the origin to the conſummation of nature, was obvious at a glance of thought.

7
Natural facts, what, and how conducive to the elucidation of hiſtory.

It has already been hinted, that the facts which we have called *natural*, not only agree with the analogy of human events, and corroborate each other, but in a great many emergencies nobly illuſtrate the hiſtory of nature in general. For this a Chriſtian might offer one inſtance, of which philoſophy will not perhaps be able to produce any tolerable ſolution, without having recourſe to the facts upon which Chriſtianity is founded. For if mankind were originally deſcended from one pair alone, how ſhould it have happened that long before the date of authentic hiſtory every nation had its own diſtinct language? Or if it be ſuppoſed, as ſome late philoſophers have maintained, that man is an indigenous animal in every country; or, that he was originally produced in, and created for, each particular ſoil and climate which he inhabits; ſtill it may be demanded, whence the prodigious multiplicity, the immenſe diverſity, of languages? Is the language of every nation intuitive, or were they dictated by exigencies, and eſtabliſhed by convention? If the laſt of theſe ſuppoſitions be true, what an immenſe period of time muſt have paſſed? How many revolutions of material and intellectual nature muſt have happened? What acceſſions of knowledge, refinement, civilization, muſt human intercourſe have gained before the formation and eſtabliſhment even of the moſt ſimple, imperfect, and barbarous language? Why is a period ſo vaſt, obliterated ſo entirely as to eſcape the retroſpect of hiſtory, of tradition, and even of fable itſelf; Why was the acquiſition and improvement of other arts ſo infinitely diſtant from that of language, that the aera of the latter is entirely loſt, whilſt we can trace the former from their origin through the various gradations of their progreſs.

8
This obſcurity inexplicable but by the Moſaic account.

Theſe difficulties, inextricable by all the lights of hiſtory or philoſophy, this more than Cimmerian darkneſs, is immediately diſſipated by the Moſaic account of the confuſion of tongues: wiſely intended to ſeparate the tribes of men one from another, to repleniſh the ſurface of the globe, and to give its multiplied inhabitants thoſe opportunities of improvement which might be derived from experiment and induſtry, variouſly exerted, according to the different ſituations in which they were placed, and the different employments which theſe ſituations dictated. Thus the time of nature's exiſtence is limited to a period within the ken of human intellect. Thus whatever has happened might have happened during the preſent mode of things; whereas, if we deduce the orign and diverſity of language from a period ſo remotely diſtant as to be abſolutely loſt, and entirely detached from all the known occurences and viciſſitudes of time, we muſt admit the preſent forms and arrangments of things to have ſubſiſted perhaps for a much longer duration than any mechanical philoſopher will allow to be poſſible. Other inſtances equally pregnant with conviction might be multiplied; but, precluded by the limits of our plan, we proceed to a ſingle obſervation upon the facts which have been termed *ſupernatural*.

9
Miracles how conducive to prove the truth of Chriſtianity.

Of thoſe changes which happen in ſenſible objects, ſenſation alone can be judge. Reaſon has nothing to do in the matter. She may draw concluſions from the teſtimonies of ſenſe, but can never refute them. If, therefore, our ſenſes inform us that ſnow is white, in vain would the moſt learned and ſubtile philoſopher endeavour to convince us that it was of a contrary colour. He might confound us, but never could perſuade us. Such changes, therefore, as appear to happen in ſenſible objects, muſt either be real or fallacious. If real, the miracle is admitted; if falacious, there muſt be a cauſe of deception equally unaccountable from the powers of nature, and therefore equally miraculous. If the veracity or competency of the witneſſes be queſtioned, the Chriſtian anſwers, that they muſt be competent, becauſe the facts which they relate are not beyond their capacity to determine. They muſt likewiſe be faithful, becauſe they had no ſecular motives for maintaining, but many for ſuppreſſing or diſguiſing, what they teſtified. Now the Chriſtian appeals to the whole ſeries of hiſtory and experience, whether ſuch a man is or can be found, as will offer a voluntary, ſolemn, and deliberate ſacrifice of truth at the ſhrine of caprice.

10
Prophecy evident by its own nature independent of its vehicles.

But ſuch facts as after a long continuance of time have been found exactly agreeable to predictions formerly emitted, muſt ſuperſede the fidelity of teſtimony, and infallibly prove that the event was known to the Being by whom it was foretold. In vain has it been urged, that prophecies are ambiguous and equivocal. For though they may prefigure ſubordinate events, yet if the grand occurrences to which they ultimately relate, can alone fulfil them in their various circumſtances, and in their utmoſt extent, it is plain, that the Being by whom they were revealed muſt have been actually preſcient of thoſe events, and muſt have had them in view when the predictions were uttered. For this ſee a learned and ingenious Diſſertation on the Credibility of Goſpel-hiſtory, by Dr M'Knight; where the evidences urged by the Chriſtian in defence of his tenets, which appear detached and ſcattered through innumerable volumes, are aſſembled and arranged in ſuch a manner as to derive ſtrength and luſtre from the method in which they are diſpoſed, without diminiſhing the force of each in particular. See alſo the works of Dr Hurd: conſult likewiſe thoſe of Newton, Sherlock Chandler, &c. For the evidences of thoſe preternatural facts which have been termed *miracles*, the reader may peruſe a ſhort but elegant and concluſive defence of theſe aſtoniſhing phenomena, in anſwer to Mr Hume, by the Rev. George Campbell, D. D.

11
Properties common to all religions.

It muſt be obvious to every reflecting mind, that whether we attempt to form the idea of any religion *a priori*, or contemplate thoſe which have been already exhibited, certain facts, principles, or *data*, muſt be pre-eſtabliſhed, from whence will reſult a particular frame of mind and courſe of action ſuitable to the character and dignity of that Being by whom the religion is enjoined, and adapted to the nature and ſituation of thoſe agents who are commanded to obſerve it. Hence *Chriſtianity* may be divided into *credenda* or doctrines, and *agenda* or precepts.

12
Chriſtian theology.

As the great foundation of his religion, therefore, the Chriſtian believes the exiſtence and government of one eternal and infinite God, who, for ever retains in himſelf the cauſe of his own exiſtence, and inherently poſſeſſes all thoſe perfections which are compatible with his nature: ſuch are, his almighty power, omniſcient wiſdom, infinite juſtice, boundleſs goodneſs, perfect holineſs, and univerſal preſence. That Jeſus Chriſt is the Son of God, in whom the fulneſs of the Godhead dwells, by whom he created and governs the univerſe, exerciſing in his univerſal government the energy of the Holy Spirit, and conducting all his diſpenſations to accompliſh the deſigns of infinite wiſdom and benevolence.

The Supreme Being, though abſolutely independent and for ever ſufficient for his own beatitude, was graciouſly pleaſed to create an univerſe replete with inferior intelligences, who might for ever contemplate and enjoy his glory, participate his happineſs, and imitate his perfections. But as freedom of will is eſſential to the nature of moral agents, that they may co-operate with God in their own improvement and happineſs, ſo their natures and powers are neceſſarily limited, and by that conſtitution rendered peccable. This degeneracy firſt took place in a rank of intelligence ſuperior to man. But guilt is never ſtationary. Impatient of itſelf, and curſed with its own feelings, it proceeds from bad to worſe, whilſt the poignancy of its torments increaſes with the number of its perpetrations. Such was the ſituation of Satan, and his apoſtate angels. They attempted to transfer their turpitude and miſery to man; and were, alas! but too ſucceſsful. Hence the heterogeneous and irreconcileable principles which operate in his nature. Hence that inexplicable medley of wiſdom and folly, of rectitude and error, of benevolence and malignity, of ſincerity and fraud, exhibited through his whole conduct.

duct. Hence the darkneſs of his underſtanding, the depravity of his will, the pollution of his heart, the irregularity of his affections, and the abſolute ſubverſion of his whole internal economy. Theſe ſeeds of perdition ſoon ripened into overt acts of guilt and horror. All the hoſtilities of nature were confronted, and the whole ſublunary creation became a theatre of diſorder and miſchief.

Here the Chriſtian once more appeals to fact and experience. If theſe things are ſo; if *man* is the veſſel of guilt and the victim of miſery; he demands how this conſtitution of things can be accounted for? how can it be ſuppoſed, that a being ſo wicked and unhappy ſhould be the production of an infinitely perfect Creator? He therefore inſiſts, that human nature muſt have been diſarranged and contaminated by ſome violent ſhock; and that, of conſequence, without the light diffuſed over the face of things by Chriſtianity, all nature muſt remain an inſcrutable and inexplicable myſtery.

To redreſs theſe evils, to re-eſtabliſh the empire of virtue and happineſs, to reſtore fallen nature to its primitive rectitude, to purify from every ſtain, to remove the guilt and deſtroy the power of vice, the Son of God, the Logos or Word, the Redeemer or Saviour of the world, the Immanuel or God with us, from whom Chriſtianity takes its name, and to whom it owes its origin, deſcended from the boſom of his Father; was made fleſh; took upon him the form of a ſervant; ; endured a ſevere probation in that character; exhibited a pattern of perfect righteouſneſs; and at laſt ratified his doctrine, and fully accompliſhed all the ends of his miſſion, by a cruel, unmerited, and ignominious death. Before he left this world, he delivered the doctrine of human ſalvation, and the rules of human conduct, to his apoſtles, whom he empowered to inſtruct the world in all that concerned their eternal felicity, and whom he inveſted with miraculous gifts to aſcertain the reality of what they taught. To them he likewiſe promiſed another comforter, even the Divine Spirit, who ſhould relume the darkneſs, conſole the woes, and purify the ſtains, of human nature. Having remained for a part of three days under the power of death, he aroſe again from the grave, diſcovered himſelf to his diſciples, converſed with them for ſome time, then reaſcended to heaven; from whence the Chriſtian expects him, according to his promiſe, to appear as the Sovereign Judge of the living and the dead, from whoſe award there is no appeal, and by whoſe ſentence the pious and the wicked ſhall receive according to their deeds.

Soon after his departure to the right hand of his Father, where he ſits ſupreme of all created beings, and inveſted with the abſolute adminiſtration of heaven and earth, the Spirit of grace and conſolation deſcended on his apoſtles with viſible ſignatures of divine power and preſence. Nor were his ſalutary operations confined to them, but extended to all the rational world, who did not by obſtinate guilt repel his influences, and provoke him to withdraw them. Theſe, indeed, were leſs conſpicuous than at the glorious æra when they were viſibly exhibited in the perſons of the apoſtles. But though his energy is leſs obſervable, it is by no means leſs effectual to all the purpoſes of grace and mercy.

The Chriſtian is convinced, that there is and ſhall continue to be a ſociety upon earth, who worſhip God as revealed in Jeſus Chriſt; who believe his doctrines; who obſerve his percepts; and who ſhall be ſaved by his death, and by the uſe of theſe external means of ſalvation which he hath appointed.

13
The external means of Chriſtianity, what, and how promotive of their end.

Theſe are few and ſimple. The ſacraments of baptiſm and the euchariſt, the interpretation and application of ſcripture, the habitual exerciſe of public and private devotion, are obviouſly calculated to diffuſe and promote the intereſts of truth and virtue, by ſuperinducing the ſalutary habits of faith, love, and repentance.

The Chriſtian is firmly perſuaded, that at the period which God hath appointed, and to which the purpoſes of providence in the various revolutions of progreſſive nature tend, the whole human race ſhall once more iſſue from their graves; ſome to ſupreme felicity, in the actual perception and enjoyment of their Creator's preſence; others to that conſummate ſhame and miſery, which are the native conſequences of their wickedneſs.

14
Chriſtian morality.

The two grand principles of action, according to the Chriſtian, are, The love of God, which is the ſovereign paſſion in every perfect mind: and the love of man, which regulates our actions according to the various relations in which we ſtand, whether to communities or individuals. This ſacred connection can never be totally extinguiſhed by any temporary injury. It ought to ſubſiſt in ſome degree even amongſt enemies. It requires that we ſhould pardon the offences of others, as we expect pardon for our own; and that we ſhould no farther reſiſt evil than is neceſſary for the preſervation of perſonal rights and ſocial happineſs. It dictates every relative and reciprocal duty between parents and children, maſters and ſervants, governors and ſubjects, friends and friends, men and men. Nor does it merely enjoin the obſervation of equity, but likewiſe inſpires the moſt ſublime and extenſive charity, a boundleſs and diſintereſted effuſion of tenderneſs for the whole ſpecies, which feels their diſtreſs and operates for their relief and improvement. Theſe celeſtial diſpoſitions, and the different duties which are their natural exertions, are the various gradations by which the Chriſtian hopes to attain the perfection of his nature and the moſt exquiſite happineſs of which it is ſuſceptible.

15
This ſyſtem aſſerted by the Chriſtian, ſuperior in the excellence of its nature, and the evidence of its reality, to all others.

Such are the ſpeculative, and ſuch the practical principles of Chriſtianity. From the former, its votaries contend, that the origin, economy, and revolutions of intelligent nature alone can be rationally explained. From the latter, they aſſert, that the nature of man, whether conſidered in its individual or ſocial capacity, can alone be conducted to its higheſt perfection and happineſs. With the determined Atheiſts they ſcarcely deign to expoſtulate. For, according to them, philoſophers who can deduce the origin and conſtitution of things from caſual rencounters or mechanical neceſſity, are capable of deducing any concluſion from any premiſes. Nor can a more glaring inſtance of abſurdity be produced, than the idea of a contingent or ſelf-originated univerſe. When

Deiſts and other ſceptics upbraid them with myſterious or incompatible principles, they without heſitation deny the charge. They demand of any reaſoner who admits that a being may be omnipreſent without extenſion; or that he can impreſs motion upon other things, whilſt he himſelf is neceſſarily immoveable, upon what ground he charges Chriſtianity with incompatible principles. They aſk the ſage, why it ſhould be thought more extraordinary, that the Son of God ſhould be ſent to this world, that he ſhould be a man of like paſſions with other men, that he ſhould ſuffer and die for the relief of his degnerate creatures, than that an exiſtence whoſe felicity is eternal, inherent, and infinite, ſhould have any motive for creating beings exterior to himſelf? Is it not, ſays the Chriſtian, equally worthy of the divine interpoſition to reſtore order and happineſs where they are loſt, as to communicate them where they never have been? Is not infinite goodneſs equally conſpicious in relieving miſery as in diffuſing happineſs? Is not the exiſtence of what we call evil in the world, under the tuition of an infinitely perfect Being, as inſcrutable as the mean exhibited by Chriſtianity for its abolition? The death and reſurrection of the Son of God, and pardon and life through him, are certainly not leſs reconcileable to human reaſon, *a priori*, than the exiſtence of vice and puniſhment in the productions of infinite wiſdom, power, and goodneſs: particularly when it is conſidered, that the virtues exerted and diſplayed by a perfect Being in a ſtate of humiliation and ſuffering, ſhall ultimately be productive of the reſtored felicity of inferior creatures, in proportion to their glory and excellence; and that ſuch goodneſs may apply the bleſſings which it has obtained, in whatever manner, in whatever degree, and to whomſoever it pleaſes, without being under any neceſſity to violate the freedom of moral agents, by recalling them to the paths of virtue and happineſs by a mechanical and irreſiſtible force.

16
Miraculous as poſſible, and perhaps as neceſſary, as natural events.

It will be granted to philoſophy by the Chriſtian, that as no theory of mechanical nature can be formed without preſuppoſing ſacred and eſtabliſhed laws from which ſhe ought rarely or never to deviate, ſo in fact ſhe tenaciouſly purſues theſe general inſtitutions, and from their conſtant obſervance reſult the order and regularity of things. But he cannot admit, that the important ends of moral and intellectual improvement may be uniformly obtained by the ſame means. He affirms, that if the hand of God ſhould either remain always entirely inviſible, or at leaſt only perceptible in the operation of ſecond cauſes, intelligent beings would be apt in the courſe of time to reſolve the interpoſitions of Deity into the general laws of mechaniſm; to forget their connection with nature, and conſequently their dependence upon him. Hence, according to the dictates of common ſenſe, and to the unanimous voice of every religion in every age or clime, for the purpoſes of wiſdom and benevolence, God may not only control, but has actually controlled, the common courſe and general operations of nature. So that, as in the material, world the law of *cauſe* and *effect* is generally and ſcrupulouſly obſerved for the purpoſes of natural ſubſiſtence and accommodation; thus ſuſpenſes and changes of that univerſal law are equally neceſſary for the advancement of moral and intellectual perfection.

17
Chriſtianity not only explains the phenomena, but conſolesthe miſeries, of human nature.

But the diſciple of Jeſus not only contends, that no ſyſtem of religion has ever yet been exhibited ſo conſiſtent with itſelf, ſo congruous to philoſophy and the common ſenſe of mankind, as Chriſtianity; he likewiſe avers, that it is infinitely more productive of real and ſenſible conſolation than any other religious or philoſophical tenets, which have ever entered into the ſoul, or been applied to the heart of man. For what is death to that mind which conſiders eternity as the career of its exiſtence? What are the frowns of fortune to him who claims an eternal world as his inheritance? What is the loſs of friends to that heart which feels, with more than natural conviction, that it ſhall quickly rejoin them in a more tender, intimate, and permanent intercourſe than any of which the preſent life is ſuſceptible? What are the fluctuations and viciſſitudes of external things to a mind which ſtrongly and uniformly anticipates a ſtate of endleſs and immutable felicity? What are mortifications, diſappointments, and inſults, to a ſpirit which is conſcious of being the original offspring and adopted child of God; which knows that its omnipotent Father will, in proper time, effectually aſſert the dignity and privileges of its nature? In a word, as earth is but a ſpeck of creation, as time is not an inſtant in proportion to eternity, ſuch are the hopes and proſpects of the Chriſtian in compariſon of every ſublunary misfortune or difficulty. It is therefore, in his judgment, the eternal wonder of angels, and indelible opprobrium of man, that a religion ſo worthy of God, ſo ſuitable to the frame and circumſtances of our nature, ſo conſonant to all the dictates of reaſon, ſo friendly to the dignity and improvement of intelligent beings, pregnant with genuine comfort and delight, ſhould be rejected and deſpiſed. Were there a poſſibility of ſuſpence or heſitation between this and any other religion extant, he could freely truſt the determination of a queſtion ſo important to the candid deciſion of real virtue and impartial philoſophy.

18
Mr Gibbon attempts to prove, that the propagation of Chriſtianity was owing to cauſes from the operation of which no arguments can be deduced in proof of its authenticity.

Mr Gibbon, in his Hiſtory of the Decline and Fall of the Roman Empire, mentions five ſecondary cauſes to which he thinks the propagation of Chriſtianity, and all the remarkable circumſtances which attended it, may be with good reaſon aſcribed. He ſeems to inſinuate, that Divine Providence did not act in a ſingular or extraordinary manner in diſſeminating the religion of Jeſus through the world; and that, if every other argument which has been adduced to prove the ſacred authority of this religion can be parried or refuted, nothing can be deduced from this ſource to prevent it from ſharing the ſame fate with other ſyſtems of ſuperſtition. The cauſes of its propagation were in his opinion founded on the principles of human nature and the circumſtances of ſociety. If we aſcribe not the propagation of Mahometiſm, or of the doctrines of Zerduſt, to an extraordinary interpoſition of divine providence, operating by an unperceived influence on the diſpoſitions of the human heart, and controlling and confounding the ordinary laws of nature; neither can we, upon any reaſonable grounds, refer the promulgation of Chriſtianity to ſuch an interpoſition.

The

19 The cauſes. The ſecondary cauſes to which he aſcribes theſe effects are, 1. The inflexible and intolerant zeal of the Chriſtians; derived from the Jewiſh religion, but purified from the narrow and unſocial ſpirit which, inſtead of inviting, deterred the Gentiles from embracing the law of Moſes. 2. The doctrine of a future life, improved by every additional circumſtance which could give weight and efficacy to that important truth. 3. The miraculous powers aſcribed to the primitive church. 4. The pure and auſtere morals of the Chriſtians. 5. The union and diſcipline of the Chriſtian republic, which gradually formed an independant and increaſing ſtate in the heart of the Roman empire.

20 Cauſe I. In pointing out the connection between the *firſt* of theſe cauſes and the effects which he repreſents as ariſing from it, this learned and ingenious writer obſerves, that the religion of the Jews does not ſeem to have been intended to be propagated among the Heathens, and that the converſion of proſelytes was rather accidental than conſiſtent with the purport and the general ſpirit of the inſtitutions of Judaiſm. The Jews were, of conſequence, ſtudious to preſerve themſelves a peculiar people. Their zeal for their own religion was intolerant, narrow, and unſocial.

In Chriſtianity, when it made its appearance in the world, all the better part of the predominant ſpirit of Judaiſm was retained; but whatever might have a tendency to confine its influence within narrow limits was laid aſide. Chriſtians were to maintain the doctrines and adhere to the inſtitutions of their religion with ſacred fidelity. They were not to violate their allegiance to Jeſus by entertaining or profeſſing any reverence for Jupiter or any other of the Heathen deities; it was not even neceſſary for them to comply with the poſitive and ceremonial inſtitutions of the law of Moſes,—although theſe were acknowledged to have been of divine origin. The zeal, therefore, which their religion inculcated, was inflexible. It was even intolerant: for they were not to content themſelves with profeſſing Chriſtianity and conforming to its laws; they were to labour with unremitting aſſiduity, and to expoſe themſelves to every difficulty and every danger, in converting others to the ſame faith.

But the ſame circumſtances which rendered it thus intolerant, communicated to it a more liberal and a leſs unſocial ſpirit than that of Judaiſm. The religion of the Jews was intended only for a few tribes: Chriſtianity was to become a catholic religion; its advantages were to be offered to all mankind.

All the different ſects which aroſe among the primitive Chriſtians uniformly maintained the ſame zeal for the propagation of their own religion, and the ſame abhorrence for every other. The Orthodox, the Ebionites, the Gnoſtics, were all equally animated with the ſame excluſive zeal, and the ſame abhorrence of idolatry, which had diſtinguiſhed the Jews from other nations.

21 Obſervations in anſwer. Such is the general purport of what Mr Gibbon advances concerning the influence of the firſt of thoſe ſecondary cauſes in the propagation of Chriſtianity. It would be uncandid to deny, that his ſtatement of facts appears to be, in this inſtance, almoſt fair, and his deductions tolerably logical. The firſt Chriſtians *were* remarkable for their deteſtation of idolatry, and for the generous diſintereſted zeal with which they laboured to convert others to the ſame faith. The firſt of theſe principles, no doubt, contributed to maintain the dignity and the purity of Chriſtianity; and the ſecond to diſſeminate it through the world. But the facts which he relates are ſcarce conſiſtent throughout. He ſeems to repreſent the zeal of the firſt Chriſtians as ſo hot and intolerant, that they could have no ſocial intercourſe with thoſe who ſtill adhered to the worſhip of Heathen deities. In this caſe, how could they propagate their religion? Nay, we may even aſk, How could they live? If they could not mingle with the Heathens in the tranſactions either of peace or war; nor witneſs the marriage or the funeral of the deareſt friend, if a Heathen; nor practiſe the elegant arts of muſic, painting, eloquence, or poetry; nor venture to uſe freely in converſation the language of Greece or of Rome;—it is not eaſy to ſee what opportunities they could have of diſſeminating their religious ſentiments. If, in ſuch circumſtances, and obſerving rigidly ſuch a tenor of conduct, they were yet able to propagate their religion with ſuch amazing ſucceſs as they are ſaid to have done; they muſt ſurely either have practiſed ſome wondrous arts unknown to us, or have been aſſiſted by the ſupernatural operation of divine power.

But all the hiſtorical records of that period, whether ſacred or profane, concur to prove, that the primitive Chriſtians in general did not retire with ſuch religious horror from all intercourſe with the Heathens. They refuſed not to ſerve in the armies of the Roman empire: They appealed to Heathen magiſtrates, and ſubmitted reſpectfully to their deciſions: the Huſband was often a Heathen, and the wife a Chriſtian; or, again, the huſband a Chriſtian, and the wife a Heathen. Theſe are facts ſo univerſally known and believed, that we need not quote authorities in proof of them.

This reſpectable writer appears therefore not to have ſtated the facts which he produces under this head with ſufficient ingenuouſneſs; and he has taken care to exaggerate and improve thoſe which he thinks uſeful to his purpoſe with all the dazzling, deluſive colours of eloquence. But had the zeal of the firſt Chriſtians been ſo intolerant as he repreſents it, it muſt have been highly unfavourable to the propagation of their religion: all their wiſhes to make converts would, in that caſe, have been counteracted by their unwillingneſs to mix, in the ordinary intercourſe of life, with thoſe who were to be converted. Their zeal, and the liberal ſpirit of their religion, were indeed ſecondary cauſes which contributed to its propagation: but their zeal was by no means ſo ridiculouſly intolerant as this writer would have us believe; if it had, it muſt have produced effects directly oppoſite to thoſe which he aſcribes to it.

22 Cauſe II. In illuſtrating the influence of the *Second* of theſe ſecondary cauſes to which he aſcribes the propagation of Chriſtianity, Mr Gibbon diſplays no leſs ingenuity than in tracing the nature and the effects of the firſt. The doctrine of a future life, improved by every additional circumſtance which can give weight and efficacy to that important truth, makes a conſpicuous figure in the Chriſtian ſyſtem; and it is a doctrine highly flattering to the natural hopes and wiſhes of the human heart.

Though the Heathen philoſophers were not unacquainted with this doctrine; yet to them the ſpirituality of the human ſoul, its capacity of exiſtence in a ſeparate ſtate from the body, its immortality, and its proſpect of laſting happineſs in a future life, rather appeared things poſſible and deſirable, than truths fully eſtabliſhed upon ſolid grounds. Theſe doctrines, Mr Gibbon would perſuade us, had no influence on the moral ſentiments and general conduct of the Heathens. Even the philoſophers, who amuſed themſelves with diſplaying their eloquence and ingenuity on thoſe ſplendid themes, did not allow them to influence the tenor of their lives. The great body of the people, who were occupied in purſuits very different from the ſpeculations of philoſophy, and were unacquainted with the queſtions diſcuſſed in the ſchools, were ſcarce ever at pains to reflect whether they conſiſted of a material and a ſpiritual part, or whether their exiſtence was to be prolonged beyond the term of the preſent life; and they could not regulate their lives by principles which they did not know.

In the popular ſuperſtition of the Greeks and Romans, the doctrine of a future ſtate was not omitted. Mankind were not only flattered with the hopes of continuing to exiſt beyond the term of the preſent life; but different conditions of exiſtence were promiſed or threatened, in which retributions for their conduct in human life were to be enjoyed or ſuffered. Some were exalted to heaven, and aſſociated with the gods; others were rewarded with leſs illuſtrious honours, and a more moderate ſtate of happineſs, in Elyſium; and thoſe, again, who by their conduct in life had not merited rewards, but puniſhments, were conſigned to Tartarus. Such were the ideas of a future ſtate which made a part of the popular ſuperſtition of the Greeks and Romans. But they produced only a very faint impreſſion on the minds of thoſe among whom they prevailed. They were not truths ſupported by evidence; they were not even plauſible; they were a tiſſue of abſurdities. They had not therefore a more powerful influence on the morals, than the more refined ſpeculations of the philoſophers.

Even the Jews, whoſe religion and legiſlature were communicated from heaven, were in general, till within a very ſhort time before the propagation of the goſpel, as imperfectly acquainted with the doctrine of a future ſtate as the Greeks and Romans. This doctrine made no part of the law of Moſes. It is but darkly and doubtfully inſinuated through the other parts of the Old Teſtament. Thoſe among the Jews who treated the ſacred ſcriptures with the higheſt reverence, always denied that ſuch a doctrine could be deduced from any thing which theſe taught; and maintained that death is the final diſſolution of man.

The rude tribes who inhabited ancient Gaul, and ſome other nations not more civilized than they, entertained ideas of a future life, much clearer than thoſe of the Greeks, the Romans, or the Jews.

Chriſtianity, however, explained and inculcated the truth of this doctrine in all its ſplendor and all its dignity. It exhibited an alluring, yet not abſurd, view of the happineſs of a future life. It conferred new horrors on the place of puniſhment, and added new ſeverity to the tortures to be inflicted, in another world. The authority on which it taught theſe doctrines, and diſplayed theſe views, was ſuch as to ſilence inquiry and doubt, and to command implicit belief. What added to the influence of the doctrine of a future ſtate of exiſtence, thus explained and inculcated, was, that the firſt Chriſtians confidently propheſied and ſincerely believed that the end of the world, the conſummation of all things, was faſt approaching, and that the generation then preſent ſhould live to witneſs that awful event. Another circumſtance which contributed to render the ſame doctrine ſo favourable to the propagation of Chriſtianity was, that the firſt Chriſtians dealt damnation without remorſe, and almoſt without making any exceptions, on all who died in the belief of the abſurdities of Heathen ſuperſtition. Thus taught and improved with theſe additional and heightening circumſtances, this doctrine, partly by preſenting alluring proſpects and exciting pleaſing hopes, partly by working upon the fears of the human heart with repreſentations of terror, operated in the moſt powerful manner in extending the influence of the Chriſtian faith.

23 Obſervations in anſwer.

Here, too, facts are rather exaggerated, and the inferences ſcarce fairly deduced. It muſt be confeſſed, that the ſpeculations of the Heathen philoſophers did not fully and undeniably eſtabliſh the doctrine of the immortality of the human ſoul; nor can we preſume to aſſert, in contradiction to Mr Gibbon, that their arguments could impreſs ſuch a conviction of this truth as might influence in a very ſtrong degree the moral ſentiments and conduct. They muſt, however, have produced ſome influence on theſe. Some of the moſt illuſtrious among the Heathen philoſophers appear to have been ſo ſtrongly impreſſed with the belief of the ſoul's immortality, and of a future ſtate of retribution, that their general conduct was conſtantly and in a high degree influenced by that belief. Plato and Socrates are eminent and well known inſtances. And if, in ſuch inſtances as theſe, the belief of theſe truths produced ſuch conſpicuous effects; it might be fairly inferred, though we had no farther evidence, that thoſe characters were far from being ſingular in this reſpect. It is a truth acknowledged as unqueſtionable in the hiſtory of the arts and ſciences, that wherever any one perſon has cultivated theſe with extraordinary ſucceſs, ſome among his contemporaries will always be found to have rivalled his excellence, and a number of them to have been engaged in the ſame purſuits. On this occaſion we may venture, without heſitation, to reaſon upon the ſame principles. When the belief of the immortality of the human ſoul produced ſuch illuſtrious patterns of virtue as a Plato and a Socrates; it muſt certainly have influenced the moral ſentiments and conduct of many others,—although in an inferior degree. We ſpeculate, we doubt, concerning the truth of many doctrines of Chriſtianity; many who profeſs that they believe them, make this profeſſion only becauſe they have never conſidered ſeriouſly whether they be true or falſe. But, notwithſtanding this, theſe truths ſtill exert a powerful influence on the ſentiments and manners of ſociety in general. Thus, alſo, it appears, that the doctrines of ancient philoſophy concerning a future life, and even the notions concerning Olympus, Elyſium, and Tartarus, which made a part of the popular ſuperſtition, *did* produce a certain influence on the ſentiments and manners of the heathens in general. That influence was often indeed inconſiderable, and not always happy; but ſtill it was ſomewhat greater than Mr Gibbon ſeems willing to allow. Chriſtians have been ſometimes at pains to exaggerate the abſurdities of Pagan ſuperſtition, in order that the advantages of Chriſtianity might acquire new value from being contraſted with it. Here we find one who is rather diſpoſed to be the enemy of Chriſtianity, diſplaying, and even exaggerating, thoſe abſurdities for a very different purpoſe. But the truth may be ſafely admitted: it is only when exaggerated that it can ſerve any purpoſe inimical to the ſacred authority of our holy religion. Mr Gibbon certainly repreſents the religious doctrine of the ancient Gauls, in reſpect to the immortality of the human ſoul and a future ſtate, in too favourable a light. It is only becauſe the whole ſyſtem of ſuperſtition which prevailed among thoſe barbarians is ſo imperfectly known, that it has been imagined to conſiſt of more ſublime doctrines than thoſe of the popular ſuperſtition of the Greeks and Romans. The evidence which Mr Gibbon adduces in proof of what he aſſerts concerning theſe opinions of the ancient Gauls, is partial, and far from ſatisfactory. They *did* indeed aſſert and believe the ſoul to be immortal; but this doctrine was blended among a number of abſurdities much groſſer than thoſe which characteriſe the popular religion of the Greeks and Romans. The latter was the ſuperſtition of a civilized people, among whom reaſon was unfolded and improved by cultivation, and whoſe manners were poliſhed and liberal; the former was that of barbarians, among whom reaſon was, as it were, in its infancy, and who were ſtrangers to the improvements of civilization. When haſty obſervers found that thoſe barbarians were not abſolutely ſtrangers to the idea of immortality, they were moved to undue admiration; their ſurpriſe at finding what they had not expected, confounded their underſtanding, and led them to miſconceive and miſrepreſent. What we ought to aſcribe to the ſavage ferocity of the character of theſe rude tribes, has been attributed by miſtake to the influence of their belief of a future ſtate.

In the law of Moſes, it muſt be allowed, that this doctrine is not particularly explained nor earneſtly inculcated. The author of the Divine Legation of Moſes, &c. has founded upon this fact an ingenious theory, which we ſhall elſewhere have occaſion to examine. The reaſons why this doctrine was not more fully explained to the Jews, we cannot pretend to aſſign, at leaſt in this place; yet we cannot help thinking, that it was more generally known among the Jews than Mr Gibbon and the author of the Divine Legation are willing to allow. Though it be not ſtrongly inculcated in their *code of laws*, yet there is ſome reaſon to think that it was known and generally prevalent among them long before the Babyloniſh captivity; even in different paſſages in the writings of Moſes, it is mentioned or alluded to in an unequivocal manner. In the hiſtory of the patriarchs, it appears that this doctrine was known to *them;* it appears to have had a ſtrong influence on the mind of Moſes himſelf. Was David, was Soloman, a ſtranger to this doctrine? We cannot here deſcend to very minute particulars; but ſurely all the efforts of ingenuity muſt be inſufficient to torture the ſacred ſcriptures of the Old Teſtament, ſo as to prove that they contain nothing concerning the doctrine of a future ſtate any where but in the writings of the latter prophets, and that even in theſe it is only darkly inſinuated. Were the Jews, in the earlier part of their hiſtory, ſo totally ſecluded from all intercourſe with other nations, that a doctrine of ſo much importance, more or leſs known to all around, could not be communicated to them? The Phariſees *did* admit traditions, and ſet upon them an undue value; yet they appear to have been conſidered as the moſt orthodox of the different ſects which prevailed among the Jews: the Sadducees were rather regarded as innovators.

But though we are of opinion, that this ingenious writer allows to the doctrine of the Greek and Roman philoſophers, concerning the immortality of the human ſoul, as well as to the notions concerning a future ſtate which made a part of the popular ſuperſtitions of thoſe nations, leſs influence on the moral ſentiments and conduct of mankind than what they really exerted; though we cannot agree with him in allowing the ideas of the immortality of the ſoul and of a future ſtate, which were entertained by the Gauls and ſome other rude nations, to have been much ſuperior in their nature, or much happier in their influence, than thoſe of the Greeks and Romans; and though, in conſequence of reading the Old teſtament, we are diſpoſed to think that the Jews knew ſomewhat more concerning the immortality of the human ſoul, and concerning the future ſtate in which human beings are diſtined to exiſt, than Mr Gibbon repreſents them to have known; yet ſtill we are very ſenſible, and very well pleaſed to admit, that "life and immortality were brought to light through the goſpel."

The doctrine of a future life, as it was preached by the firſt Chriſtians, was eſtabliſhed on a more ſolid baſis than that on which it had been before maintained; was freed from every abſurdity; and was, in ſhort, ſo much improved, that its influence, which, as it was explained by Heathen poets and philoſophers, muſt be confeſſed to have been in many inſtances doubtful, now became favourable only to the intereſts of piety and virtue, and to them in a very high degree. It undoubtedly contributed to the ſucceſsful propagation of Chriſtianity; for it was calculated to attract and pleaſe both the ſpeculating philoſopher and the ſimple unenlightened votary of the vulgar ſuperſtition. The views which it exhibited were diſtinct; and all was plauſible and rational, and demonſtrated by the fulleſt evidence. But the happineſs which it promiſed was of a leſs ſenſual nature than the enjoyments which the Heathens expected on Olympus or in Elyſium; and would therefore appear leſs alluring to thoſe who were not very capable of refined ideas, or preferred the gratification of the ſenſes in the preſent life to every other ſpecies of good. If the firſt Chriſtians rejoiced in the hope of beholding all the votaries of Pagan idolatry afflicted with the torments of hell in a future ſtate, and boaſted of theſe hopes with inhuman exultation, they would in all probability rather irritate than alarm thoſe whom they ſought to convert from that ſuperſtition: the Heathens would be moved to regard with indignant ſcorn the preacher who pretended, that thoſe whom they venerated as gods, heroes, and wiſe men, were condemned to a ſtate of unſpeakable and laſting torment. Would not every feeling of the heart revolt againſt the idea, that a parent, a child, a huſband, a wife, a friend, a lover, or a miſtreſs, but lately loſt, and ſtill lamented, was conſigned to eternal torments for actions and opinions which they had deemed highly agreeable to ſuperior powers?

We may conclude, then, with reſpect to the influence of this ſecondary cauſe in promoting the propagation of Chriſtianity, that the circumſtances of the Heathen world was leſs favourable to that influence than Mr Gibbon pretends; that the means by which he repreſents the primitive Chriſtians, as improving its efficacy, were ſome of them not employed, and others rather likely to weaken than to ſtrengthen it; and that therefore more is attributed to the operation of this cauſe than it could poſſibly produce.

Cauſe III.

The *third cauſe*, the miraculous powers of the primitive church, is with good reaſon repreſented as having conduced very often to the conviction of infidels. Mr Gibbon's reaſonings under this head are, That numerous miraculous works of the moſt extraordinary kind were oſtentatiouſly performed by the firſt Chriſtians: that, however, from the difficulty of fixing the period at which miraculous powers ceaſed to be communicated to the Chriſtian church, and from ſome other circumſtances, there is reaſon to ſuſpect them to have been merely the pretences of impoſture; but this (to uſe a phraſe of his own) is only darkly inſinuated: and laſtly, that the Heathens having been happily prepared to receive them as real by the many wonders nearly of a ſimilar nature to which they were accuſtomed in their former ſuperſtition, the miracles which the firſt Chriſtians employed to give a ſanction to their doctrines, contributed in the moſt effectual manner to the propagation of Chriſtianity.

Obſervations in reply.

In reply to what is here advanced, it may be ſuggeſted, that the miracles recorded in the New Teſtament, as having been performed by the firſt Chriſtians when engaged in propagating their religion, as well as a number of others recorded by the Fathers, are eſtabliſhed as true, upon the moſt indubitable evidence which human teſtimony can afford for any fact. An ingenious Scotch writer *, who was to fond of employing his ingenuity in undermining truths generally received, has endeavoured to prove that no human teſtimony, however ſtrong and unexceptionable, can afford ſufficient evidence of the reality of a miracle. But his reaſonings on this head, which once excited doubt and wonder, have been ſince completely refuted; and mankind ſtill continue to acknowledge, that though we are all liable to miſtakes and capable of deceit, yet human teſtimony *may* afford the moſt convincing evidence of the moſt extraordinary and even ſupernatural facts. The reader will not expect us to enter, in this place, into a particular examination of the miracles of our Saviour, and his apoſtles, and the primitive church. An enquiry into theſe will be a capital object in another part of this work (THEOLOGY). We may here conſider it as an undeniable and a generally acknowledged fact, that a certain part of thoſe miracles were real. Such as were real, undoubtedly contributed, in a very eminent manner, to the propagation of Chriſtianity; but they are not to be ranked among the natural and *ſecondary* cauſes.

It is difficult to diſtinguiſh at what period miraculous gifts ceaſed to be conferred on the members of the primitive church; yet we *may* diſtinguiſh, if we take pains to inquire with minute attention, at what period the evidence ceaſes to be ſatisfactory. We can alſo by conſidering the circumſtances of the church through the ſeveral ſtages of its hiſtory, form ſome judgment concerning the period during which the gifts of propheſying, and ſpeaking with tongues, and working miracles, were moſt neceſſary to Chriſtians to enable them to aſſert the truth and dignity of their religion.

The Heathens were no ſtrangers to pretended miracles and prophecies, and other ſeeming interpoſitions of ſuperior beings, diſturbing the ordinary courſe of nature and of human affairs: but the miracles to which they were familiariſed had been ſo often detected to be tricks of impoſture or pretences of mad enthuſiaſm, that, inſtead of being prepared to witneſs or to receive accounts of new miracles with eaſy credulity, they muſt have been in general diſpoſed to view them with jealouſy and ſuſpicion. Beſides, the miracles to which they had been accuſtomed, and thoſe performed by the apoſtles and the firſt preachers of Chriſtianity, were directly contradictory; and therefore the one could receive no aſſiſtance from the other.

Yet we muſt acknowledge, notwithſtanding what we have above advanced, that as diſagreements with reſpect to the principles and inſtitutions of their religion very early aroſe among Chriſtians; ſo they likewiſe ſought to extend its influence, at a very early period, by the uſe of *pious frauds*. Pious frauds, too, appear to have ſometimes ſerved the immediate purpoſes for which they were employed, though eventually they have been highly injurious to the cauſe of Chriſtianity.

We conclude, then, that Chriſtianity *was* indebted to the influence of miracles in a conſiderable degree for its propagation: but that the real miracles of our Saviour and his apoſtles, &c. were not among the *ſecondary* cauſes of its ſucceſs: that the Heathens who were to be converted were not very happily prepared for receiving the miracles of the goſpel with blind credulity: that, as it is poſſible to diſcern between ſufficient and inſufficient evidence, ſo it is not more difficult to diſtinguiſh between true and falſe miracles: and, laſtly, that falſe miracles were ſoon employed by Chriſtians as engines to ſupport and propagate their religion, and perhaps not unſucceſsfully; but were, upon the whole, more injurious than ſerviceable to the cauſe which they were called in to maintain.

Cauſe IV.

The *fourth of this ſeries of ſecondary cauſes*, which this author thinks to have been adequate to the propagation of Chriſtianity, is the virtues of the primitive Chriſtians. Theſe he is willing to attribute to other and leſs generous motives, rather than to the pure influence of the doctrines and precepts of their religion.

The firſt converts to Chriſtianity were moſt of them from among the loweſt and moſt worthleſs characters. The wiſe, the mighty, and thoſe who were diſtinguiſhed by ſpecious virtues, were in general perfectly ſatisfied with theeir preſent circumſtances and future proſpects. People whoſe minds were naturally weak, unenlightened, or oppreſſed with the ſenſe of atrocious guilt, and who were infamous or outcaſts from ſociety, were eager to graſp at the hopes which the goſpel held out to them.

When, after enliſting under the banner of Chriſt, they began to conſider themſelves as " born again to newneſs of life; remorſe and fear, which eaſily prevail over weak minds; ſelfiſh hopes of regaining their reputation, and attaining to the honours and happineſs of thoſe manſions which Jeſus was ſaid to have gone to

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* Mr *Hume*.

prepare; with a deſire to raiſe the honour and extend the influence of the ſociety of which they were become members; all together operated ſo powerfully as to enable them to diſplay both active and paſſive virtue in a very extraordinary degree. Their virtues did not flow from the pureſt and nobleſt ſource; yet they attracted the notice and moved the admiration of mankind. Of thoſe who admired, ſome were eager to imitate; and, in order to that, thought it neceſſary to adopt the ſame principles of action.

Their virtues too, were rather of that ſpecies which excite wonder, becauſe uncommon, and not of eſſential utility in the ordinary intercourſe of ſociety; than of thoſe which are indiſpenſably neceſſary to the exiſtence of ſocial order, and contribute to the eaſe and convenience of life. Such virtues were well calculated to engage the imitation of thoſe who had failed egregiouſly in the practice of the more ſocial virtues.

Thus they practiſed extraordinary, but uſeleſs and unſocial, virtues, upon no very generous motives; and thoſe virtues drew upon them the eyes of the world, and induced numbers to embrace their faith.

Obſervations, in anſwer.

We muſt, however unwillingly, declare, that this is plainly an uncandid account of the virtues of the primitive Chriſtians, and the motives from which they originated. The ſocial virtues are ſtrongly recommended through the goſpel. No degree of mortification or ſelf-denial, or ſecluſion from the ordinary buſineſs and amuſements of ſocial life, was required of the early converts to Chriſtianity; ſave what was indiſpenſably neceſſary to wean them from the irregular habits in which they had before indulged, and which had rendered them nuiſances in ſociety, and to form them to new habits equally neceſſary to their happineſs and their uſefulneſs in life. We allow that they practiſed virtues which in other circumſtances would, however ſplendid, have been unneceſſary. But in the difficult circumſtances in which the firſt Chriſtians were placed, the virtues which they practiſed were in the higheſt degree ſocial. The moſt prominent feature in their character was, "their continuing to entertain ſentiments of generous benevolence, and to diſcharge ſcrupulouſly all the ſocial duties," towards thoſe who exerciſed neither charity nor humanity, and frequently not even bare integrity and juſtice, in their conduct towards them.

It cannot be ſaid with truth, that ſuch a proportion of the primitive Chriſtian were people whoſe characters had been infamous and their circumſtances deſperate, as that the character of the religion which they embraced can ſuffer from this circumſtance. Nor were they *only* the weak and illiterate whom the apoſtles and their immediate ſucceſſors converted by their preaching. The criminal, to be ſure, rejoiced to hear that he might obtain abſolution of his crimes; the mourner was willing to receive comfort; minds of refined and generous feelings were deeply affected with that goodneſs which had induced the Son of God to ſubmit to ſuffer and die for ſinners: but the ſimplicity, the rationality, and the beauty of the Chriſtian ſyſtem, likewiſe prevailed in numerous inſtances over the pride and prejudices of the great and the wiſe; in ſo many inſtances, as are ſufficient to vindicate the Chriſtian church from the aſperſion by which it has been repreſented, as being in the firſt period of its exiſtence merely a body of *criminals and idiots*.

The principles, too, from which the virtues of the firſt Chriſtians originated, were not peculiarly mean and ſelfiſh; nay, they ſeem to have been uncommonly ſublime and diſintereſted. Remorſe in the guilty mind is a natural and reaſonable ſentiment; the deſire of happineſs in every human breaſt is equally ſo. It is uncandid to cavil againſt the firſt Chriſtians for being, like the reſt of mankind, influenced by theſe ſentiments: And when we behold them overlooking temporary poſſeſſions and enjoyments, extending their views to futurity, and "living by faith;" when we obſerve them "doing good to thoſe who hated them, bleſſing thoſe who curſed them, and praying for thoſe by whom they were deſpitefully uſed;" can we deny their virtues to have been of the moſt generous and diſintereſted kind?

We allow, then, that the virtues of the firſt Chriſtians muſt have contributed to the propagation of their religion: but it is with pain that we obſerve this reſpectable writer ſtudiouſly labouring to miſrepreſent the principles from which thoſe virtues aroſe; and not only the principles from which they aroſe, but alſo their importance in ſociety.

Cauſe V. with obſervations.

The *fifth cauſe* was the mode of church government adopted by the firſt Chriſtians, by which they were knit together in one ſociety; who preferred the church and its intereſts to their country and civil concerns. We wiſh not to deny, that the mutual attachment of the primitive Chriſtians contributed to ſpread the influence of their religion; and the order which they maintained, in conſequence of being animated with this ſpirit of brotherly love, and with ſuch ardent zeal for the glory of God, muſt no doubt have produced no leſs happy effects among them than order and regularity produce on every other occaſion on which they are ſtrictly obſerved. But whether the form of church-government, which was gradually eſtabliſhed in the Chriſtian church, was actually the happieſt that could poſſibly have been adopted; or whether, by eſtabliſhing a diſtinct ſociety, with ſeparate intereſts, within the Roman empire, it contributed to the diſſolution of that mighty fabric, we cannot here pretend to inquire. Theſe are ſubjects of diſcuſſion, with reſpect to which we may with more propriety endeavour to ſatisfy our readers elſewhere.

General concluſion concerning the influence of the five cauſes.

From the whole of this review of what Mr Gibbon has ſo ſpeciouſly advanced concerning the influence of theſe five ſecondary cauſes in the propagation of the goſpel, we think ourſelves warranted to conclude, That the zeal of the firſt Chriſtians was not, as he repreſents it, intolerant: That the doctrine of the immortality of the human ſoul was ſomewhat better underſtood in the heathen world, particularly among the Greeks and Romans and the Jews, than he repreſents it to have been; and had an influence ſomewhat happier than what he aſcribes to it: That the additional circumſtances by which, he tells us, the firſt preachers of Chriſtianity improved the effects of this doctrine, were far from being calculated to allure converts: That the heathens, therefore, were not quite ſo well prepared for an eager reception of this doctrine as he would perſuade us they were; and, of conſequence, could not be influenced by it in ſo conſiderable a degree, in their converſion: That real, unqueſtionable miracles, performed by our Saviour, by his apoſtles, and

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by their ſucceſſors, *did* contribute ſignally to the propagation of Chriſtianity; but are not to be ranked among the *ſecondary* cauſes: That weakneſs and blind zeal did at times employ pretended miracles for the ſame purpoſe not altogether ineffectually: That though theſe deſpicable and wicked means might be in ſome inſtances ſucceſsful; yet they were, upon the whole, much more injurious than beneficial: That the virtues of the primitive Chriſtians aroſe from the moſt generous and noble motives, and were in their nature and tendency highly favourable to ſocial order, and to the comfort of mankind in the ſocial ſtate: And, laſtly, That the order and regularity of church-government, which were gradually eſtabliſhed among the firſt Chriſtians, contributed greatly to maintain the dignity and ſpread the influence of their religion; but do not appear to have disjoined them from their fellow-ſubjects or to have rendered them inimical to the welfare of the ſtate of which they were members.

Upon the whole, then, we do not ſee that theſe ſecondary cauſes were equal to the effects that have been aſcribed to them; and it ſeems undeniable, that others of a ſuperior kind co-operated with them. We earneſtly recommend to the peruſal of the reader a valuable performance of Lord Hailes's, in which he enquires into Mr Gibbon's aſſertions and reaſonings, concerning the influence of theſe five cauſes, with the utmoſt accuracy of information, ſtrength and clearneſs of reaſoning, and elegant ſimplicity of ſtyle, and without virulence or paſſion.

CHRISTIANS, thoſe who profeſs the religion of Chriſt: See CHRISTIANITY and MESSIAH.—The name *Chriſtian* was firſt given at Antioch in the year 42 to ſuch as believed in Chriſt, as we read in the Acts: till that time they were called *diſciples*.

The firſt Chriſtians diſtinguiſhed themſelves in the moſt remarkable manner by their conduct and their virtues. The faithful, whom the preaching of St Peter had converted, hearkened attentively to the exhortations of the Apoſtles, who failed not carefully to inſtruct them, as perſons who were entering upon an entirely new life. They went every day to the temple with one heart and one mind, and continued in prayers; doing nothing different from the other Jews, becauſe it was yet not time to ſeparate from them. But they made a ſtill greater progreſs in virtue; for they ſold all that they poſſeſſed, and diſtributed their goods in proportion to the wants of their brethren. They *eat their meat with gladneſs and ſingleneſs of heart, praiſing God, and having favour with all the people.* St Chryſoſtom, examining from what ſource the eminent virtue of the firſt Chriſtians flowed, aſcribes it principally to their diveſting themſelves of their poſſeſſions; "For (ſays that father) perſons from whom all that they have is taken away, are not ſubject to ſin: whereas, whoever has large poſſeſſions, wants not a devil or a tempter to draw him into hell by a thouſand ways."

The Jews were the firſt and the moſt inveterate enemies the Chriſtians had. They put them to death as often as they had it in their power: and when they revolted againſt the Romans in the time of the emperor Adrian, Barchochebas, the head of that revolt, employed againſt the Chriſtians the moſt rigorous puniſhments to compel them to blaſpheme and renounce Jeſus Chriſt. And we find that, even in the third century, they endeavoured to get into their hands Chriſtian women, in order to ſcourge and ſtone them in their ſynagogues. They curſed the Chriſtians ſolemnly three times a-day in their ſynagogues, and their rabbins would not ſuffer them to converſe with Chriſtians upon any occaſion. Nor were they contented to hate and deteſt them; but they diſpatched emiſſaries all over the world to defame the Chriſtians, and ſpread all ſorts of calumnies againſt them. They accuſed them, among other things, of worſhipping the ſun and the head of an aſs. They reproached them with idleneſs, and being an uſeleſs race of people. They charged them with treaſon, and endeavouring to erect a new monarchy againſt that of the Romans. They affirmed, that, in celebrating their myſteries, they uſed to kill a child and eat its fleſh. They accuſed them of the moſt ſhocking inceſts, and of intemperance in their feaſts of charity. But the lives and behaviour of the firſt Chriſtians were ſufficient to refute all that was ſaid againſt them, and evidently demonſtrated that theſe accuſations were mere calumny and the effect of inveterate malice.

Pliny the younger, who was governor of Pontus and Bithynia between the years 103 and 105, gives a very particular account of the Chriſtians in that province, in a letter which he wrote to the emperor Trajan, of which the following is an extract: "I take the liberty, Sir, to give you an account of every difficulty which ariſes to me. I have never been preſent at the examination of the Chriſtians; for which reaſon I know not what queſtions have been put to them, nor in what manner they have been puniſhed. My behaviour towards thoſe who have been accuſed to me has been this: I have interrogated them, in order to know whether they were really Chriſtians. When they have confeſſed it, I have repeated the ſame queſtion two or three times, threatening them with death if they did not renounce this religion. Thoſe who have perſiſted in their confeſſion, have been, by my order, led to puniſhment. I have even met with ſome Roman citizens guilty of this phrenſy, whom, in regard to their quality, I have ſet apart from the reſt, in order to ſend them to Rome. Theſe perſons declare, that their whole crime, if they are guilty, conſiſts in this; that, on certain days, they aſſemble before ſun-riſe, to ſing alternately the praiſes of Chriſt, as of a God, and to oblige themſelves, by the performance of their religious rites, not to be guilty of theft, or adultery, to obſerve inviolably their word, and to be true to their truſt. This depoſition has obliged me to endeavour to inform myſelf ſtill farther of this matter, by putting to the torture two of their women-ſervants, whom they call *deaconeſſes*: but I could learn nothing more from them, than that the ſuperſtition of theſe people is as ridiculous as their attachment to it is aſtoniſhing."

There is extant a juſtification, or rather panegyric, of the Chriſtians, pronounced by the mouth of a Pagan prince. It is a letter of the emperor Antoninus, written in the year 152, in anſwer to the States of Aſia, who had accuſed the Chriſtians of being the cauſe of ſome earthquakes which had happened in that part of the world. The emperor adviſes them to "take care, leſt, in torturing and puniſhing thoſe whom they accuſed of Atheiſm (meaning the Chriſtians), they ſhould render them more obſtinate, inſtead of prevailing upon them to change their opinion; ſince their religion taught them to ſuffer with pleaſure for the ſake of God." As to the earthquakes which had happened, he puts them in mind," that they themſelves are always diſcouraged, and ſink under ſuch misfortunes; whereas the Chriſtians never diſcovered more cheerfulneſs and confidence in God than upon ſuch occaſions." He tells them, that "they pay no regard to religion, neglect the worſhip of the Eternal; and, becauſe the Chriſtians honour and adore Him, therefore they are jealous of them, and perſecute them even to death." He concludes: "Many of the governors of provinces have formerly written to my father concerning them; and his anſwer always was, that they ſhould not be moleſted or diſturbed, provided they quietly ſubmitted to the authority of the government. Many perſons have likewiſe conſulted me upon this affair, and I have returned the ſame anſwer to them all; namely, that if any one accuſes a Chriſtian merely on account of his religion, the accuſed perſon ſhall be acquitted, and the accuſer himſelf puniſhed." This ordinance, according to Euſebius, was publicly fixed up at Epheſus in an aſſembly of the ſtates.

It is no difficult matter to diſcover the cauſes of the many perſecutions, to which the Chriſtians were expoſed during the three firſt centuries. The purity of the Chriſtian morality, directly oppoſite to the corruption of the Pagans, was doubtleſs one of the moſt powerful motives of the public averſion. To this may be added, the many calumnies unjuſtly ſpread about concerning them by their enemies, particularly the Jews. And this occaſioned ſo ſtrong a prejudice againſt them, that the Pagans condemned them without inquiring into their doctrine, or permitting them to defend themſelves. Beſides, their worſhipping Jeſus Chriſt, as God, was contrary to one of the moſt ancient laws of the Roman empire, which expreſsly forbad the acknowledging of any God which had not been approved by the ſenate.

But notwithſtanding the violent oppoſition made to the eſtabliſhment of the Chriſtian religion, it gained ground daily, and very ſoon made a ſurpriſing progreſs in the Roman empire. In the third century, there were Chriſtians in the camp, in the ſenate, in the palace; in ſhort every where, but in the temples and the theatres: they filled the towns, the country, the iſlands. Men and women, of all ages and conditions, and even thoſe of the firſt dignities, embraced the faith; inſomuch that the Pagans complained that the revenues of their temples were ruined. They were in ſuch great numbers in the empire, that (as Tertullian expreſſes it) were they to have retired into another country, they would have left the Romans only a frightful ſolitude.

The primitive Chriſtians were not only remarkable for the practice of every virtue; they were alſo very eminently diſtinguiſhed by the many miraculous gifts and graces beſtowed by God upon them. "Some of the Chriſtians (ſays Irenæus) drive out devils, not in appearance only, but ſo as that they never return; whence it often happens, that thoſe who are diſpoſſeſſed of evil ſpirits embrace the faith and are received into the church. Others know what is to come, ſee viſions, and deliver oracles as prophets. Others heal the ſick by laying their hands on them, and reſtore them to perfect health: and we find ſome who even raiſe the dead.——It is impoſſible to reckon up the gifts and graces which the church has received from God—what they have freely received they as freely beſtow. They obtain theſe gifts by prayer alone, and invocation, of the name of Jeſus Chriſt, without any mixture of enchantment or ſuperſtition."

We ſhall here ſubjoin the remarkable ſtory, atteſted by Pagan authors themſelves, concerning the *Chriſtian Legion* in the army of the emperor Marcus Aurelius. That prince having led his forces againſt the Quadi, a people on the other ſide of the Danube, was ſurrounded and hemmed in by the enemy in a diſadvantageous place, and where they could find no water. The Romans were greatly embarraſſed, and, being preſſed by the enemy, were obliged to continue under arms, expoſed to the violent heat of the ſun, and almoſt dead with thirſt; when, on a ſudden, the clouds gathered, and the rain fell in great abundance. The ſoldiers received the water in their bucklers and helmets, and ſatisfied both their own thirſt and that of their horſes. The enemy, preſently after, attacked them; and ſo great was the advantage they had over them, that the Romans muſt have been overthrown, had not heaven again interpoſed by a violent ſtorm of hail, mixed with lightning, which fell on the enemy, and obliged them to retreat. It was found afterwards, that one of the legions, which conſiſted of Chriſtians, had by their prayers, which they offered up on their knees before the battle, obtained this favour from heaven: and from this event that legion was ſirnamed *The thundering Legion*. See, however, the criticiſm of Mr *Moyle* on this ſtory in his *Works*, vol. ii. p. 81—390. See alſo *Moſheim's Church Hiſtory*, vol. i. p. 124.

Such were the primitive Chriſtians, whoſe religion has by degrees ſpread itſelf over all parts of the world, though not with equal purity in all. And though, by the providence of God, Mahometans and Idolaters have been ſuffered to poſſeſs themſelves of thoſe places in Greece, Aſia, and Africa, where the Chriſtian religion formerly moſt flouriſhed; yet there are ſtill ſuch remains of the Chriſtian religion among them as to give them opportunity ſufficient to be converted. For, in the dominions of the Turk in Europe, the Chriſtians make two third parts at leaſt of the inhabitants: and in Conſtantinople itſelf there are above twenty Chriſtian churches, and above thirty in Theſſalonica. Philadelphia, now called *Ala-ſhahir*, has no fewer than twelve Chriſtian churches. The whole iſland of Chio is governed by Chriſtians; and ſome iſlands of the Archipelago are inhabited by Chriſtians only. In Africa, beſides the Chriſtians living in Egypt, and in the kingdom of Congo and Angola, the iſlands upon the weſtern coaſts are inhabited by Chriſtians; and the vaſt kingdom of Abyſſinia, ſuppoſed to be as big as Germany, France, Spain, and Italy, put together, is poſſeſſed by Chriſtians. In Aſia, moſt part of the empire of Ruſſia, the countries of Circaſſia and Mingrelia, Georgia, and Mount Libanus, are inhabited only by Chriſtians. In America, it is notorious that the Chriſtians are very numerous, and ſpread over moſt parts of that vaſt continent.

Christians of St John, a ſect of Chriſtians very numerous in Balſara and the neighbouring towns: they formerly inhabited along the river Jordan, where St John baptized, and it was from thence they had their name. They hold an anniverſary feaſt of five days; during which they all go to the biſhop, who baptizes them with the baptiſm of St John. Their baptiſm is alſo performed in rivers, and that only on Sundays: they have no notion of the third Perſon in the Trinity; nor have they any canonical books, but abundance full of charms, &c. Their biſhoprics deſcend by inheritance, as our eſtates do, though they have the ceremony of an election.

Christians of St Thomas, a ſort of Chriſtians in a peninſula of India on this ſide of the Gulf: they inhabit chiefly at Cranganor, and the neighbouring country: theſe admit of no images; and receive only the croſs, to which they pay a great veneration: they affirm, that the ſouls of the ſaints do not ſee God till after the day of judgement: they acknowledge but three ſacraments, *viz.* baptiſm, orders, and the euchariſt: they make no uſe of holy oils in the adminiſtration of baptiſm; but, after the ceremony, anoint the infant with an unction compoſed of oil and walnuts, without any benediction. In the euchariſt, they conſecrate with little cakes made of oil and ſalt, and inſtead of wine make uſe of water in which raiſins have been infuſed.

CHRISTIANA, a town of Norway, in the province of Aggerhuys, ſituated on a bay of the ſea. E. Long. 10. 15. N. Lat. 59. 30.

CHRISTIANOPLE, a port-town of Sweden, ſituated on the Baltic Sea, in the territory of Blecking, and province of South Gothland. E. Long. 15. 40 N. Lat. 57°.

CHRISTIANSTADT, a ſtrong fortified town of Sweden; ſituated in the territory of Blecking and province of South Gothland. It was built in 1614 by Chriſtian IV. king of Denmark, when this province belonged to the Danes; and finally ceded to the Swedes by the peace of Roſkild in 1658. The town is ſmall but neatly built, and is eſteemed the ſtrongeſt fortreſs in Sweden. The houſes are all of brick, and moſtly ſtuccoed white. It ſtands in a marſhy plain cloſe to the river Helge-a, which flows into the Baltic at Ahus about the diſtance of 20 miles, and is navigable only for ſmall craft of ſeven tons burden. Engliſh veſſels annually reſort to this port for alum, pitch, and tar. The inhabitants have manufactures of cloth and ſilken ſtuffs, and carry an a ſmall degree of commerce. E. Long. 14. 40. N Lat. 56. 30.

CHRISTINA, daughter of Guſtavus Adolphus king of Sweden, born in in 1626; and ſucceeded to the crown in 1633, when only ſeven years of age. This princeſs diſcovered even in her infancy, what ſhe afterwards expreſſed in her memoirs, an invincible antipathy for the employments and converſation of women; and ſhe had the natural aukwardneſs of a man with reſpect to all the little works which generally fall to their ſhare. She was on the contrary, fond of violent exerciſes, and ſuch amuſements as conſiſt in feats of ſtrength and activity. She had alſo both ability and taſte for abſtracted ſpeculations; and amuſed herſelf with language and the ſciences, particularly that of legiſlature and government. She derived her knowledge of ancient hiſtory from its ſource: and Polybius and Thucydides were her favourite authors. As ſhe was the ſovereign of a powerful kingdom, it is not ſtrange that almoſt all the princes in Europe aſpired to her bed. Among others, were the Prince of Denmark, the Elector Palatine, the Elector of Brandenburg, the King of Spain, the king of the Romans, Don John of Auſtria; Sigiſmund of Rockocci, count and general of Caſſovia; Staniſlaus king of Poland; John Caſſimir his brother; and Charles Guſtavus duke of Deux Ponts, of the Bavarian Palatinate family, ſon of her father the great Guſtavus's ſiſter, and conſequently her firſt couſin. To this nobleman, as well as to all his competitors, ſhe conſtantly refuſed her hand; but ſhe cauſed him to be appointed her ſucceſſor by the ſtates. Political intereſts, differences of religion, and contrariety of manners, furniſhed Chriſtina with pretences for rejecting all her ſuitors; but her true motives were the love of independence, and a ſtrong averſion ſhe had conceived, even in her infancy, from the marriage yoke. "Do not force me to marry (ſaid ſhe to the ſtates); for if I ſhould have a ſon, it is not more probable that he ſhould be an Auguſtus than a Nero."

An accident happened in the beginning of her reign which gave her a remarkable opportunity of diſplaying the ſtrength and equanimity of her mind. As ſhe was at the chapel of the caſtle of Stockholm, aſſiſting at divine ſervice with the principal lords of her court, a poor wretch, who was diſordered in his mind, came to the place with a deſign to aſſaſſinate her. This man, who was preceptor of the college, and in the full vigour of his age, choſe, for the execution of his deſign, the moment in which the aſſembly was performing what in the Swediſh church is called an *act of recollection*; a ſilent and ſeparate act of devotion, performed by each individual kneeling and hiding the face with the hand. Taking this opportunity; he ruſhed through the crowd, and mounted a balluſtrade within which the queen was upon her knees. The Baron Braki, chief juſtice of Sweden, was alarmed, and cried out; and the guards croſſed their partiſans, to prevent his coming further: but he ſtruck them furiouſly on one ſide; leaped over the barrier; and, being then cloſe to the queen, made a blow at her with a knife which he had concealed without a ſheath in his ſleeve. The queen avoided the blow, and puſhed the captain of her guards, who inſtantly threw himſelf upon the aſſaſſin, and ſeized him by the hair. All this happened in leſs than a moment of time. The man was known to be mad, and therefore nobody ſuppoſed he had any accomplices: they therefore contented themſelves with locking him up; and the queen returned to her devotion without the leaſt emotion that could be perceived by the people, who were much more frightened than herſelf.

One of the great affairs that employed Chriſtina while ſhe was upon the throne, was the peace of Weſtphalia, in which many claſhing intereſts were to be reconciled, and many claims to be aſcertained. It was concluded in the month of October 1648. The ſucceſs of the Swediſh arms rendered Chriſtina the arbitreſs of this treaty; at leaſt as to the affairs of Sweden, to which this peace confirmed the poſſeſſion of many important countries. No public event of importance took place during the reſt of Chriſtina's reign; for there were neither wars abroad, nor troubles at home. This quiet might be the effect of chance; but it might alſo be the effect of a good adminiſtration,

miniſtration, and the great reputation of the queen; and the love her people had for her ought to lead us to this determination. Her reign was that of learning and genius. She drew about her, wherever ſhe was, all the diſtinguiſhed characters of her time: Grotius, Paſcal, Bochart, Deſcartes, Gaſſendi, Saumaiſe, Naude, Voſſius, Heinſius, Meibom, Scudery, Menage, Lucas, Holſtenius, Lambecius, Bayle, madam Dacier, Filicaia, and many others. The arts never fail to immortalize the prince who protects them; and almoſt all theſe illuſtrious perſons have celebrated Chriſtina, either in poems, letters, or literary productions of ſome other kind, the greater part of which are now forgotten. They form, however, a general cry of praiſe, and a maſs of teſtimonials which may be conſidered as a ſolid baſis of reputation. Chriſtina, however, may be juſtly reproached with want of taſte, in not properly aſſigning the rank of all theſe perſons, whoſe merits, though acknowledged, were yet unequal; particularly for not having been ſufficiently ſenſible of the ſuperiority of Deſcartes, whom ſhe diſguſted, and at laſt wholly neglected. The rapid fortune which the adventurer Michon, known by the name of *Bourdelot*, acquired by her countenance and liberality, was alſo a great ſcandal to literature. He had no pretenſions to learning; and though ſprightly, was yet indecent. He was brought to court by the learned Saumaiſe; and, for a time drove literary merit entirely out of it, making learning the object of his ridicule, and exacting from Chriſtina an exorbitant tribute to the weakneſs and inconſtancy of her ſex; for even Chriſtina, with reſpect to this man, ſhowed herſelf to be weak and inconſtant. At laſt ſhe was compelled, by the public indignation, to baniſh this unworthy minion; and he was no ſooner gone, than her regard for him was at an end. She was aſhamed of the favour ſhe had ſhown him; and in a ſhort time, thought of him with hatred or contempt. This Bourdelot, during his aſcendency over the queen, had ſupplanted count Magnus de la Gardie, ſon of the conſtable of Sweden, who was a relation, a favourite, and perhaps the lover of Chriſtina. M. de Motteville, who had ſeen him ambaſſador in France, ſays, in his memoirs, that he ſpoke of his queen in terms ſo paſſionate and reſpectful, that every one concluded his attachment to her to be more ardent and tender, than a mere ſenſe of duty can produce. This nobleman fell into diſgrace becauſe he ſhowed an inclination to govern; while M. Bourdelot ſeemed to aim at nothing more than to amuſe; and concealed, under the unſuſpected character of a droll, the real aſcendency which he exerciſed over the queen's mind.

About this time, an accident happened to Chriſtina which brought her into ſtill greater danger, than that which has been related already. Having given orders for ſome ſhips of war to be built at the port of Stockholm, ſhe went to ſee them when they were finiſhed; and as ſhe was going on board of them, croſs a narrow plank, with admiral Fleming, his foot ſlipping, he fell, and drew the queen with him into the ſea, which in that place was near 90 feet deep. Anthony Steinberg, the queen's firſt equerry, inſtantly threw himſelf into the water, laid hold of her robe, and, with ſuch aſſiſtance as was given him, got the queen aſhore: during this accident, her recollection was ſuch, that the moment her lips were above water, ſhe cried, out, "Take care of the Admiral." When ſhe was got out of the water, ſhe diſcovered no emotion either by her geſture or countenance; and ſhe dined the ſame day in public, where ſhe gave a humorous account of her adventure.

But, though at firſt ſhe was fond of the power and ſplendor of royalty, yet ſhe began at length to feel that it embarraſſed her; and the ſame love of independence and liberty which had determined her againſt marriage, at laſt made her weary of her crown. As, after her firſt diſguſt, it grew more and more irkſome to her, ſhe reſolved to abdicate; and, in 1652, communicated her reſolution to the ſenate. The ſenate zealouſly remonſtrated againſt it; and was joined by the people; and even by Charles Guſtavus himſelf, who was to ſucceed her: ſhe yielded to their importunities, and continued to ſacrifice her own pleaſure to the will of the public till the year 1654, and then ſhe carried her deſign into execution. It appears by one of her letters to M. Canut, in whom ſhe put great confidence, that ſhe had meditated this project for more than eight years; and that ſhe had communicated it to him five years before it took place.

The ceremony of her abdication was a mournful ſolemnity, a mixture of pomp and ſadneſs, in which ſcarce any eyes but her own were dry. She continued firm and compoſed through the whole; and, as ſoon as it was over, prepared to remove into a country more favourable to ſcience than Sweden was. Concerning the merit of this action, the world has always been divided in opinion; it has been condemned alike both by the ignorant and the learned, the trifler and the ſage. It was admired, however, by the great Condé: "How great was the magnanimity of this princeſs (ſaid he), who could ſo eaſily give up that for which the reſt of mankind are continually deſtroying each other, and which ſo many throughout their whole lives, purſue without attaining!" It appears by the works of St Evermond, that the abdication of Chriſtina was at that time the univerſal topic of ſpeculation and debate in France. Chriſtina, beſides abdicating her crown, abjured her religion: but this act was univerſally approved by one party and cenſured by another; the Papiſts triumphed, and the Proteſtants were offended. No prince, after a long impriſonment, ever ſhowed ſo much joy upon being reſtored to his kingdom, as Chriſtina did in quitting hers. When ſhe came to a little brook, which ſeparates Sweden from Denmark, ſhe got out of her carriage; and leaping to the other ſide, cried out in a tranſport of joy, "At laſt I am free, and out of Sweden, whither I hope I ſhall never return." She diſmiſſed her women, and laid by the habit of her ſex: "I would become a man (ſaid ſhe); yet I do not love men becauſe they are men, but becauſe they are not women." She made her abjuration at Bruſſels; where ſhe ſaw the great Condé, who, after his defection, made that city his aſylum. "Couſin (ſaid ſhe), who would have thought ten years ago, that we ſhould have met at this diſtance from our countries?"

The inconſtancy of Chriſtina's temper appeared in her going continually from place to place: from Bruſſels ſhe went to Rome; from Rome to France, and from France ſhe returned to Rome again; after this ſhe went to Sweden, where ſhe was not very well received; from Sweden ſhe went to Hamburgh, where ſhe continued a year, and then went again to Rome; from Rome ſhe returned to Hamburgh; and again to Sweden, where ſhe was ſtill worſe received than before; upon which ſhe went back to Hamburgh, and from Hamburgh again to Rome. She intended another journey to Sweden; but it did not take place, any more than an expedition to England, where Cromwell did not ſeem well diſpoſed to receive her; and after many wanderings, and many purpoſes of wandering ſtill more, ſhe at laſt died at Rome in 1689.

It muſt be acknowledged, that her journeys to Sweden had a motive of neceſſity; for her appointments were very ill paid, though the ſtates often confirmed them after her abdication: but to other places ſhe was led merely by a roving diſpoſition; and, what is more to her diſcredit, ſhe always diſturbed the quiet of every place ſhe came into, by exacting greater deference to her rank as queen than ſhe had a right to expect, by her total non-conformity to the cuſtoms of the place, and by continually exciting and fomenting intrigues of ſtate. She was indeed always too buſy, even when ſhe was upon the throne; for there was no event in Europe in which ſhe was not ambitious of acting a principal part. During the troubles in France by the faction called the *Fronde*, ſhe wrote with great eagerneſs to all the intereſted parties, officiouſly offering her mediation to reconcile their intereſts, and calm their paſſions, the ſecret ſprings of which it was impoſſible ſhe ſhould know. This was firſt thought a dangerous, and afterwards a ridiculous, behaviour. During her reſidence in France ſhe gave univerſal diſguſt, not only by violating all the cuſtoms of the country, but by practiſing others directly oppoſite. She treated the ladies of the court with the greateſt rudeneſs and contempt: when they came to embrace her, ſhe, being in man's habit, cried out, "What a ſtrange eagerneſs have theſe women to kiſs me! is it becauſe I look like a man?"

But though ſhe ridiculed the manners of the French court, ſhe was very ſolicitous to enter into its intrigues. Louis XIV. then very young, was enamoured of Mademoiſelle de Mancini niece to Cardinal Mazarine; Chriſtina flattered their paſſion, and offered her ſervice. "I would fain be your confident (ſaid ſhe); if you love, you muſt marry."

The murder of Monaldeſchi is, to this hour, an inſcrutable myſtery. It is, however, of a piece with the expreſſions conſtantly uſed by Chriſtina in her letters, with reſpect to thoſe with whom ſhe was offended; for ſhe ſcarce ever ſignified her diſpleaſure without threatening the life of the offender. "If you fail in your duty, (ſaid ſhe to her ſecretary, whom ſhe ſent to Stockholm after her abdication), not all the power of the king of Sweden ſhall ſave your life, though you ſhould take ſhelter in his arms." A muſician having quitted her ſervice for that of the duke of Savoy, ſhe was ſo tranſported with rage as to diſgrace herſelf by theſe words, in a letter written with her own hand: "He lives only for me; and if he does not ſing for me, he ſhall not long ſing for any body."

Bayle was alſo threatened for having ſaid that the letter which Chriſtina wrote, upon the revocation of the edict of Nantes, was "a remain of Proteſtantiſm;" but he made his peace by apologies and ſubmiſſion. See the article Bayle.

Upon the whole, ſhe appears to have been an uncommon mixture of faults and great qualities; which, however it might excite fear and reſpect, was by no means amiable. She had wit, taſte, parts, and learning: ſhe was indefatigable upon the throne; great in private life; firm in misfortunes; impatient of contradiction; and, except in her love of letters, inconſtant in her inclinations. The moſt remarkable inſtance of this fickleneſs is, That after ſhe had abdicated the crown of Sweden, ſhe intrigued for that of Poland. She was, in every action and purſuit, violent and ardent in the higheſt degree; impetuous in her deſires, dreadful in her reſentment, and fickle in her conduct.

She ſays of herſelf, "that ſhe was miſtruſtful, ambitious, paſſionate, haughty, impatient, contemptuous, ſatyrical, incredulous, undevout, of an ardent and violent temper, and extremely amorous;" a diſpoſition, however, to which, if ſhe may be believed, her pride and her virtue were always ſuperior. In general, her failings were thoſe of her ſex, and her virtues the virtues of ours.

Santa-Christina, one of the Marquesas *Iſlands*.

CHRISTMAS-day, a feſtival of the Chriſtian church; obſerved on the 25th of December, in memory of the *nativity* or birth of Jeſus Chriſt. As to the antiquity of this feſtival, the firſt footſteps we find of it are in the ſecond century, about the time of the emperor Commodus. The decretal epiſtles indeed carry it up a little higher; and ſay that Teleſphorus, who lived in the reign of Antoninus Pius, ordered divine ſervice to be celebrated, and an angelical hymn to be ſung, the night before the nativity of our Saviour. However, that it was kept before the times of Conſtantine we have a melancholy proof: for whilſt the perſecution raged under Diocleſian, who then kept his court at Nicomedia, that prince, among other acts of cruelty, finding multitudes of Chriſtians aſſembled together to celebrate Chriſt's nativity, commanded the church-doors where they were met to be ſhut, and fire to be put to it, which, in a ſhort time, reduced them and it to aſhes.

CHRISTOPHER'S, St. one of the Caribbee Iſlands, in America, lying to the north-weſt of Nevis, and about 60 miles weſt of Antigua. It was formerly inhabited by the French and Engliſh; but, in 1713, it was ceded entirely to the latter. In 1782, it was taken by the French, but reſtored to Britain at the peace. It is about 20 miles in breadth and ſeven in length; and has high mountains in the middle, whence rivulets run down. Between the mountains are dreadful rocks, horrid precipices, and thick woods; and in the ſouth-weſt part of the iſland, hot ſulphureous ſprings at the foot of them. The air is good; the ſoil, light, ſandy, and fruitful; but the iſland is ſubject to hurricanes. The produce is chiefly ſugar, cotton, ginger, indigo, and the tropical fruits. W. Long. 62. 32. N. Lat. 17. 30.

CHROASTACES, in natural hiſtory, a genus of pellucid gems, comprehending all thoſe of variable colours, as viewed in different lights; of which kinds are the *opal* and the *aſteria* or *oculus cati*. See OPAL and ASTERIA.

CHROMATIC, a kind of muſic which proceeds by ſeveral ſemitones in ſucceſſion. The word is derived from the Greek χρωμα, which ſignifies *colour*. For this denomination ſeveral cauſes are aſſigned, of which none appear certain, and all equally unſatisfactory. Inſtead, therefore, of fixing upon any, we ſhall offer a conjecture of our own; which, however, we do not impoſe upon the reader as more worthy of his attention than any of the former. Χρωμα may perhaps not only ſignify a *colour*, but that ſhade of a colour by which it melts into another, or what the French call *nuance*. If this interpretation be admitted, it will be highly applicable to ſemitones; which being the ſmalleſt interval allowed in the diatonic ſcale, will moſt eaſily run one into another. To find the reaſons aſſigned by the ancients for this denomination, and their various diviſions of the chromatic ſpecies, the reader may have recourſe to the ſame article in Roſſeau's Muſical Dictionary. At preſent, that ſpecies conſiſts in giving ſuch a procedure to the fundamental baſs, that the parts in the harmony, or at leaſt ſome of them may proceed by ſemitones, as well in riſing as deſcending; which is moſt frequently found in the minor mode, from the alterations to which the ſixth and ſeventh note are ſubjected, by the nature of the mode itſelf.

The ſucceſſive ſemitones uſed in the *chromatic* ſpecies are rarely of the ſame kind; but alternately major and minor, that is to ſay, *chromatic* and *diatonic:* for the interval of a minor tone contains a major or chromatic ſemitone, and another which is major or diatonic; a meaſure which temperament renders common to all tones: ſo that we cannot proceed by two minor ſemitones which are conjunctive in ſucceſſion, without entering into the enharmonic ſpecies; but two major ſemitones twice follow each other in the *chromatic* order of the ſcale.

The moſt certain procedure of the fundamental baſs to generate the chromatic elements in aſcent, is alternately to deſcend by thirds, and riſe by fourths, whilſt all the chords carry the third major. If the fundamental baſs proceeds from dominant to dominant by perfect cadences avoided, it produces the *chromatic* in deſcending. To produce both at once, you interweave the perfect and broken cadences, but at the ſame time avoid them.

As at every note in the *chromatic* ſpecies one muſt change the tone, that ſucceſſion ought to be regulated and limited for fear of deviation. For this purpoſe, it will be proper to recollect, that the ſpace moſt ſuitable to *chromatic* movements, is between the extremes of the dominant and the tonic in aſcending, and between the tonic and the dominant in deſcending. In the major mode, one may alſo chromatically deſcend from the dominant upon the ſecond note. This tranſition is very common in Italy; and, notwithſtanding its beauty, begins to be a little too common amongſt us.

The chromatic ſpecies is admirably fitted to expreſs grief and affliction: theſe ſounds boldly ſtruck in aſcending tear the ſoul. Their power is no leſs magical in deſcending; it is then that the ear ſeems to be pierced with real groans. Attended with its proper harmony, this ſpecies appears proper to expreſs every thing: but its completion, by concealing the melody, ſacrifices a part of its expreſſion: and for this diſadvantage, ariſing from the fullneſs of the harmony, it can only be compenſated by the nature and genius of the movement. We may add, that in proportion to the energy of this ſpecies, the compoſer ought to uſe it with greater caution and parſimony. Like thoſe delicate viands, which when profuſely adminiſtered, immediately ſurfeit us with their abundance: as much as they delight us when enjoyed with temperance, ſo much do they diſguſt when devoured with prodigality.

CHROMATIC, *Enharmonic*. See ENHARMONIC.

CHROMATICS;

THAT part of optics which explains the ſeveral properties of the colours of light, and of natural bodies.

1
Different hypotheſes concerning colours.

Before the time of Sir Iſaac Newton, we find no hypotheſis concerning colours of any conſequence. The opinions of the old philoſophers, however, we ſhall briefly mention, in order to gratify the curioſity of our readers. The Pythagoreans called colour the ſuperficies of body. Plato ſaid that it was a flame iſſuing from them. According to Zeno, it is the firſt configuration of matter; and Ariſtotle ſaid it was that which moved bodies actually tranſparent. Deſcartes aſſerted, that colour is a modification of light; but he imagined, that the difference of colour proceeds from the prevalence of the direct or rotatory motion of the particles of light. Father Grimaldi, Dechales, and many others, thought the differences of colour depended upon the quick or ſlow vibrations of a certain elaſtic medium filling the whole univerſe. Rohault imagined, that the different colours were made by the rays of light entering the eye at different angles with reſpect to the optic axis; and from the phænomenon of the rainbow, he pretended to calculate the preciſe quantity of the angle that conſtituted each particular colour. Laſtly, Dr Hooke, the rival of Newton, imagined that colour is cauſed by the ſenſation of the oblique or uneven pulſe of light; and this being capable of no more than two varieties, he concluded there could be no more than two primary colours.

2
This ſubject inveſtigated by Sir Iſaac Newton.

In the year 1666, Sir Iſaac Newton began to inveſtigate this ſubject; and finding the coloured image of the ſun, formed by a glaſs priſm, to be of an oblong, and not of a circular form, as, according to the laws of refraction, it ought to be, he began to conjecture that light is not *homogeneal*; but that it conſiſts of rays, ſome of which are much more refrangible than others. See this diſcovery fully explained and aſcertained under the article OPTICS.

This method of accounting for the different colours of bodies, from their reflecting this or that kind of rays moſt copiouſly, is ſo eaſy and natural, that Sir Iſaac's ſyſtem quickly overcame all objections, and to this day continues to be almoſt univerſally believed. It is now acknowledged, that the light of the ſun, which to us ſeems perfectly homogeneal and white, is compoſed of no fewer than ſeven different colours, *viz.* red, orange, yellow, green, blue, purple, and violet or indigo. A body which appears of a red colour, hath the property of reflecting the red rays more powerfully than any of the others; and ſo of the orange, yellow, green, &c. A body which is of a black colour, inſtead of reflecting, *abſorbs* all or the greateſt part of the rays that fall upon it; and, on the contrary, a body which appears white, reflects the greateſt part of the rays indiſcriminately, without ſeparating the one from the other.

3
Colours appearing between two glaſs plates.

The foundation of a rational theory of colours being thus laid, it next became natural to inquire, by what peculiar mechaniſm in the ſtructure of each particular body it was fitted to reflect one kind of rays more than another? This Sir Iſaac Newton attributes to the denſity of theſe bodies. Dr Hooke had remarked, that thin tranſparent ſubſtances, particularly water and ſoap blown into bubbles, exhibited various colours according to their thinneſs, though, when they have a conſiderable degree of thickneſs, they appear colourleſs; and Sir Iſaac himſelf had obſerved, that as he was compreſſing two priſms hard together, in order to make their ſides (which happened to be a little convex) to touch one another, in the place of contact they were both perfectly tranſparent, as if they had been but one continued piece of glaſs. Round the point of contact, where the glaſſes were a little ſeparate from each other, rings of different colours appeared. To obſerve more nicely the order of the colours produced in this manner, he took two object-glaſſes; one of them a plano-convex one belonging to a 14 feet refracting teleſcope, and the other a large double convex one for a teleſcope of about 50 feet; and laying the former of them upon the latter, with its plain ſide downwards, he preſſed them ſlowly together; by which means the colours very ſoon emerged, and appeared diſtinct to a conſiderable diſtance. Next to the pellucid central ſpot, made by the contact of the glaſſes, ſucceeded blue, white, yellow, and red. The blue was very little in quantity, nor could he diſcern any violet in it; but the yellow and red were very copious, extending about as far as the white, and four or five times as far as the blue. The next circuit immediately ſurrounding theſe, conſiſted of violet, blue, green, yellow, and red: all theſe were copious and vivid, except the green, which was very little in quantity, and ſeemed more faint and dilute than the other colours. Of the other four, the violet was the leaſt in extent; and the blue leſs than the yellow or red. The third circle of colours was purple, blue, green, yellow, and red. In this the purple ſeemed more reddiſh than the violet in the former circuit and the green was more conſpicuous; being as briſk and copious as any of the other colours, except the yellow; but the red began to be a little faded, inclining much to purple. The fourth circle conſiſted of green and red; and of theſe the green was very copious and lively, inclining on the one ſide to blue, and on the other to yellow; but in this fourth circle there was neither violet, blue, nor yellow, and the red was very imperfect and dirty. All the ſucceeding colours grew more and more imperfect and dilute, till after three or four revolutions they ended in perfect whiteneſs.

4
Suppoſed ariſe from denſity.

As the colours were thus found to vary according to the different diſtances of the glaſs-plates from each other, our author thought that they proceeded from the different thickneſs of the plate of air intercepted between the glaſſes; this plate of air being, by the mere circumſtance of thinneſs or thickneſs, diſpoſed to reflect or tranſmit this or that particular colour. From this he concluded, as already obſerved, that the colours of all natural bodies depended on their denſity, or the bigneſs of their component particles. He alſo conſtructed a table, wherein the thickneſs of a plate neceſſary to reflect any particular colour was expreſſed in parts of an inch divided into 1,000,000 parts.

5
Colours by reflection.

Sir Iſaac Newton purſuing his diſcoveries concerning the colours of thin ſubſtances, found that the ſame were alſo produced by plates of a conſiderable thickneſs. There is no glaſs or ſpeculum, he obſerves, how well poliſhed ſoever, but, beſides the light which it refracts or reflects regularly, ſcatters every way irregularly a faint light; by means of which the poliſhed ſurface, when illuminated in a dark room by a beam of the ſun's light, may eaſily be ſeen in all poſitions of the eye. It was with this ſcattered light that the colours in the following experiments were produced.

The ſun ſhining into his darkened chamber through a hole in the ſhutter one inch wide, he let the beam of light fall perpendicularly upon a glaſs ſpeculum, concave on one ſide and convex on the other, ground to a ſphere of five feet eleven inches radius, and quickſilvered over on the convex ſide. Then, holding a quire of white paper at the centre of the ſphere, to which the ſpeculums were ground, in ſuch a manner as that the beam of light might paſs through a little hole made in the middle of the paper, to the ſpeculum, and thence be reflected back to the ſame hole, he obſerved on the paper four or five concentric rings of colours, like rainbows ſurrounding the hole, very much like thoſe which appeared in the thin plates abovementioned, but larger and fainter. Theſe rings, as they grew larger and larger, became more dilute, ſo that the fifth was hardly viſible; and yet ſometimes, when the ſun ſhone very clear, there appeared faint traces of a ſixth and ſeventh.

6
Colours by refraction and reflection enumerated.

We have already taken notice, that the thin plates made uſe of in the former experiments reflected ſome kinds of rays in particular parts, and tranſmitted others in the ſame parts. Hence the coloured rings appeared variouſly diſpoſed, according as they were viewed by tranſmitted or reflected light; that is, according as the plates were held up between the light and the eye, or not. For the better underſtanding of which we ſubjoin the following table, wherein on one ſide are mentioned the colours appearing on the plates by reflected light, and on the other thoſe which were oppoſite to them, and which became viſible when the glaſſes were held up between the eye and the window. We have already obſerved, that the centre, when the glaſſes were in full contact, was perfectly tranſparent. This ſpot, therefore, when viewed by reflected light, appeared

appeared black, becauſe it tranſmitted all the rays: and for the ſame reaſon it appeared white when viewed by tranſmitted light.

Colours by reflected Light.	*Colours by Tranſmitted Light.*
Black	White
Blue	Yellowiſh-red
White	Black
Yellow	Violet
Red	Blue
Violet	White
Blue	Yellow
Green	Red
Yellow	Violet
Red	Blue
Purple	Green
Blue	Yellow
Green	Red
Yellow Red	Bluiſh-green
Green	Red
Red	Bluiſh-green
Greeniſh-blue	Red.
Red.	

The colours of the rings produced from reflection by the thick plates, followed the order of thoſe produced by tranſmiſſion through the thin ones: and by the analogy of their phenomena with thoſe produced from the thin plates, Sir Iſaac Newton concluded that they were produced in a ſimilar manner. For he found, that if the quickſilver was rubbed off from the back of the ſpeculum, the glaſs alone would produce the ſame rings, but much more faint than before; ſo that the phenomenon did not depend upon the quickſilver, except in as far as, by increaſing the reflection at the back of the glaſs, it increaſed the light of the coloured rings. He alſo found that a ſpeculum of metal only, produced none of thoſe rings; which made him conclude, that they did not ariſe from one ſurface only, but depended on the two ſurfaces of the plate of glaſs of which the ſpeculum was made, and upon the thickneſs of the glaſs between them.

7 General theory of colours by Sir Iſaac Newton.

From theſe experiments and obſervations, it will be eaſy to underſtand the Newtonian theory of colours. Every ſubſtance in nature ſeems to be tranſparent, provided it is made ſufficiently thin. Gold, the moſt denſe ſubſtance we know, when reduced into thin leaves, tranſmits a bluiſh-green light through it. If, therefore, we ſuppoſe any body, gold, for inſtance, to be divided into a vaſt number of plates ſo thin as to be almoſt perfectly tranſparent, it is evident that all or greateſt part of the rays will paſs through the upper plates, and when they loſe their force will be reflected from the under ones. They will then have the ſame number of plates to paſs through which they had penetrated before; and thus, according to the number of thoſe plates through which they are obliged to paſs, the object appears of this or that colour, juſt as the rings of colours appeared different in the experiment of the two plates, according to their diſtance from one another, or the thickneſs of the plate of air between them.

8 Mr Delaval's experiments in confirmation of it.

This theory is adopted by Edward Huſſey Delaval, in his Experimental Inquiry into the cauſe of the changes of colours in opaque and coloured bodies. He endeavours to confirm it by a number of experiments on the infuſions of flowers of different colours; but his ſtrongeſt arguments ſeem to be thoſe derived from the different tinges given to glaſs by metallic ſubſtances. Here he obſerves, that each metal gives a tinge according to its ſpecific denſity; the more denſe metals producing the leſs refrangible colours, and the lighter ones thoſe colours which are more eaſily refrangible. Gold, which is the denſeſt of all metals, imparts a red colour to glaſs, whenever it can be divided into particles ſo minute, that it is capable of being mixed with the materials of which glaſs is made. It ſeems indifferent by what means it is reduced to this ſtate, nor can it by any means be made to produce another colour. If it is mixed in large maſſes without being minutely divided, it imparts no colour to the glaſs, but remains in its metallic form. Lead, the metal whoſe denſity is next in order to that of gold, affords a glaſs of the colour of the hyacinth; a gem whoſe diſtinguiſhing characteriſtic is, that it is red with an admixture of yellow, the ſame colour which is uſually called *orange*. Glaſs of lead is mentioned by ſeveral authors as a compoſition proper, without the addition of any other ingredient, for imitating the hyacinth. Silver, next in denſity to lead, can only be made to communicate a yellow colour to glaſs. If the metal is calcined with ſulphur, it readily communicates this colour. Leaf-ſilver laid upon red-hot glaſs likewiſe tinges it yellow. When we meet with authors who mention a blue or greeniſh colour communicated by ſilver, the cauſe, muſt have been, that the ſilver uſed in ſuch proceſſes was mixed with copper. Mr Delaval aſſures us, from his own experience, that ſilver purified by the teſt retains ſo much copper, that, when melted ſeveral times with nitre and borax, it always imparted a green colour at the firſt and ſecond melting; though afterwards no ſuch colour was obtainable from it. The only colour produced by copper is green. It is indifferent in what manner the copper is prepared in order to tinge the glaſs, provided it is expoſed without any other ingredient to a ſufficient degree of heat. If a quantity of ſalts are added in the preparation, they will, by attenuating the mixture, make the glaſs incline to blue, the colour next in order: but this happens only when the fire is moderate; for, in a greater degree of heat, the redundant ſalts, even thoſe of the moſt fixed nature, are expelled. It is true, that copper is mentioned by ſome writers as an ingredient in red glaſs and enamel: but the *red*, which is the colour of the metal not diſſolved or mixed with the glaſs, remains only while the compoſition is expoſed to ſuch a degree of heat as is too ſmall to melt and incorporate it; for, if it be ſuffered to remain in the furnace a few minutes after the copper is added, the maſs will turn out green inſtead of red. Iron, the metal next in denſity to copper, is apt to be calcined, or reduced to a ruddy crocus, ſimilar to that ruſt which it contracts ſpontaneouſly in the air. In this ſtate, it requires a conſiderable degree of heat to diſſolve and incorporate it with glaſs: till that heat is applied, it retains its ruddy colour: by increaſing the heat, it paſſes through the intermediate colours, till it arrives at its permanent one, which is blue; this being effected in the greateſt degree of heat the glaſs will bear, without loſing all colour whatever. Iron vitrified *per ſe* is converted into a blue glaſs. In ſhort, it is indubitable, that iron is the only metal which will, without any addition, impart to the glaſs a blue colour: for copper will not communicate that colour without the addition of a conſiderable quantity of ſalts; or ſome other matter that attenuates it; and the other metals cannot by any means be made to produce it at all.

9
Sir Iſaac's theory defended by Dr Prieſtley.

10
His experiments.

11
Mr Canton's experiments.

Theſe are the principal of Mr Delaval's arguments in favour of Sir Iſaac Newton's theory of colours being formed by denſity. Dr Prieſtley too hath mentioned ſome which deſerve attention. "It was a diſcovery of Sir Iſaac Newton (ſays he), that the colours of bodies depend upon the thickneſs of the fine plates which compoſe their ſurfaces. He hath ſhown, that a change of the thickneſs of theſe plates occaſions a change in the colours of the body; rays of a different colour being thereby diſpoſed to be tranſmitted through it; and conſequently rays of a different colour reflected at the ſame place, ſo as to preſent an image of a different colour to the eye. A variation in the denſity occaſions a variation in the colour; but ſtill a medium of any denſity will exhibit all the colours, according to the thickneſs of it. Theſe obſervations he confirmed by experiments on plates of air, water, and glaſs. He likewiſe mentions the colours which ariſe on poliſhed ſteel by heating it, as likewiſe on bell-metal, and ſome other metalline ſubſtances, when melted and poured on the ground, where they may cool in the open air; and he aſcribes them to the ſcoriae or vitrified parts of the metal, which, he ſays, moſt metals, when heated or melted, do continually protrude and ſend out to their ſurfaces, covering them in the form of a thin glaſſy ſkin. This great diſcovery concerning the colours of bodies depending on the thickneſs of the fine plates which compoſe their ſurfaces, of whatever denſity theſe plates may be, I have been ſo happy as to hit upon a method of illuſtrating and confirming by means of electrical exploſions. A number of theſe being received on the ſurface of any piece of metal, change the colour of it to a conſiderable diſtance from the ſpot on which they were diſcharged; ſo that the whole circular ſpace is divided into a number of concentric rings, each of which conſiſts of all the priſmatic colours, and perhaps as vivid as they can be produced in any method whatever. Upon ſhowing theſe coloured rings to Mr Canton, I was agreeably ſurpriſed to find, that he had likewiſe produced all the priſmatic colours from all the metals, but by a different operation. He extended fine wires of all the different metals along the ſurfaces of pieces of glaſs, ivory, wood, &c.; and when the wire was exploded, he always found them tinged with all the colours. They are not diſpoſed in ſo regular and beautiful a manner as in the rings I produced, but they equally demonſtrate that none of the metals thus exploded diſcovers the leaſt preference to one colour more than to another. In what manner theſe colours are formed it may not be eaſy to conjecture. In Mr Canton's method of producing them, the metal, or the calcined and vitrified parts of it, ſeem to be diſperſed, in all directions from the plate of exploſion, in the form of ſpheres of a very great variety of ſizes, tinged with all the variety of colours, and ſome of them ſmaller than can be diſtinctly ſeen by any magnifier. In my method of making theſe colours, they ſeem to be produced in a manner ſimilar to the production of colours on ſteel and other metals by heat; *i. e.* the ſurface is affected without the parts of it being removed from their places, certain plates or laminae being formed of a thickneſs proper to exhibit the reſpective colours."

12
Newtonian theory impugned by Dr Prieſtley.

13
Curious experiments by the Abbe Mazeas.

But, however well ſupported this doctrine of the formation of colours by denſity may be, we find the ſame author (Dr Prieſtley), whom we have juſt now ſeen arguing for it in his hiſtory of electricity, arguing againſt it in his hiſtory of viſion. "There are (ſays he) no optical experiments with which Sir Iſaac Newton ſeems to have taken more pains than thoſe relating to the rings of colours which appear in thin plates; and in all his obſervations and inveſtigations concerning them, he diſcovers the greateſt ſagacity both as a philoſopher and mathematician; and yet in no ſubject to which he gave his attention, does he ſeem to have overlooked more important circumſtances in the appearances he obſerved, or to have been more miſtaken with regard to their cauſes. The former will be evident from the obſervations of thoſe who ſucceeded him in theſe inquiries, particularly thoſe of the Abbe Mazeas. This gentleman, endeavouring to give a very high poliſh to the flat ſide of an object-glaſs, happened to be rubbing it againſt another piece of flat and ſmooth glaſs; when he was ſurpriſed to find, that after this friction, they adhered very firmly together, till at laſt he could not move the one upon the other. But he was much more ſurpriſed to obſerve the ſame colours between theſe plane glaſſes that Newton obſerved between the convex object-glaſs of a teleſcope and another that was plane. Theſe colours between the plane glaſſes, the Abbe obſerves, were in proportion to their adheſion. The reſemblance between them and the colours produced by Newton, induced him to give a very particular attention to them; and his obſervations and experiments are as follow:

"If the ſurfaces of the pieces of glaſs are tranſparent, and well poliſhed, ſuch as are uſed for mirrors, and the preſſure be as equal as poſſible on every part of the two ſurfaces, a reſiſtance, he ſays, will ſoon be perceived when one of them is made to ſlide over the other; ſometimes towards the middle, and ſometimes towards the edges; but wherever the reſiſtance is felt, two or three very fine curve lines will be perceived, ſome of a pale red, and others of a faint green. Continuing the friction, theſe red and green lines increaſe in number at the place of contact, the colours being ſometimes mixed without any order, and ſometimes diſpoſed in a regular manner. In the laſt caſe, the coloured lines are generally concentric circles, or ellipſes, or rather ovals, more or leſs elongated as the ſurfaces are more or leſs united. Theſe figures will not fail to appear, if the glaſſes are well wiped and warmed before the friction.

"When the colours are formed, the glaſſes adhere with conſiderable force, and would always continue ſo without any change in the colours. In the centre of all thoſe ovals, the longer diameter of which generally exceeds ten lines, there appears a ſmall plate of the ſame figure, exactly like a plate of gold interpoſed between the glaſſes; and in the centre of it there is often

often a dark ſpot, which abſorbs all the rays of light except the violet; for this colour appears very vivid through a priſm.

"If the glaſſes are ſeparated ſuddenly, either by ſliding them horizontally over one another, or by the action of fire, as will be explained hereafter, the colours will appear immediately upon their being put together again, without the leaſt friction.

"Beginning by the ſlighteſt touch, and increaſing the preſſure by inſenſible degrees, there firſt appears an oval plate of a faint red, and in the midſt of it a ſpot of light green, which enlarges by the preſſure, and becomes a green oval, with a red ſpot in the centre; and this, enlarging in its turn, diſcovers a green ſpot in its centre. Thus the red and the green ſucceed one another in turns, aſſuming different ſhades, and having other colours mixed with them, which will be diſtinguiſhed preſently.

"The greateſt difference between theſe colours exhibited between plane ſurfaces and thoſe formed by curve ones is, that in the former caſe preſſure alone will not produce them, except in the caſe abovementioned. With whatever force he compreſſed them, his attempts to produce the colours were in vain without previous friction. But the reaſon of this plainly was, that without ſliding one of the glaſſes over the other, they could not be brought to approach near enough for the purpoſe.

"Having made theſe obſervations with plates of glaſs whoſe ſides were nearly parallel, he got two priſms with very ſmall refracting angles; and rubbing them together, when they were ſo joined as to form a parallelopiped, the colours appeared with a ſurpriſing luſtre at the places of contact, owing, he did not doubt, to the ſeparation of the rays of light by the priſm. In this caſe, differently coloured ovals appeared, but the plate of gold in them was much whiter, and only appeared yellow about its edges. This plate having a black ſpot in its centre, was bordered by a deep purple. He could not perceive any violet by his naked eye, but it might be perceived by the help of a lens with a weak light. It appeared in a very ſmall quantity at the confines of the purple and the blue, and ſeemed to him to be only a mixture of theſe two colours. It was very viſible in each of the coloured rings by inclining the glaſſes to the light of the moon. Next to the purple and violet appeared blue, orange, red tinged with purple, light green, and faint purple. The other rings appeared to the naked eye to conſiſt of nothing but faint reds and greens; and they were ſo ſhaded that it was not eaſy to mark their terminations. That the order of theſe may be compared with Newton's, he gives a view of both in the following table:

Order of the Colours in the Plane Glaſſes.		*Order of the Colours in Newt. Object Glaſſes.*
Order I.	Black ſpot	Black
	Whitiſh oval	Blue
	Yellow border	White
	Deep purple	Yellow
		Red
Order II.	Blue	Violet.
	Orange	Blue
	Purple	Green
		Yellow
		Red.
Order III.	Greeniſh blue	Purple
	Yellowiſh green	Blue
	Purpled red	Green
		Yellow
		Red
Order IV.	Green	Green
	Red	Red
Order V.	Faint green	Greeniſh blue
	Faint red	Red
Order VI.	Weak green	Greeniſh blue
	Light red	Red
Order VII	Very faint green	Greeniſh blue
	Very faint red.	Pale red.

"When theſe coloured glaſſes were ſuſpended over the flame of a candle, the colours diſappeared ſuddenly, though the glaſſes ſtill continued to adhere to one another when they were parallel to the horizon. When they were ſuffered to cool, the colours returned by degrees to their former places, in the order of the preceding table.

"After this the Abbe took two plates much thicker than the former, in order to obſerve at his leiſure the action of fire upon the matter which he ſuppoſed to produce the colours and obſerved, that as they grew warm, the colours retired to the edges of the glaſſes, and there became narrower and narrower till they were reduced to imperceptible lines. Withdrawing the flame, they returned to their place. This experiment he continued till the glaſſes were bent by the violence of the heat. It was pleaſant, he ſays, to obſerve theſe colours glide over the ſurface of the glaſs as they were purſued by the flame.

"At the firſt, our author had no doubt but that theſe colours were owing to a thin plate of air between the glaſſes, to which Newton has aſcribed them; but the remarkable difference in the circumſtances attending thoſe produced by the flat plates, and thoſe produced by the object-glaſſes of Newton, convinced him that the air was not the cauſe of this appearance. The colours of the flat plates vaniſhed at the approach of flame, but thoſe of the object-glaſſes did not. He even heated the latter till that which was next the flame was cracked by the heat, before he could obſerve the leaſt dilatation of the coloured rings. This difference was not owing to the plane glaſſes being leſs compreſſed than the convex ones; for though the former were compreſſed ever ſo much by a pair of forceps it did not in the leaſt hinder the effect of the flame.

"Afterwards he put both the plane glaſſes and the convex ones into the receiver of an air-pump, ſuſpending the former by a thread, and keeping the latter compreſſed by two ſtrings; but he obſerved no change in the colours of either of them in the moſt perfect vacuum he could make.

"Notwithſtanding theſe experiments ſeemed to be concluſive againſt the hypotheſis of theſe colours being formed by a plate of air, the Abbe frankly acknowledges, that the air may adhere ſo obſtinately to the ſurface of the glaſſes as not to be ſeparated from them by the force of the pump; which, indeed, is agreeable to other appearances: but the following experiments of our author make it ſtill more improbable that the air ſhould be the cauſe of theſe colours.

"To try the utmoſt effect of heat upon theſe coloured plates, after warming them gradually, he laid them upon burning coals; but though they were nearly red, yet when he rubbed them together by means of an iron rod, he obſerved the ſame coloured circles and ovals as before. When he ceaſed to preſs upon them, the colours ſeemed to vaniſh; but when he repeated the friction, they returned, and continued till the pieces of glaſs began to be red-hot, and their ſurfaces to be united by fuſion.

"When the outward ſurface of one of his plates of glaſs was quickſilvered, none of thoſe colours were viſible, though the glaſſes continued to adhere with the ſame force. This he aſcribed to the ſtronger impreſſion made on the eye by the greater quantity of light reflected from the quickſilver.

"Judging from the reſemblance between his experiments and thoſe of Sir Iſaac Newton, that the colours were owing to the thickneſs of ſome matter, whatever that was, interpoſed between the glaſſes, the Abbe, in order to verify his hypotheſis, tried the experiment on thicker ſubſtances. He put between his glaſſes a little ball of ſuet, about a fourth of a line in diameter, and preſſed it between the two ſurfaces, warming them at the ſame time, in order to diſperſe the ſuet; but, though he rubbed them together as before, and uſed other ſoft ſubſtances beſides ſuet, his endeavours to produce the colours had no effect. But, rubbing them with more violence in a circular manner, he was ſurpriſed, on looking at a candle through them, to ſee it ſurrounded with two or three concentric rings, very broad, and with very lively delicate colours; namely, a red inclining to a yellow, and a green inclining to that of an emerald. At that time he obſerved only theſe two colours; but continuing the friction, the rings aſſumed the colours of blue, yellow, and violet, eſpecially when he looked through the glaſſes on bodies directly oppoſed to the ſun. If, after having rubbed the glaſſes, the thickneſs was conſiderably diminiſhed, the colours grew weaker by tranſmitted light, but they ſeemed to be much ſtronger by reflection, and to gain on one ſide what they loſt on the other.

14 Newtonian hypotheſis oppoſed.

"Our author was confirmed in his opinion, that there muſt be ſome error in Newton's hypotheſis, by conſidering, that, according to his meaſures, the colours of the plates varied with the difference of a millionth part of an inch; whereas he was ſatisfied that there muſt have been much greater differences in the diſtance between his glaſſes, when the colours remained unchanged.

"If the colour depended upon the thickneſs only, he thought that the matter interpoſed between the glaſſes ought to have given the ſame colour when it was reduced to a thin plate by ſimple fuſion as well as by friction, and that, in rubbing two plates together, warming them at different times, and compreſſing them with a conſiderable force, other colours would have appeared beſides thoſe abovementioned.

"Theſe circumſtances made him ſuſpect, that the different thickneſſes of the ſubſtance interpoſed between the glaſſes ſerved only to make them more or leſs tranſparent, which was an eſſential condition in the experiment; and he imagined that the friction diffuſed over the ſurface of the thin ſubſtance a kind of matter on which the colours are formed by reflected light: for when he held the plates (which gave the colours when the ſuet was between them) over the flame of a ſmall candle, the colours fled with great precipitation, and returned to their place without his being able to perceive the leaſt alteration in the ſuet.

"He was confirmed in his conjectures, by frequently obſerving, that when the glaſſes were ſeparated, at the moment the colours diſappeared, they were covered with the ſame greaſy matter, and that it ſeemed to be in the very ſame ſtate as when they were ſeparated without warming. Beſides, having often repeated the ſame experiment with different kinds of matter, he found that the degree of heat that diſperſed the colours was not always ſufficient to melt it; which difference was more ſenſible in proportion as the matter interpoſed was made thinner.

"Inſtead of the ſuet, he ſometimes made uſe of Spaniſh wax, reſin, common wax, and the ſediment of urine. He began with Spaniſh wax, on account of its remarkable tranſparency in Mr Haukſbee's electrical experiments; but he had much difficulty in making it ſufficiently thin by friction, being often obliged to warm his glaſſes, to ſeize the moment of fuſion, which continued but a ſhort time, and to hazard the burning of his fingers.

"The experiment at length ſucceeding, the Spaniſh wax appeared with its opacity and natural colour when it reflected the light, but they both diſappeared in the tranſmitted light. He obſerved the ſame rings in it as in the ſuet; and indeed he could perceive but little difference between the colours of ſuet, Spaniſh wax, common wax, or reſin; except that this laſt ſubſtance did not make the colours ſo vivid, on account of the too great tranſparency of its particles.

"The ſediment of urine had ſomething more particular in its appearance, as its colours were more lively. Holding it above the flame, its colours diſappeared; and, keeping it in that ſituation, there were formed, upon its ſurface, ramifications, like thoſe of the hoar-froſt, which diſappeared as the glaſſes grew cold. There were the ſame ramifications both upon the ſuet and the wax, but they were not ſo conſiderable. The glaſſes which had Spaniſh wax and reſin between them adhered with ſo much force, that they could not be ſeparated without the help of fire; and when they began to grow warm, they ſeparated with a noiſe like that of a glaſs breaking in the fire, though the glaſſes were not broken, and the matter between them was not melted.

"Separating the glaſſes which he firſt uſed very ſuddenly, he obſerved upon their ſurface very thin vapours, which formed different colours, but preſently vaniſhed altogether.

"To try the effect of vapour, he breathed upon one of his plates of glaſs, and obſerved that the vapours which adhered to the glaſſes ſometimes formed, before they were entirely diſperſed, a ſurpriſing variety of colours. This experiment, he obſerves, does not always ſucceed at the firſt trial. The glaſs muſt be breathed upon ſeveral times, and care muſt be taken to wipe it every time with one's hand, both to take off the moiſture, and alſo to make upon the glaſs a kind of furrows, which contribute very much to the variety of colours, by making inequalities in the thickneſſes of the vapours. It is neceſſary, alſo, that the glaſſes on which theſe experiments are made have no quickſilver upon them.

“ When the particles of water which formed this vapour were too thick to exhibit theſe colours, he ſtruck them ſeveral times with his pencil, in order to attenuate them; and then he ſaw an infinity of ſmall coloured threads which ſucceeded one another with great rapidity.

“ Putting a drop of water between two pieces of common glaſs, he obſerved that the compreſſion of them produced no colour; but if, while they were compreſſed, the water was made to paſs from one place to another, it left behind it large ſpots, red, yellow, green, purple, *&c.* and the ſpots aſſumed different colours with a ſurpriſing rapidity, and preſented to the eye a moſt beautiful variety of ſhades.

“ In order to determine with greater certainty whether they were vapours that cauſed the colours in his firſt obſervations, he firſt breathed upon one of his plates of glaſs, and then rubbed them againſt one another, when the colours appeared in the ſame order as before, but darker, and diſperſed in confuſion in the places occupied by the vapours; but when he made uſe of fire to diſſipate the watery particles, the colours reſumed their luſtre.

“ Newton, having introduced a drop of water between his two object-glaſſes, obſerved, that in proportion as the water inſinuated itſelf between the glaſſes, the colours grew fainter, and the rings were contracted; and aſcribing theſe colours to the thickneſs of the plate of water, as he aſcribed the former to that of the plate of air, he meaſured the diameters of the coloured rings made by the plate of water, and concluded that the intervals between the glaſſes at the ſimilar rings of theſe two mediums were nearly as three to four; and thence he inferred, that, in all caſes, theſe intervals would be as the ſines of the refractions of theſe mediums.

“ The Abbé Mazeas, in order to aſſure himſelf whether, agreeable to this rule, the coloured rings of his glaſſes depended upon the thickneſs of the water only, dipped one of the edges of his coloured glaſſes in a veſſel of water, having taken care to wipe and warm them well before he produced his colours by friction. The water was a conſiderable time in riſing as high as the glaſſes; and in proportion as it aſcended, he perceived a very thin plate of water, which ſeemed to paſs over the matter which he thought produced the colours, without mixing with it; for beyond this plate of water, he ſtill perceived the colours in the ſame place and order, but deeper and darker; and holding the glaſſes above the flame of a candle, he ſaw the colours go and come ſeveral times as he moved them nearer to or farther from the flame. He then moiſtened both the glaſſes more than before; and rubbing them as uſual, he always ſaw the ſame appearance; and ſeizing the moment when the colours had diſappeared to ſeparate the glaſſes, he always found that they were wet. On this account, he thought that it could not be the water on which the colour depended, but ſome ſubſtance much more ſenſible to heat. He alſo thought that theſe coloured rings could not be owing to the compreſſion of the glaſſes; or that, if this circumſtance did contribute any thing to them, it ſerved rather to modify than to generate them.

15
M. du Tour's obſervations.

“ M. du Tour gave particular attention to the preceding obſervations of the Abbé Mazeas. He repeated the experiments with ſome variation of circumſtances, particularly comparing them with thoſe of Sir Iſaac Newton. He is ſo far from ſuppoſing a plate of air to be neceſſary to the formation of theſe coloured rings, that he thinks the reaſon of their not appearing between the flat plates of glaſs is the adhering of the air to their ſurfaces; and that mere preſſure is not ſufficient to expel it; except, as the Abbé Mazeas obſerved, the rings had before been made in the ſame place; in which caſe, ſimple appoſition without friction is ſufficient; the air, probably, not having had time to apply itſelf ſo cloſely to the ſurface of the glaſs. The contact of ſome other ſubſtances, M. du Tour obſerves, is not ſo prejudicial in this experiment as that of air; for he found, that, if he only gave the plates a ſlight coating of any kind of greaſe, the rings would appear without friction. Alſo dipping them ſlightly in water, or wiping them with his finger, would anſwer the ſame purpoſe. He verified his conjectures by means of the air-pump: for, dipping two pieces of glaſs in water, one of which had been wiped, and the other not, the former appeared to have no bubbles adhering to it when the air was exhauſted, whereas the other had.

“ When one of the glaſſes is convex, our author obſerves, that the particles of air may more eaſily make their eſcape by preſſure only; whereas their retreat is in a manner cut off when they are compreſſed between two flat ſurfaces. The air-pump, he found, was not able to detach theſe particles of air from the ſurfaces to which they adhere; leaving theſe flat plates for a conſiderable time in an exhauſted receiver, was not ſufficient to prepare them ſo well for the experiment, as wiping them.

16
Experiments on colours by reflection.

“ Beſides the obſervations on the colours of thin plates, it has been ſeen that Sir Iſaac Newton imagined he could account for the colours exhibited by thick ones in ſome caſes in a ſimilar manner; particularly in thoſe curious experiments in which he admitted a beam of light through a hole in a piece of paſteboard, and obſerved the rings of colours reflected back upon it by a concave glaſs mirror of equal thickneſs in all places. Theſe experiments were reſumed, and happily purſued, by the Duke de Chaulnes, who aſcribed theſe colours to the inflection of light*. Chance led the duke to obſerve, that when the nearer ſurface of the glaſs mirror was clouded by breathing upon it, ſo as lightly to tarniſh it, a white diffuſed and vivid light was ſeen upon the paſteboard, and all the colours of the rings became much ſtronger, and more diſtinct. This appearance he made conſtant by moiſtening the ſurface of the mirror with a little milk and water, and ſuffering it to dry upon it.

“ In all his experiments upon this ſubject, he found, than when the rays fell converging on the ſurface of the mirror, the rings were hardly viſible; when they fell parallel upon it, as they muſt have done in all the experiments of Newton, they appeared ſufficiently diſtinct; but when, by means of a convex lens placed in the hole of the window, they were made to diverge

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* See *Optics.*

from the centre of the ſphere to which the mirror was ground, ſo that they fell perpendicularly on the ſurface of the mirror, the colours were as vivid as he could make them. In this caſe he could remove the reflected image to a great diſtance from the hole, without making the rings diſappear; and he could plainly perceive them to ariſe from their central ſpots, which changed their colours ſeveral times.

"The effect of tarniſhing the mirror convinced him, that theſe coloured rings depended on the firſt ſurface of the mirror, and that the ſecond ſurface, or that which reflected them after they had paſſed the firſt, only ſerved to collect them and throw them upon the paſteboard in a quantity ſufficient to make them viſible, and he was confirmed in his ſuppoſition by the following experiments.

"He took a plano-convex object-glaſs, of ſix feet focus, and placed it ſix feet from the paſteboard with its convex ſide towards it. By this means the rays which fell upon that ſurface, after being refracted there, were tranſmitted through the thickneſs of the glaſs, parallel to one another, and fell perpendicularly on the plane ſurface that reflected them, and, in their return, would be collected upon the paſteboard. In theſe circumſtances the rings appeared very diſtinct after he had tarniſhed the convex ſurface, which in this poſition was next to the light.

"Turning the ſame glaſs the contrary way, ſo that the plane ſurface was towards the paſteboard, he could perceive none of the rings at the diſtance of ſix feet; but they were viſible at the diſtance of three feet: becauſe at that diſtance the ſecond ſurface reflected the rays by its concavity directly towards the paſteboard.

"Theſe two experiments demonſtrate the uſe of the ſecond ſurface of the mirror, and ſhow the manner of placing it to moſt advantage. Thoſe that follow ſhow the uſe of the firſt ſurface with reſpect to theſe rings; and he was led to make them by the caſual obſervation abovementioned.

"Newton, he obſerves, had remarked, that when he made uſe of a mirror of the ſame focus with the firſt he had uſed, but of twice the thickneſs, he found the diameter of the rings much ſmaller than before. This obſervation the duke thought favourable to his own concluſions; for if theſe rings depend upon the firſt ſurface, the nearer it is to the ſecond, which only reflects the ray tranſmitted from it, the larger they ought to appear upon the paſteboard.

"To aſcertain this fact, he thought of making uſe of two moveable ſurfaces; and to make uſe of a micrometer to meaſure the diſtance between them with exactneſs. For this purpoſe he took a metallic mirror belonging to a reflecting teleſcope, being part of a ſphere of ten feet radius; and he fixed it firm upon a foot in which was a groove that carried a light frame, to which was faſtened a thin piece of talc tarniſhed with milk and water. The frame that ſupported the piece of talc could neither be brought into contact with the mirror, or be removed to the diſtance of eight or nine inches from it, and the micrometer ſhowed to the utmoſt exactneſs the leaſt motion of the frame.

"Having placed this mirror ten feet from the paſteboard, that is, at the diſtance of the radius of its own ſphere, he obſerved the rings to appear very diſtinct, the form of his mirror being very true: but the diameter of the rings upon the paſteboard varied with the diſtance of the talc from the mirror; ſo that they were very large when the talc was near the mirror, and very ſmall when it was placed at the diſtance of ſeven or eight inches.

"Theſe experiments proved, that the rings were formed by the firſt ſurface, and reflected by the ſecond; but it ſtill remained to be determined in what manner they were formed. He imagined, that the ſmall pencils of rays that were tranſmitted through the pores of the glaſs, or any other tranſparent ſubſtance, might ſuffer a kind of inflection, which might change the cylinder which they formed into a truncated cone, either by means of their different degrees of inflexibility, or by the different diſtances at which they paſs by the edges of the ſmall hole through which they are tranſmitted. Purſuing this idea, he thought of making uſe of ſome body, the pores of which were of a known and determined ſhape. Inſtead, therefore, of the piece of talc, he placed a piece of fine linen in the abovementioned frame, ſtretching it as even as poſſible, to make the pores formed by the threads more exact and more permeable by the light; and he ſoon found, with great pleaſure, that his conjecture was verified: for, inſtead of the circular rings which he had before, they were now manifeſtly ſquare, though their angles were a little rounded; and they were coloured as the others, though the light was not very vivid, on account of the quantity that was ſtopped by the muſlin.

"When, inſtead of the muſlin, he ſtretched acroſs his frame fine ſilver wires exactly parallel, at the diſtance of about three quarters of a line, or a whole line from one another, without any other wires acroſs them; inſtead of the rings which he had ſeen before, there was nothing upon the paſteboard but a gleam of white light divided by many ſmall ſtreaks, coloured in a very vivid manner, and in the ſame manner as the rings."

17
Another theory of colours.

Thus we have another hypotheſis of the formation of colours, namely, by the inflection of light in its paſſage out from between the ſolid and impenetrable particles of which bodies are compoſed. It is, however, very difficult, upon the hypotheſis either of Sir Iſaac Newton, or that of the Duke de Chaulnes, to give a reaſon why bodies that are not entirely white, ſhould not appear variouſly coloured. For, it appears from Sir Iſaac Newton's experiments, that plates of different denſity are capable of exhibiting the ſame colours; and that where a plate is continually varying in denſity, it will produce all the colours. Now it is evident, that the plates of which we ſuppoſe all natural bodies to be compoſed, muſt be ſimilar to one that is perpetually varying in its thickneſs; for ſuppoſing the plates of which any ſubſtance is compoſed to be of any determinate thickneſs, 9 millionth parts of an inch for inſtance; ſuch of the rays as are reflected from this plate will be red. But if any of them penetrate to the depth of $11\frac{1}{6}$ of theſe parts, they will be reflected of a violet colour, *&c.* and thus muſt alloy and obſcure the red; and ſo of others. If we ſuppoſe the colours to be produced by inflection, it will be equally difficult to account for ſome particular rays being inflected and others not; ſeeing we obſerve that all of them are capable of being inflected by every ſubſtance whatever, when they paſs very near it. In ſome caſes too, colours are produced when the light is neither refracted nor inflected, as far as we can judge; and this ſeems to obſcure the theory of chromatics more than any thing we have yet mentioned.

As the experiments we are now about to mention are of the greateſt importance, and in direct terms contradict one of Sir Iſaac Newton's, we ſhall give a full account of them, from Prieſtley's hiſtory of Viſion, *&c.* with his remarks thereon.

18 One of Sir Iſaac Newton's experiments found to be erroneous

The experiment in queſtion is the eight of Newton's ſecond book of Optics: "He (Sir Iſaac Newton) found, he ſays, that when light goes out of air through ſeveral contiguous refracting mediums, as through water and glaſs, and thence goes out again into air, whether the refracting ſurfaces be parallel or inclined to one another, that light, as often as, by contrary refractions, it is ſo corrected, that it emerges in lines parallel to thoſe in which it was incident, continues ever after to be white: but if the emergent rays be inclined to the incident, the whiteneſs of the emerging light will, by degrees, in paſſing on from the place of emergence, become tinged, at its edges with colours. This he tried by refracting light with priſms of glaſs, placed within a priſmatic veſſel of water.

" By theorems deduced from this experiment, he infers, that the refraction of the rays of every ſort, made out of any medium into air, are known by having the refraction of the rays of any one ſort; and alſo, that the refraction out of one medium into another is found as often as we have the refractions out of them both into any third medium.

" On the contrary, a Swediſh philoſopher (M. Klingenſtierna) obſerves*, that, in this experiment, the rays of light, after paſſing through the water and the glaſs, though they come out parallel to the incident rays, will be coloured; but that the ſmaller the glaſs priſm is, the nearer will the reſult of it approach to Newton's deſcription.

" This paper of M. Klingenſtierna, being communicated to Mr Dollond by M. Mallet, made him entertain doubts concerning Newton's report of the reſult of his experiment; and determined him to have recourſe to experiments of his own.

" He therefore cemented together two plates of parallel glaſs, at their edges, ſo as to form a priſmatic veſſel when ſtopped at the ends or baſes; and the edge being turned downwards, he placed in it a glaſs priſm with one of its edges upwards, and filled up the vacancy with clear water: ſo that the refraction of the priſm was contrived to be contrary to that of the water, in order that a ray of light, tranſmitted through both theſe refracting mediums, might be affected by the difference only between the two refractions. As he found the water to refract more or leſs than the glaſs priſm, he diminiſhed or increaſed the angle between the glaſs plates, till he found the two contrary refractions to be equal, which he diſcovered by viewing an object through this double priſm. For when it appeared neither raiſed nor depreſſed, he was ſatisfied that the refractions were equal, and that the emergent rays were parallel to the incident.

19 Colours produced without refraction or reflection.

" Now, according to the prevailing opinion, he obſerves, that the object ſhould have appeared through this double priſm in its natural colour; for if the difference of refrangibility had been in all reſpects equal, in the two equal refractions, they would have rectified each other. But this experiment fully proved the fallacy of the received opinion, by ſhowing the divergency of the light by the glaſs priſm to be almoſt double of that by the water; for the image of the object, though not at all refracted, was yet as much infected with priſmatic colours, as though it had been ſeen through a glaſs wedge only whoſe angle was near 30 degrees.

" This experiment is the very ſame with that of Sir Iſaac Newton abovementioned, notwithſtanding the reſult was ſo remarkably different: but Mr Dollond aſſures us, that he uſed all poſſible precaution and care in his proceſs; and he kept his apparatus by him, that he might evince the truth of what he wrote, whenever he ſhould be properly required to do it.

" He plainly ſaw, however, that if the refracting angle of the water-veſſel could have admitted of a ſufficient increaſe, the divergency of the coloured rays would have been greatly diminiſhed, or entirely rectified; and that there would have been a very great refraction without colour, as he had already produced a great diſcolouring without refraction: but the inconveniency of ſo large an angle as that of the priſmatic veſſel muſt have been, to bring the light to an equal divergency with that of the glaſs priſm, whoſe angle was about 60°, made it neceſſary to try ſome experiments of the ſame kind with ſmaller angles.

" Accordingly he got a wedge of plate-glaſs, the angle of which was only nine degrees: and, uſing it in the ſame circumſtances, he increaſed the angle of the water-wedge, in which it was placed, till the divergency of the light by the water was equal to that by the glaſs; that is, till the image of the object, though conſiderably refracted by the exceſs of the refraction of the water, appeared nevertheleſs quite free from any colours proceeding from the different refrangibility of the light.

20 Defences of Sir Iſaac.

" Notwithſtanding it evidently appeared, I may ſay to almoſt all philoſophers, that Mr Dollond had made a real diſcovery of ſomething not comprehended in the optical principles of Sir Iſaac Newton, it did not appear to ſo ſenſible a man, and ſo good a mathematician, as Mr Murdoch is univerſally acknowledged to be. Upon this occaſion he interpoſed in the defence, as he imagined, of Sir Iſaac Newton; maintaining, that Mr Dollond's poſitions, which he ſays, he knows not by what miſhap have been deemed paradoxes in Sir Iſaac's theory of light, are really the neceſſary conſequences of it. He alſo endeavours to ſhow, that Sir Iſaac might not be miſtaken in his account of the experiment abovementioned. But admitting all that he advances in this part of his defence, Newton muſt have made uſe of a priſm with a much ſmaller refracting angle than, from his own account of his experiments, we have any reaſon to believe he ever did make uſe of.

" The fact probably was, that Sir Iſaac deceived himſelf in this caſe, by attending to what he imagined to be the clear conſequences of his other experiments; and though the light he ſaw was certainly tinged with

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* *Swed. Abhand.* vol. 16. p. 300.

colours, and he muſt have ſeen it to be ſo, yet he might imagine that this circumſtance aroſe from ſome imperfection in his priſms, or in the diſpoſition of them, which he did not think it worth his while to examine. It is alſo obſervable, that Sir Iſaac is not ſo particular in his deſcription of his priſms, and other parts of his apparatus, in his account of this experiment, as he generally is in other caſes, and therefore probably wrote his account of it from his memory only.

P. 804. “ Much has been ſaid on this experiment; and it is thought very extraordinary that a man of Sir Iſaac's accurate attention ſhould overlook a circumſtance, the effect of which now appears to be ſo conſiderable. But it has happily occurred to Mr Michell, that, as Sir Iſaac Newton obſerves he uſed to put ſaccharum ſaturni into his water to increaſe its refractive power, the lead, even in this form, might increaſe the diſſipative refraction, as it does in the compoſition of glaſs; and if ſo, that this would account for Newton's not finding the diſſipative power of water leſs than that of his glaſs priſms, which he otherwiſe ought to have done, if he had tried the experiment as he ſaid he did.

“ Accordingly he included a priſm of glaſs in water, as highly impregnated with ſaccharum ſaturni as it would bear, the proportion of ſaccharum to water being about as 5 to 11. When the image, ſeen through the water (ſo impregnated) and a glaſs priſm, was in its natural place, it ſtill was coloured, though very little: he thought not more than a fourth part as much as when ſeen through plain water, and the priſm in its natural place; ſo that he had no doubt, but that, if his priſm had had a little leſs of the diſperſing power, its errors would have been perfectly corrected.”

21
Mr Delaval's experiments on the colours of opaque bodies.

Beſides the experiments of Mr Delaval above related, and which were made on the colours of tranſparent bodies, he has lately publiſhed an account of ſome made upon the permanent colours of opaque ſubſtances; the diſcovery of which muſt be of the utmoſt conſequence in the arts of colour-making and dyeing. Theſe arts, he obſerves, were in very remote ages carried to the utmoſt height of perfection in the countries of Phoenicia, Egypt, Paleſtine, India, &c. and that the inhabitants of theſe countries alſo excelled in the art of imitating gems, and tinging glaſs and enamel of various colours. The colours uſed in very ancient paintings were as various as thoſe now in uſe, and greatly ſuperior both in beauty and durability. The paints uſed by Apelles were ſo bright, that he was obliged to glaze his pictures with a dark-coloured varniſh, leſt the eye ſhould be offended by their exceſſive brightneſs; and even theſe were inferior to what had been uſed among the ancient Egyptians. Pliny complains that the art of painting was greatly decayed in his time; and the moderns were not furniſhed with any means of retrieving the art until they began to avail themſelves of experimental obſervations.

22
Theſe colours depend chiefly on the diviſion of the colouring particles.

The changes of colour in permanently coloured bodies, our author obſerves, are produced by the ſame laws which take place in tranſparent colourleſs ſubſtances; and the experiments by which they can be inveſtigated conſiſt chiefly of various methods of uniting the colouring particles into larger, or dividing them into ſmaller maſſes. Sir Iſaac Newton made his experiments chiefly on tranſparent ſubſtances; and in the few places where he treats of others, acknowledges his deficiency of experiments. He makes the following remark, however, on thoſe bodies which reflect one kind of light and tranſmit another, viz. that “ if theſe glaſſes or liquors were ſo thick and maſſy that no light could get through them, he queſtioned whether they would not, like other opaque bodies, appear of one and the ſame colour in all poſitions of the eye; though he could not yet affirm it from experience.” It was the opinion of this great philoſopher, that all coloured matter reflects the rays of light, ſome reflecting the more refrangible and others the leſs refrangible rays more copiouſly; and that this is not only a true reaſon of theſe colours, but likewiſe the only reaſon. He was likewiſe of opinion that opaque bodies reflect the light from their anterior ſurface by ſome power of the body evenly diffuſed over and external to it. With regard to tranſparent coloured liquors, he expreſſes himſelf in the following manner: “ A tranſparent body which looks of any colour by tranſmitted light, may alſo look of the ſame colour by reflected light; the light of that colour being reflected by the farther ſurface of that body, or by the air beyond it: and then the reflected colour will be diminiſhed, and perhaps ceaſe, by making the body very thick, and pitching it on the back-ſide to diminiſh the reflection of its farther ſurface, ſo that the light reflected from the tinging particles may predominate. In ſuch caſes the colour of the reflected light will be apt to vary from that of the light tranſmitted.”

To inveſtigate the truth of theſe opinions Mr Delaval entered upon a courſe of experiments with tranſparent coloured liquors and glaſſes, as well as with opaque and ſemitranſparent bodies. From theſe he diſcovered ſeveral remarkable properties of the colouring matter; particularly, that in tranſparent coloured ſubſtances, it does not reflect any light; and when, by intercepting the light which was tranſmitted, it is hindered from paſſing through ſuch ſubſtances, they do not vary from their former colour to any other, but become entirely black (A).

23
No light reflected by the colouring particles.

This incapacity of the colouring particles of tranſparent bodies to reflect light, being deduced from very numerous experiments, may therefore be held as a general law. It will appear the more extenſive, if we conſider that, for the moſt part, the tinging particles of liquors or other tranſparent ſubſtances are extracted from opaque bodies; that the opaque bodies owe their colours to thoſe particles, in like manner as the tranſparent ſubſtances do: and that by the loſs of them they are deprived of their colours.

For making his experiments, Mr Delaval uſed ſmall vials

(A) Here our author obſerves, that he makes uſe of the word *colour* only to expreſs thoſe called *primary*; ſuch a mixture of them as does not compoſe whiteneſs, or any of the gradations between white and black, ſuch as are called by Sir Iſaac Newton, grey, dun, or ruſſet brown.

24 Apparatus for making theſe experiments.

vials of flint glaſs, whoſe form was a parallelopiped, and their height, excluſive of the neck, about two inches, the baſe about an inch ſquare, and the neck two inches in length. The bottom and three ſides of each of theſe vials was covered with a black varniſh; the cylindrical neck, and the anterior ſide, except at its edges, being left uncovered. He was careful to avoid any crevices in the varniſh. That no light might be admitted except through the neck or anterior ſide of the vials.

In theſe experiments it is of importance to have the vials perfectly clean; and as many of the liquors are apt to depoſit a ſediment, they ought to be put into the vials only at the time the experiments are to be made. The uncovered ſide of the vials ſhould not be placed oppoſite to the window through which the light is admitted: becauſe in that ſituation the light would be reflected from the farther ſide of the vial; and our author obſerves that ſmooth black ſubſtances reflect light very powerfully. But as it is a principal object in the experiment that no light be tranſmitted through the liquor, this is beſt accompliſhed by placing the uncovered ſide of the vial in ſuch a ſituation that it may form a right angle with the window.

25 The colouring matter only ſhows itſelf by tranſmitted light.

With theſe precautions our author viewed a great numbers of ſolutions, both of coloured metallic ſalts and of the tinging matter of vegetables; univerſally obſerving, that the colour by reflection was black, whatever it might be when viewed by tranſmitted light. If theſe liquors, however, are ſpread thin upon any white ground, they appear of the ſame colour as when viewed by tranſmitted light: but on a black ground they afford no colour, unleſs the black body be poliſhed; in which caſe the reflection of the light through it produces the ſame effect as tranſmiſſion.

The experiments with tinged glaſſes were in many reſpects analogous to thoſe with tranſparent coloured liquors. For theſe he made ſeveral parcels of colourleſs glaſs, principally uſing one compoſed of equal parts of borax and white ſand. The glaſs was reduced to powder, and afterwards ground, together with the ingredients by which the colours were imparted. "This method (ſays he) of incorporating the tinging particles is greatly preferable to mixing them with the raw materials; and the glaſſes thus compoſed excel moſt others in hardneſs, being ſcarcely inferior in luſtre to real gems."

The reſult of all the experiments made in this manner was, that when matter is of ſuch thinneſs, and the tinge ſo dilute, that light can be tranſmitted through it, the glaſſes then appear vividly coloured; but when they are in larger maſſes, and the tinging matter is more denſely diffuſed through them, they appear black; for theſe, as well as the tranſparent coloured liquors, ſhow their colour only by a tranſmiſſion. The following experiments were made with a view to determine the proportion of tinging matter which produces colour or blackneſs.

26. Experiments to determine the proportion of tinging matter.

1. Glaſs was tinged green by adding to it $\frac{1}{60}$th of its weight of copper; and that whether the latter was uſed in its metallic or calcined ſtate.

2. A blue glaſs was made by the addition of zaffre, a purple one by maganeſe, a red glaſs by gold, and yellow glaſſes by ſilver and calcined iron. A yellow glaſs reſembling a topaz was likewiſe made by the addition of a ſmall quantity of charcoal in powder. The ſame colour was likewiſe procured by the addition of wheat-flour, roſin, and ſeveral other inflammable matters. Small pieces of each of theſe glaſſes being ground by a lapidary, reſembled gems of their different colours.

3. Having formed pieces of ſuch glaſſes about two inches thick, he incloſed them in black cloth on all ſides except their farther and anterior ſurfaces. In this ſituation each of them ſhowed a vivid colour when light was tranſmitted through them; but when the poſterior ſurface was likewiſe covered with the cloth to prevent this tranſmiſſion, no other colour than black was exhibited by any of them.

4. When plates of tranſparent coloured glaſs, ſomewhat thicker than common window-glaſs, were made uſe of, they always exhibited their colours by tranſmitted light.

5. On intercepting the light tranſmitted through theſe coloured plates, they as conſtantly appeared black when placed in ſuch a direction as to form a right angle with the window.

From theſe phenomena Mr Delaval deduced the following obſervations: 1. That the colouring particles do not reflect any light. 2. That a medium, ſuch as Sir Iſaac Newton has deſcribed, is diffuſed over both the anterior and farther ſurfaces of the plates, whereby objects are equally and regularly reflected as by a mirror. Hence, when it is ſaid that light is reflected by the ſurface of any ſubſtance, it ſhould be underſtood from this expreſſion, that the reflection is effected by the medium diffuſed over its ſurface.

27 On the reflection of the light of a candle by coloured glaſſes.

6. When a lighted candle is placed near one of thoſe coloured plates, the flame is reflected by the medium which is diffuſed over the anterior ſurface. The image thus reflected entirely reſembles the flame in ſize and colour; being ſcarcely diminiſhed, and not in the leaſt tinged by the coloured glaſs.

7. If the plate be not ſo intenſely coloured, or ſo maſſy, as to hinder the tranſmiſſion of the light of the candle, there appears a ſecondary image of the flame, which is reflected by the medium contiguous to the farther ſurface of the glaſs; and as the light thus reflected paſſes through the coloured glaſs, it is tinged very vividly.

8. When the glaſs uſed in this experiment is of a green colour, the image of the flame is always of a bright green; and when glaſſes of other colours are uſed, that of a ſecondary flame is always the ſame with that of the glaſs.

9. The ſecondary image is leſs than that reflected from the anterior ſurface. This diminution is occaſioned by the loſs of that part of the light which is abſorbed in paſſing through the coloured glaſs. For whenever any medium tranſmits one ſort of rays more copiouſly than the reſt, it ſtops a great part of the different coloured rays. Much more light alſo is loſt in paſſing through coloured than tranſparent ſubſtances. In making theſe obſervations, it is proper to chooſe coloured plates of glaſs which are not in every part of an equal thickneſs, that the ſecondary image may not coincide with that reflected from the anterior ſurface, and be intercepted by it.

10. When the plates are ſo thick, and ſo copiouſly coloured, that the light cannot penetrate to their far-

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ther ſurface, they appear intenſely black in whatever direction they are viewed, and afford no ſecondary image, but only reflect, from their anterior ſurface, the flame, or any other objects that are oppoſed to them. Theſe objects are repreſented in their own proper colours, and are as free from tinge as thoſe reflected from quickſilvered glaſs, or ſpecula made of white metals.

Hence again it is manifeſt, that the colouring particles do not poſſeſs any ſhare of reflective power; for if they had any ſhare in this reflection, they would certainly impart ſome ſhare of colour to the light they reflected. Hence alſo it appears, that tranſparent coloured bodies, in a ſolid ſtate, poſſeſs no more reflective power than thoſe in a fluid ſtate.

28 Experiments on the pure colouring particles.

Our author next conſiders the colouring particles themſelves, pure, and unmixed with other media. In order to procure maſſes made up of ſuch particles, ſeveral tranſparent coloured liquors were reduced to a ſolid conſiſtence by evaporation. By employing a gentle heat, the colouring matter may thus remain unimpaired; and is capable of having its particles again ſeparated by water or other liquids, and tinging them as before.

In this ſtate the colouring particles reflect no light, and therefore appear uniformly black, whatever ſubſtance they have been extracted from. In the courſe of his experiments, Mr Delaval made uſe of the infuſions of brazil wood, logwood, fuſtic, turmeric, red ſaunders, alkanet, ſap-green, kermes, and all the other tranſparent coloured liquors he had tried before, among which were infuſions of red and yellow flowers, without obſerving the leaſt variation in the reſult.

Some liquors are apt to become totally opaque by evaporation: the reaſon of which may be the cryſtallization of ſaline matters, or the coaleſcence of the particles into maſſes, differing conſiderably in denſity from the menſtrua in which they were diſſolved. When this opacity takes place, our author has conſtantly obſerved, that they become incapable of entering the pores of wool, ſilk, or other matters of that kind, or of adhering to their ſurface; and conſequently unfit for the purpoſes of dyeing. This he ſuppoſes to ariſe from their increaſed bulk; for the attractive force by which the particles cohere together is weakened in proportion as their bulk increaſes: ſo that the degree of magnitude of the colouring particles, which is eſſential to the opacity of liquors, is inconſiſtent with the minuteneſs requiſite for dyeing. An inſtance of this is given in an infuſion of fuſtic. Having infuſed ſome of this wood in ſuch a quantity of water, that the latter was ſaturated with the colouring particles, he evaporated the liquor to a ſolid conſiſtence with an uninterrupted, but very gentle heat. During every part of the proceſs the liquor continued tranſparent, and the ſolid extract yielded by it tranſmitted a yellow colour when ſpread thin, but appeared black when thicker maſſes were viewed. Having prepared another pint of this liquor, he evaporated half the water, and allowed the remainder to become cold. In this ſtate it became turbid and opaque; on filtering, a tranſparent tincture paſſed through an opaque fecula remaining on the paper. This fecula did not adhere to the paper, but was eaſily ſeparable from it: on being dried, it appeared white with a ſlight tinge of yellow; but was nevertheleſs ſoluble in water, and by ſolution gave a liquid in all reſpects ſimilar to the original infuſion. "From theſe circumſtances (ſays he) it appears that a given proportion of water, or a ſufficient degree of heat, is requiſite to the ſolution of the colouring particles of fuſtic. And experience evinces, that thoſe particles which are too groſs to paſs through filtering paper, are incapable of entering the pores or firmly cohering to the ſurface of bodies. Many ingredients, ſuch as the colouring particles of logwood, kermes, and various other matters, are ſoluble in water in every proportion; and therefore their infuſions are not ſubject to become opaque or turbid during their evaporation. The ſolid extracts obtained by evaporation reflect no colour, but are black.

Our author alſo formed ſolid maſſes by mixing a ſmall quantity of drying oil with pigments which conſiſt chiefly of colouring matter; as Pruſſian blue, indigo, and ſap-green. Theſe paints likewiſe exhibit their reſpective colours only by tranſmitted light; appearing entirely black when viewed by reflection. Inſtances of blackneſs ariſing from this denſity of the colouring matter may be obſerved in ſeveral kinds of fruits, as black currants, cherries, &c. for the juices of theſe appear red when ſpread thin on a white ground, or otherwiſe viewed by tranſmitted light.

Mr Delaval's next attempt was to conſider the action and properties of the colouring particles of opaque bodies themſelves, and the means by which theſe colours are produced. Here our author endeavours to prove, that theſe colours of opaque bodies appear on the ſame principles as thoſe already mentioned, which ſeem black when very denſe, but ſhow their proper tinge when ſpread thin upon a white ground. On this ſubject the following experiments were made.

1. Graſs, and other green leaves of plants, were digeſted in rectified ſpirit of wine; by which means a tranſparent green tincture was obtained. One of the vials formerly mentioned being filled with this liquid, it was obſerved to tranſmit a vivid green colour; but the other part of the tincture, which was contiguous to the uncovered ſide of the vial, reflected no light, and therefore appeared black.

2. Having poured ſome of the tincture into a China cup, the bottom was thereby made to look green, exactly reſembling the colour which had been extracted from the leaves.

3. After the colour had been totally abſtracted by the vinous ſpirit, the leaves remained apparently unaltered, either as to figure or texture; but were entirely white, or had their whiteneſs ſlightly tinged with brown.

4. Red, purple, and blue flowers, were alſo digeſted in ſpirit of wine; all of which yielded their colouring matter to the ſpirit, and became white by being deprived of it. From moſt of theſe flowers, however, the ſpirit acquired either no tinge at all, or only a very faint one; but when acidulated, it became red, and by the addition of an alkali appeared blue, purple, or green, according to the quantity of alkali and the nature of the infuſion. In theſe ſtates, all of them, when viewed

viewed by tranſmitted light, or poured upon a white ground, ſhowed their colours, but univerſally appeared black by reflection.

5. Red, purple, and blue flowers, were digeſted in water ſlightly acidulated with nitrous acid. Thus, red infuſions were obtained, which, by ſaturation with ſea ſalt, might be preſerved for many years.

6. The ſame liquors were changed, green, blue, or purple, by the addition of an alkali: but here the caſe was the ſame as before; all of them yielding vivid colours by tranſmiſſion, but none by reflection. In making this experiment, care muſt be taken to add the alkali very gradually; for if too much is put in at once to the red liquor, the intermediate colours between the red and the green will be wanting. To half an ounce of the red infuſion it is proper to add, at once, only the ſmalleſt quantity that can be taken up on the point of a pen; repeating this addition ſlowly, until each of the colours be produced.

7. The flowers, after having been repeatedly macerated in acidulated water, loſt their colouring matter, and became white.

8. Yellow flowers alſo communicated their colours to water and to ſpirit of wine. The infuſions and tinctures of theſe flowers were ſubjected to the ſame experiments as had been employed in the examination of the liquors already mentioned; and appeared yellow by tranſmitted light, but did not reflect any colour.

9. White paper, linen, &c. may be tinged of any of theſe colours, by dipping them in the infuſions; and the conſideration of the manner in which the colours are imparted to the linen, affords much inſight into the manner in which natural colours are produced. It has already been obſerved, that, when the colouring matter of plants is extracted from them, the ſolid fibrous parts, thus diveſted of their covering, diſplay their natural whiteneſs. White linen, paper, &c. are formed of ſuch fibrous vegetable matter; which is bleached by diſſolving and detaching the heterogeneous colouring particles. When theſe are dyed or painted with vegetable colours, it is evident that they do not differ in their manner of acting on the rays of light from natural vegetable bodies; both yielding their colours by tranſmitting, through the tranſparent coloured matter, the light which is reflected from the white ground. This white matter frequently exiſts, without any conſiderable mixture, in plants, while they are in a ſtate of vegetation; as cotton, white flowers, the pith, wood, ſeeds, roots, and other parts of ſeveral kinds of vegetables. When decayed trees, &c. have been long expoſed to the atmoſphere, their coloured juices are ſometimes ſo perfectly extracted, that the fibres appear white. This white matter is not diſtinct from the vegetable earth to which plants are reduced by burning†. Mr Delaval has rendered aſhes intenſely white, by carefully calcining them, and afterwards grinding with a ſmall proportion of nitre, and expoſing them to ſuch a degree of heat as would cauſe the nitre deflagrate with the remaining quantity of phlogiſton. Laſtly, the aſhes were digeſted with marine acid, in order to diſſolve the ferruginous matter diffuſed through them, and repeatedly waſhing the remainder in water. Mixing aſhes thus purified with borax, and applying a vitrifying heat, an opaque enamel is obtained, remarkable for its whiteneſs.

29
How aſhes may be made intenſely white.

30
White earth of plants, the only ſubſtance in them that reflects the light.

Hence it appears, that the earth which forms the ſubſtance of plants is white, and ſeparable from that ſubſtance which gives to each its peculiar colour; that whenever it is pure and unmixed, or diffuſed through colourleſs media, it ſhows its native whiteneſs; and is the only vegetable matter endowed with a reflective power. It may be diſcovered, however, by other means than that of burning: thus, roſes may be whitened by expoſing them to the vapour of burning ſulphur; an effect which cannot be attributed to the vitriolic acid, but to the phlogiſton contained in that vapour. This was proved to be the caſe, by expoſing ſeveral kinds of red and purple flowers to the phlogiſtic vapour iſſuing from hepar ſulphuris; and by this every one of them was whitened; their colour being afterwards reſtored by the addition of an acid either mineral or vegetable.

31
Colouring matter diſſolved by phlogiſton.

“ Thus (ſays Mr Delaval) it appears, that the colouring matter of the flowers is not diſcharged or removed, but only diſſolved by the phlogiſton; and thereby divided into particles too minute to exhibit any colour. In this ſtate, together with the vegetable juice in which they are diffuſed, they form a colourleſs tranſparent covering, through which the white matter of the flowers is ſeen untinged. The colouring particles of plants conſiſt principally of inflammable matter; and their ſolubility in phlogiſton, and union with it, are analogous to the action of other inflammable bodies upon each other. Thus, ether diſſolves all eſſential and expreſſed oils, animal empyreumatic oils, and reſins. Sulphur, camphor, and almoſt all ſubſtances abounding in phlogiſton, are ſoluble in oils, ardent ſpirits, or other inflammable menſtrua. The manner in which the red colour of vegetable flowers is reſtored, appears to be explicable from known chemical laws. When acids are applied to the whitened flowers, they unite with the phlogiſton which the ſulphur had communicated, and diſengage it from the colouring particles; which, being thus extricated, reſume their original magnitude and hue. A change of the ſame kind is alſo produced by fixed alkali, which, like the acids, has a ſtrong attraction for phlogiſton, always changes the whitened flowers to a blue, purple, or green colour.

32
Colours deſtroyed by the light of the ſun.

“ In like manner, the action of the rays of light operates upon coloured bodies. Thus, dyed ſilk, or other ſubſtances of that kind, when expoſed to the ſun's light, are deprived of their colour in every part on which the rays are allowed to act; whilſt thoſe preſerve their colour which are defended from the light by the folds of the cloth, or intervention of any opaque body. The colours, thus impared, may be reſtored if acids are applied while the injury is recent; but they are afterwards apt to fly off, on account of that volatility which is conſtantly imparted by inflammable matter to any other with which it is united.”

Our author now proceeds, at conſiderable length, to prove the identity of the ſolar light and phlogiſton: but as recent experiments have ſhown that theſe two are eſſentially diſtinct, we omit his argumentation upon his head. The error of his theory in this reſpect, however, does not in the leaſt affect the doctrine concerning colours above laid down: on the contrary, the

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† See *Chemiſtry-Index.*

lateſt experiments have determined, that phlogiſton, in its groſſeſt form, *viz.* that of common charcoal, manifeſts a ſurpriſing power of whitening various ſubſtances; which, according to Mr Delaval's theory, proceeds from the power it has of diſſolving the colouring matter with which they are impregnated. This ſolvent power, according to our author, is manifeſt in many other inſtances beſides thoſe already mentioned. Silk is whitened by the phlogiſtic vapours of ſulphur: and this operation does not appear to differ from the change effected on flowers by the ſame vapour. The light of the ſun is found to be a neceſſary and eſſential agent in bleaching linen, wax, and various other ſubſtances; ſome part of the colouring matter which impairs the whiteneſs of theſe bodies not yielding to any other ſolvent. Red flowers are whitened by the electric ſpark, of whoſe inflammable nature we cannot entertain the leaſt doubt; for the ſpark itſelf is a bright flame, and yields the ſame ſmell which all other phlogiſtic matters impart. The electric ſpark, in like manner, changes the blue infuſion of turnſole to red (B). The effects which it produces on the turnſole, and on red flowers, do not differ from each other, except in degree only. For when vegetable matter is diſſolved, it is changed from blue to red; and, when farther diſſolved, it is divided into particles too minute to exhibit any colour.

33 How to diſtinguiſh the ſolutions made by phlogiſton from thoſe made by acids.

Solutions effected by means of phlogiſton frequently are wrongly attributed to the operation of ſuppoſed acid menſtrua, as ſeveral kinds of ſubſtances are capable of being diſſolved indiſcriminately both by acids and phlogiſton. For the purpoſe of diſtinguiſhing, therefore, in any caſe between the action of the acid ſolvents and that of the inflammable menſtrua, it is proper to examine the nature of the matter by which either of theſe principles are furniſhed. It appears from various chemical proceſſes, that alkalies are rendered mild, and capable of cryſtallization, in proportion as they are united to phlogiſton. The phlogiſticated alkaline lixivium, when ſaturated, is perfectly mild; and by a ſlight evaporation is reduced to a concrete cryſtalline maſs, which does not deliqueſce or imbibe the leaſt moiſture from the air, and no longer retains any alkaline property. M. Beaumé by an elegant and ingenious experiment, has proved the preſence of phlogiſton in mild alkalies, and has ſhown that their power of cryſtallizing depends upon their union with that principle. He heated in a ſilver veſſel a lixivium of mild alkali, which imparted to the ſilver a covering or coating of inflammable matter, by which its ſurface was tarniſhed and became black. The lixivium was ſeveral times poured out of the ſilver veſſel; and after the ſurface of the metal had been freed from the tarniſh, the lixivium was replaced in it, and again heated, by which the tarniſh was renewed; and this was repeated till the lixivium no longer communicated any ſtain to the ſilver. The cauſticity of the lixivium was increaſed in proportion as it imparted its phlogiſton to the ſilver; and at the end of the proceſs the alkali became perfectly cauſtic, and incapable of cryſtallizing.

Our author now goes on to prove, that fixed air is not an acid, nor a compound of air and phlogiſton, as is now generally believed, but rather entirely of a phlogiſtic nature. For an account of his arguments in favour of this opinion, ſee the article Fixed Air: here we ſhall only conſider his farther experiments on colours.

"From the preceding experiments (ſays he) it appears, that the colouring particles of flowers and leaves are ſoluble in acid, alkaline, and phlogiſtic menſtrua. The other parts of vegetables conſiſt of materials ſimilar to thoſe which are contained in their flowers and leaves, and undergo the ſame changes from the ſame cauſes. Having extracted from logwood its colouring particles by repeatedly boiling it in water, the wood was thus deprived of its yellow colour, and aſſumed a brown hue ſimilar to that of oak-wood. Some pieces of it thus deprived of its colour were then macerated in aquafortis; and after they had undergone the action of that acid, they were waſhed in a ſufficient quantity of water. The wood was thus reduced to whiteneſs."

34 Logwood affords only a yellow tincture with water.

Here our author obſerves, that though moſt authors who treat of colouring ſubſtances deſcribe logwood as of a red colour, he was never able to procure any other colour from it but yellow. It imparts yellow and orange colours to diſtilled water. Other waters extract a red tinge from it by means of the alkali which they contain. Theſe obſervations are alſo applicable to the other dyeing woods, kermes, and various other articles of the materia tinctoria. By a ſimilar treatment, fuſtic wood alſo loſt its colouring matter, and became white.

The reſults of all the experiments above related are, that the colouring matter of plants does not exhibit any colour by reflection, but by tranſmiſſion only; that their ſolid earthy ſubſtance is a white matter; and that it is the only part of vegetables which is endowed with a reflective power; that the colours of vegetables are produced by the light reflected from this white matter, and tranſmitted from thence through the coloured coat or covering which is formed on its ſurface by the colouring particles; that whenever the colouring matter is either diſcharged or divided by ſolution into particles too minute to exhibit any colour, the ſolid earthy ſubſtance is expoſed to view, and diſplays that whiteneſs which is its diſtinguiſhing characteriſtic.

34 Colouring matter of animal ſubſtances.

Mr Delaval next proceeds to examine the coloured parts of animal ſubſtances, and finds them exactly ſimilar, with regard to the manner in which the colour is produced, to the vegetable bodies already treated of. The tinctures and infuſions of cochineal and of kermes yield their colours when light is tranſmitted through them, but ſhow none by reflection. On diluting freſh ox-gall with water, and examining it in the phials already mentioned, that part of it which was in the neck of the phial, and viewed by tranſmitted light, was yellow; but the anterior ſurface was black, and reflected no colour. Fleſh derives its colour entirely from the blood, and when deprived of it the fibres and veſſels are perfectly white; as are likewiſe the membranes

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(B) This effect of the electric ſpark is now known to be produced, not by its phlogiſtic nature, but by the generation of an acid.

branes, ſinews, and bones, when freed from their aqueous and volatile parts; in which caſe they are a mere earth, unalterable by fire, and capable of imparting an opaque whiteneſs to glaſs.

35 Of the colour of blood.

On examining blood diluted with water in one of the phials formerly deſcribed, it tranſmitted a red colour, and the anterior ſurface was almoſt, but not entirely, black; for it received a ſlight hue of brown from ſome coagulated particles that were ſuſpended in the liquor. In order to procure blood ſufficiently diluted, and at the ſame time equably and perfectly diſſolved, he mixed as much cruor with ſpirit of ſal ammoniac as imparted a bright colour to it. The liquor being then viewed in the phial, that part which was contained in the neck, and tranſmitted the light, appeared of a fine red; but the anterior part reflecting no light, was intenſely black. Hence it appears, that the florid red colour of the fleſh ariſes from the light which is reflected from the white fibrous ſubſtance, and tranſmitted back through the red tranſparent covering which the blood forms on every part of it.

Blood, when recently drawn, does not aſſume the appearance common to tranſparent coloured liquors; for theſe, when too maſſy to tranſmit light from their farther ſurfaces, always appear black; but blood, when recently drawn, always ſhows a fine red colour, in whatever way it be viewed. This is occaſioned by a white matter diffuſed through the blood; and which is eaſily ſeparated from the cruor, by dividing it after coagulation into a number of thin pieces, and waſhing in a ſufficient quantity of pure water. Thus the water acquires a red colour, and ought to be changed daily. In a few days it will acquire no more tinge; and the remaining maſſes of the cruor are no longer red, but white.

36 Of the ſhells of lobſters.

In like manner, the red colour of the ſhells of lobſters, after boiling, is no more than a mere ſuperficial covering ſpread over the white calcareous earth of which the ſhells are compoſed, and may be eaſily removed from the ſurface by ſcraping or filing. Before the application of heat, this ſuperficial covering is much denſer; inſomuch that, in ſome parts of the ſhell, it appears quite black, being too thick to admit the paſſage of the light to the ſhell and back again; but where this tranſparent blue colour of the unboiled lobſter is thinner, it conſtantly appears like a blue film. In like manner, the colours of the eggs of certain birds are entirely ſuperficial, and may be ſcraped off, leaving the white calcareous earth expoſed to view.

37 Of feathers.

The caſe is the ſame with feathers, which owe their colours entirely to a very thin layer of ſome tranſparent matter upon a white ground. Our author aſcertained this by ſcraping off the ſuperficial colours from certain feathers which were ſtrong enough to bear the operation; and thus ſeparated the coloured layers from the white ground on which they had been naturally ſpread. The lateral fibres of the feathers cannot indeed have their ſurfaces ſeparated in this manner; but their texture, when viewed by a microſcope, ſeems to indicate, that the colours are produced on them by no other means than thoſe already related. In the examination of ſome animal ſubjects where the colouring matter could not be ſeparated by chemical means, our author had recourſe to mechanical diviſion; but this can only be employed when the principal part of the white ſubſtance is unmixed with the coloured coat or covering which is ſpread upon its ſurface. All of them, however, by whatever means their colours could be ſeparated, ſhowed that they were produced in the ſame manner, namely, by the tranſmiſſion of light from a white ground through a tranſparent coloured medium.

38 Of the colours of mineral ſubſtances.

The coloured ſubſtances of the mineral kingdom are very numerous, and belong principally to two claſſes, *viz.* earths and metals. The former, when pure, are all perfectly white, and their colours ariſe from phlogiſtic or metallic mixtures. Calcareous earths, when indurated, conſtitute marble, and may be tinged with various colours by means of metallic ſolutions; all which are ſimilar in their nature to the dyes put upon ſilk, cotton, or linen, and invariably proceed from the ſame cauſe, *viz.* the tranſmiſſion of light through a very thin and tranſparent coloured medium. Flints are formed from ſiliceous earth, and owe their colour to phlogiſton. When ſufficiently heated, they are rendered white by the loſs of the inflammable matter which produced their colour. When impregnated with metals, they form agates, cornelians, jaſper, and coloured cryſtals. The coloured gems alſo receive their different hues from metals; and all of them may be imitated by glaſſes tinged with ſuch phlogiſtic or metallic matters as enter into the compoſition of the original ſubſtances.

39 Of metals.

Thus our author concludes, that the coloured earths, gems, &c. exhibit their various tints in the ſame manner with other ſubſtances; *viz.* by the tranſmiſſion of light reflected from a white ground. Our author, however, proceeds farther; and aſſerts, that even the colours of metals themſelves are produced in the ſame manner.

“ Gold (ſays he) exhibits a white light, which is tinged with yellow. I have uſed this expreſſion, becauſe it appears from experiment that gold reflects a white light, and that its yellow colour is a tinge ſuperadded to its whiteneſs. The experiment is thus ſet forth by Sir Iſaac Newton. Gold in this light (that is, a beam of white light) appears of the ſame yellow colour as in day light; but by intercepting at the lens a due quantity of the yellow-making rays, it will appear white like ſilver, as I have tried; which ſhows, that its yellowneſs ariſes from the exceſs of the intercepted rays, tinging that whiteneſs with their colour when they are let paſs.

“ I have already ſhown, by numerous experiments, in what manner coloured tinges are produced; and it uniformly appears, from all theſe experiments, that colours do not ariſe from reflection, but from tranſmiſſion only. A ſolution of ſilver is pellucid and colourleſs. A ſolution of gold tranſmits yellow, but reflects no colour. This metal alſo, when united with glaſs, yields no colour by reflection, but by tranſmiſſion only. All theſe circumſtances ſeem to indicate, that the yellow colour of gold ariſes from a yellow tranſparent matter, which is a conſtituent part of that metal; that it is equally mixed with the white particles of the gold, and tranſmits the light which is reflected by them, in like manner as when ſilver is gilt, or foils are made by covering white metals with tranſparent colours. But theſe factitious coverings are only ſuperficial; whereas the yellow matter of gold is diffuſed throughout the whole ſubſtance of the metal, and appears to envelope, and cover each of the white particles. In whatſoever manner the yellow matter of gold is united to its white ſubſtance, it exiſts in a rare ſtate; for it bears only the ſame proportion to the white particles of the gold as that of the yellow-making rays which were intercepted bears to all the other rays compriſed in the white light of the ſun.

"Sir Iſaac Newton has ſhown, that when ſpaces or interſtices of bodies are repleniſhed with media of different denſities, the bodies are opaque; that thoſe ſuperficies of tranſparent bodies reflect the greateſt quantity of light which intercede media that differ moſt in their refractive denſities; and that the reflections of very thin tranſparent ſubſtances are conſiderably ſtronger than thoſe made by the ſame ſubſtances of a greater thickneſs. Hence the minute portions of air, or of the rarer medium, which occupies ſpaces void of other matter, reflect a vivid white light whenever their ſurfaces are contiguous to media whoſe denſities differ conſiderably from their own; ſo that every ſmall maſs of air, or of the rarer medium, which fills the pores or interſtices of denſe bodies, is a minute white ſubſtance. This is manifeſt in the whiteneſs of froth, and of all pellucid colourleſs bodies; ſuch as glaſs, cryſtal, or ſalts, reduced to powder, or otherwiſe flawed; for in all theſe inſtances a white light is reflected from the air or rarer medium which intercede the particles of the denſer ſubſtances whoſe interſtices they occupy."

From theſe principles our author takes occaſion to explain the reaſon why the particles of metals which yield no colour by incident light when ſuſpended in their ſolvents, are diſpoſed to exhibit colours when ſeparated from them. Hence alſo we ſee why opaque white ſubſtances are rendered pellucid by being reduced to uniform maſſes whoſe component parts are every where nearly of the ſame denſity; for as all pellucid ſubſtances are rendered opaque and white by the admixture of pellucid colourleſs media of conſiderably different denſities, they are again deprived of their opacity by extricating theſe media which kept their particles at a diſtance from each other: thus froth or ſnow, when reſolved into water, loſe their whiteneſs, and aſſume their former pellucid appearance. In like manner, by proper fluxes, the opaque white earths are reduced to pellucid colourleſs glaſſes; becauſe all reflections are made at the ſurfaces of bodies differing in denſity from the ambient medium, and in the confines of equally denſe media there is no reflection.

As the calces of metals are enabled to reflect their colours by the intervention of the particles of air; ſo, when mixed with oil in the making of paints, they always aſſume a darker colour, becauſe the exceſs of the denſity of oil over that of air forms a ſenſible difference when comparatively conſidered with reſpect to the ſpecific gravity of the rarer metals. From this cauſe perceptibly leſs light is reflected from the moleculæ of oil than from thoſe of air, and conſequently the maſs appears darker. The caſe, however, is different with ſuch paints as are formed of the denſer metals; as vermilion, minium, &c.: for though oil differs very conſiderably from air in its ſpecific denſity, yet it alſo differs very much in this reſpect from the denſer metallic powders; and the moleculæ of oil which divide their particles act upon the light ſo ſtrongly, that the reflection occaſioned by them cannot be diſtinguiſhed from thoſe which are cauſed by rarer media. Hence, though we mix vermilion or minium with oil, the colour is not ſenſibly altered.

40 Objections to his theory of metallic colours.

This part of our author's theory, however, ſeems liable to objection: for though it be true that the calces of ſome metals are denſer than others, yet that is, comparatively ſpeaking, but in a very ſmall proportion; nor is even the difference of denſity between oil and the calces of the heavier metals at all comparable to that between the denſity of air and oil. Thus, tho' the calx of iron may be 10 or 11 times more denſe than oil; yet, as the latter is between 500 and 600 times denſer than air, the ſmall difference between the oil and metallic calx ought to be imperceptible. In this reſpect, indeed, there are conſiderable differences with regard to the oils employed, which cannot be ſuppoſed to ariſe from the mere circumſtance of denſity. Thus the colour of vermilion, when mixed with turpentine-varniſh, is much brighter than with linſeed-oil; and yet the difference between the denſities of linſeed-oil and turpentine-varniſh is very trifling. The mere action of heat likewiſe has a ſurpriſing effect in this caſe. Thus the red calx of iron, called *ſcarlet oker*, by being only heated a certain degree, appears of a very dark purple, reſuming its red colour when cold; and this variation may be induced as often as we pleaſe by only heating it over the fire in a ſhovel. In like manner, by gradually heating red lead, it may be made to aſſume a moſt beautiful crimſon colour; which growing gradually darker, becomes at laſt almoſt quite black. On cooling, if the heat has not been raiſed too high, it gradually returns through the ſame ſhades of colour, until at laſt it fixes in its original hue. Theſe immenſe differences in colour cannot by any means be attributed either to the expulſion of air or to an alteration in denſity. The fire indeed does certainly expand theſe calces as well as other bodies; but as the medium interſperſed between their particles is thus alſo expanded, the colour ought at leaſt to remain the ſame, if not to become lighter, on account of the ſuperior expanſion of air to that of metal by the ſame degree of heat. It would ſeem, therefore, that the action of the element of fire itſelf has a conſiderable ſhare in the production of colours; and indeed its ſhare in the operations of nature is ſo great, that we might well think it ſtrange if it ſhould be entirely excluded from this.

41 Of the colours of ſemipellucid ſubſtances.

With regard to ſemipellucid ſubſtances, which appear of one colour by incident and another by tranſmitted light, our author likewiſe endeavours to ſhow, that no reflection is made by the coloured matter, but only by the white or colourleſs particles. They conſiſt of pellucid media, throughout which white or colourleſs opaque particles are diſperſed. The latter are diſpoſed at ſuch diſtances from each other, that ſome of the incident rays of light are capable of paſſing through the intervals which intercede them, and thus are tranſmitted through the ſemipellucid maſs. Some ſorts of rays penetrate through ſuch maſſes, while others which differ from them in their refrangibility are reflected by the white or colourleſs particles; and from thence are tranſmitted through the pellucid part of the medium which intervenes between the reflecting particles and the anterior ſurface of the maſs. On the ſame principle our author explains the blue colour of the ſky, the green colour of the ſea, and other natural phenomena: and from his numerous experiments on this ſubject at laſt concludes, that the power by which the ſeveral rays of light are tranſmitted through different media is inherent in the particles themſelves, and therefore is not confined to the ſurfaces of ſuch media. For if the tranſmiſſive force was exerted at the ſurface only, the thinner plates of coloured ſubſtances would act upon the rays as powerfully as thicker maſſes. But it appears from experiment, that in proportion as the rays paſs through different thickneſſes of coloured media, they exhibit colours differing not only in degree, but frequently in ſpecies alſo.

42 How colours are ſhown by tranſmitted light

"The ſun's light, by which bodies are illuminated, conſiſts of all the rays by which a white light is compounded. Theſe rays, in their entire and undivided ſtate, are incident upon the opaque particles of ſemipellucid ſubſtances, and upon the colouring particles of tranſparent coloured ſubſtances, whenever theſe media are expoſed to the light. When the rays accede to the opaque particles of ſemipellucid ſubſtances, ſome ſorts of them are reflected back from the anterior ſurface of thoſe particles: the other ſorts of rays, which are not reflected back, are diverted from the direction which is opppoſite to the anterior ſurface of the opaque particles, and paſſing through the intervals between the particles, are tranſmitted through the maſs.

"When the rays are incident upon the particles of tranſparent coloured bodies, none of them are reflected back; becauſe the colouring particles are not endowed with any reflective power: but ſome of the rays are either ſtopped at the anterior ſurface of the particles, or are diverted into ſuch directions as render them incapable of paſſing towards the farther ſide of the maſs; and conſequently ſuch rays cannot be tranſmitted. The rays which are not thus intercepted or diſperſed, are tranſmitted in the ſame manner as thoſe which paſs through ſemipellucid media. Thus it is evident, that the coloured rays which are tranſmitted through ſemipellucid ſubſtances are *inflected* by the opaque particles: and thoſe which are tranſmitted through tranſparent-coloured ſubſtance are *inflected* by the colouring particles. From the preceding obſervations likewiſe it appears, that the particles of coloured media inflect the ſeveral ſorts of rays according to the ſeveral ſizes and denſities of the particles; alſo in proportion to the inflammability of the media which owe their colour to them; and it is manifeſt that the tranſmiſſion of coloured rays depends upon their inflection. All theſe obſervations are conformable to Sir Iſaac Newton's doctrine, that the rays of light are reflected, refracted, and inflected, by one and the ſame principle acting variouſly in various circumſtances."

43 Of the manner in which light is reflected from white bodies.

The moſt remarkable part of Mr Delaval's doctrine is that concerning the metals; for the better underſtanding of what we ſhall premiſe a ſhort abſtract of his general doctrine concerning white bodies, and the manner in which light is reflected by them. "All the earths (he obſerves), which in their natural ſtate are of a pure white, conſtitute tranſparent colourleſs media when vitrified with proper fluxes, or when diſſolved in colourleſs menſtrua; and the ſaline maſſes obtainable from their ſolutions are tranſparent and colourleſs while they retain the water which is eſſential to their cryſtallization, and are not flawed or reduced to powder; but after their pores and interſtices are opened in ſuch a manner as to admit the air, they become then white and opaque by the entrance of that rare medium. The earthy particles which form the ſolid parts of bodies generally exceed the others in denſity; conſequently theſe particles, when contiguous to the rare media already mentioned, muſt reflect the rays of light with a force proportionate to their denſity. The reflective power of bodies does not depend merely upon their exceſs of denſity, but upon their difference of denſity, with reſpect to the ſurrounding media. Tranſparent colourleſs particles, whoſe denſity is greatly inferior to that of the media they come between, alſo powerfully reflect all ſorts of rays, and thereby become white. Of this kind are the air or other rare fluids which occupy the interſtices of liquors; and in general of all denſer media into whoſe interſtices ſuch rare particles are admitted.

"Hence we may conclude, that white opaque bodies are conſtituted by the union or contiguity of two or more tranſparent colourleſs media differing conſiderably from each other in their reflective powers. Of theſe ſubſtances we have examples in froth, emulſions, or other imperfect combinations of pellucid liquors, milk ſnow, calcined or pulverized ſalts, glaſs or cryſtal reduced to powder, white earths, paper, linen, and even thoſe metals which are called white by mineralogiſts and chemiſts: for the metals juſt mentioned do not appear white unleſs theſe ſurfaces be rough? as in that caſe only there are interſtices on their ſurface ſufficient to admit the air, and thus make a reflection of a white and vivid light.

"But the poliſhed ſurfaces of metallic mirrors reflect the incident rays equably and regularly, according to their ſeveral angles of incidence; ſo that the reflected rays do not interfere with each other, but remain ſeparate and unmixed, and therefore diſtinctly exhibit their ſeveral colours. Hence it is evident, that white ſurfaces cannot act upon the light as mirrors; becauſe all the rays which are reflected from them are blended in a promiſcuous and diſorderly manner.

44 Of the cauſe of opacity.

"The abovementioned phenomena give much inſight into the nature and cauſe of opacity; as they clearly ſhow, that even the rareſt tranſparent colourleſs ſubſtances, when their ſurfaces are adjacent to media differing greatly from them in refractive power, may thereby acquire a perfect opacity, and may aſſume a reſplendency and hue ſo ſimilar to that of white metals, that the rarer pellucid ſubſtances cannot by the ſight be diſtinguiſhed from the denſe opaque metals. And this ſimilarity to the ſurface of metals occurs in the rare pellucid ſubſtances, not only when, from the roughneſs of their ſurfaces, they reſemble unpoliſhed metals in whiteneſs, but alſo when, from their ſmoothneſs, they reſemble the poliſhed ſurfaces of metals.

"Metals ſeem to conſiſt entirely of tranſparent matter, and to derive their apparent opacity and luſtre ſolely from the copious reflection of light from their ſurfaces. The analogy between the metals and tranſparent media, as far as reſpects their optical properties, will appear from the following conſiderations.

"1. All metals diſſolved in their proper menſtrua are tranſ-

tranſparent. 2. By the union of two or more tranſparent media, ſubſtances are conſtituted which are ſimilar to metals in their opacity and luſtre, as plumbago and marcaſites. 3. The tranſparent ſubſtances of metals, as well as thoſe of minerals, by their union with phlogiſton, acquire their ſtrong reflective powers from which their luſtre and opacity ariſe. 4. The ſurfaces of pellucid media, ſuch as glaſs or water, aſſume a metallic appearance, when by their ſmoothneſs, difference of denſity with reſpect to the contiguous media, or any other cauſe, they are diſpoſed copiouſly to reflect the light.

"From all theſe conſiderations it is evident that opaque ſubſtances are conſtituted by the union or contiguity of tranſparent colourleſs media, differing from one another in their reflective powers: and that, when the common ſurface, which comes between ſuch media, is plane, equal, and ſmooth, it reflects the incident rays equally and regularly as a mirror; but when the ſurface is rough and unequal, or divided into minute particles, it reflects the incident rays irregularly and promiſcuouſly in different directions, and conſequently appears white."

45 Theory of colours ſtill uncertain. From all thoſe experiments we can only conclude, that the theory of colours ſeems not yet to be determined with certainty; and very formidable, perhaps unanſwerable, objections, might be brought againſt every hypotheſis on this ſubject that hath been invented. The diſcoveries of Sir Iſaac Newton, however, are ſufficient to juſtify the following

APHORISMS.

1. All the colours in nature proceed from the rays of light.

2. There are ſeven primary colours: which are red, orange, yellow, green, blue, indigo, and violet.

3. Every ray of light may be ſeparated into the ſeven primary colours.

4. The rays of light in paſſing through the ſame medium have different degrees of refrangibility.

5. The difference in the colours of light ariſes from its different refrangibility: that which is the leaſt refrangible producing red; and that which is the moſt refrangible violet.

6. By compounding any two of the primary colours, as red and yellow, or yellow and blue, the intermediate colour, as orange or green, may be produced.

7. The colours of bodies ariſe from their diſpoſitions to reflect one ſort of rays, and to abſorb the other: thoſe that reflect the leaſt refrangible rays appearing red; and thoſe that reflect the moſt refrangible violet.

8. Such bodies as reflect two or more ſorts of rays appear of various colours.

9. The whiteneſs of bodies ariſes from their diſpoſition to reflect all the rays of light promiſcuouſly.

10. The blackneſs of bodies proceeds from their incapacity to reflect any of the rays of light (c).

Entertaining EXPERIMENTS, *founded on the preceding Principles.*

I. *Out of a ſingle colourleſs ray of light to produce ſeven other rays, which ſhall paint, on a white body, the ſeven primary colours of nature.*

Plate CXXXV. fig. 1. PROCURE of an optician a large glaſs priſm DEF, well poliſhed, two of whoſe ſides muſt contain an angle of about ſixty-four degrees. Make a room quite dark, and in the window ſhutter AB, cut a round hole, about one-third of an inch in diameter, at C, through which a ray of light LI paſſing, falls on the priſm DEF: by that it is refracted out of the direction IT, in which it would have proceeded into another GH; and, falling on the paper MNSX, will there form an oblong ſpectrum PQ, whoſe ends will be ſemicircular, and its ſides ſtraight; and if the diſtance of the priſm from the paper be about eighteen feet, it will be ten inches long, and two inches wide. This ſpectrum will exhibit all the primary colours: the rays between P and V, which are the moſt refracted, will paint a deep violet: thoſe between V and I, indigo; thoſe between I and B, blue; thoſe between B and G, green; thoſe between G and Y, yellow; thoſe between Y and O, orange; and thoſe between O and R, being the leaſt refracted, an intenſe red. The colours between theſe ſpaces will not be every where equally intenſe, but will incline to the neighbouring colour: thus the part of the orange next to R, will incline to a red; that next to Y, to a yellow: and ſo of the reſt.

II. *From two or more of the primary colours, to compoſe others that ſhall, in appearance, reſemble thoſe of the former.*

BY mixing the two homogeneal colours red and yellow, an orange will be produced ſimilar in appearance to that in the ſeries of primary colours; but the light of the one being homogeneal, and that of the other heterogeneal, if the former be viewed through a priſm it will remain unaltered, but the other will be reſolved into its component colours red and yellow. In like manner other contiguous homogeneal colours may compound new colours; as by mixing yellow and green, a colour between them is formed; and if blue be added, there will appear a green that is the middle colour of thoſe three. For the yellow and blue, if they are equal in quantity, will draw the intermediate green equally toward them, and keep it, at it were, in equilibrio, that it verge not more to the one than to the other. To this compound green there may be added ſome red and violet; and yet the green will not immediately ceaſe, but grow leſs vivid; till by adding more red and violet it will become more diluted; and at laſt by the prevalence of the added colours, it will be overcome, and turned into ſome anomalous colour.

If the ſun's white, compoſed of all kinds of rays, be added

(c) From hence it ariſes, that black bodies, when expoſed to the ſun, become ſooner heated than all others.

CHROMATICS

Plate CXXXV

Fig. 3

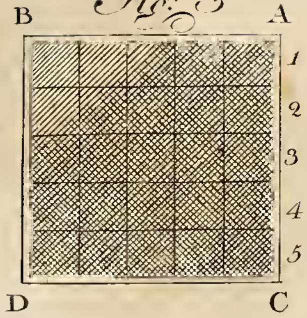


Fig. 2

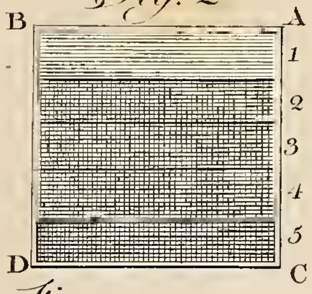


Fig. 1

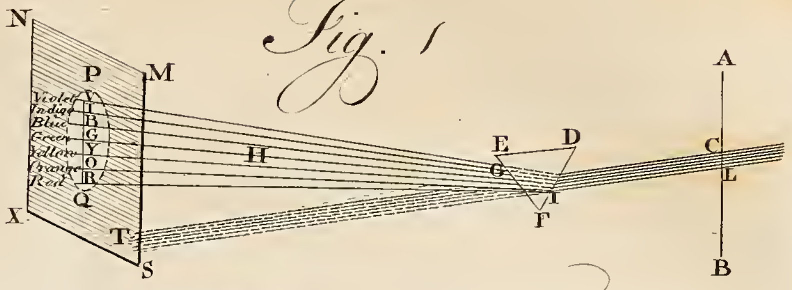


Fig. 7

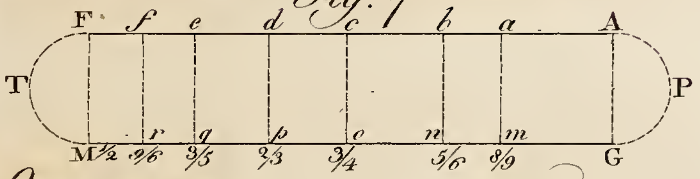


Fig. 4

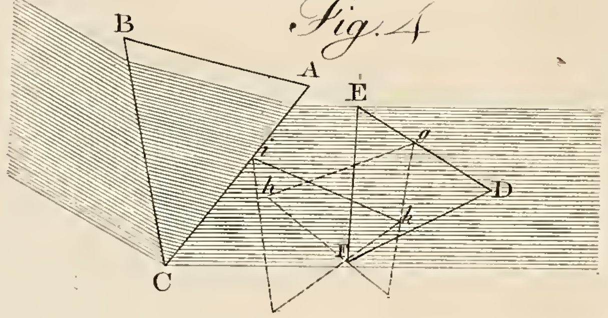


Fig. 9

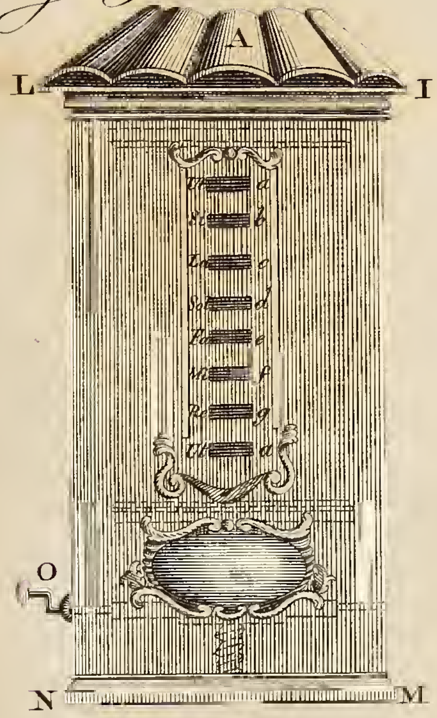


Fig. 8

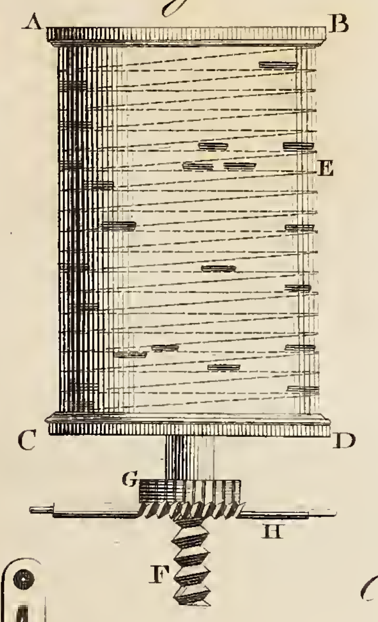
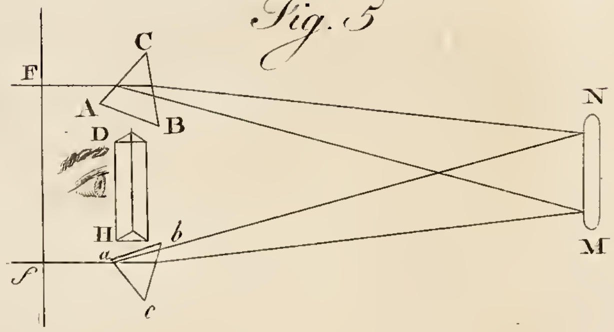
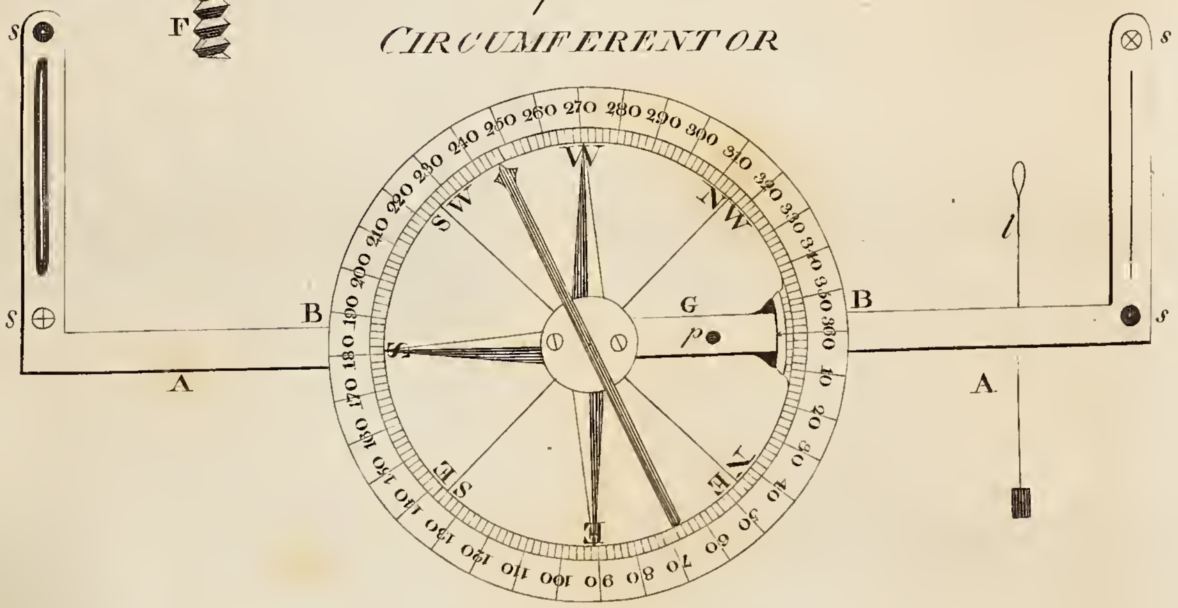


Fig. 6

Fig. 5



Improved,
CIRCUMFERENTOR



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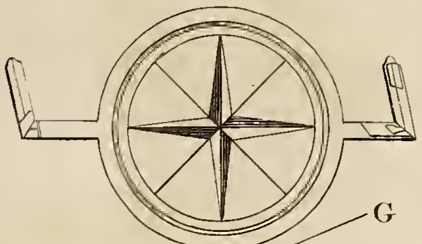

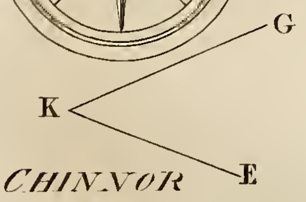

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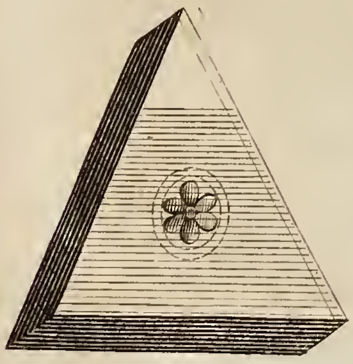
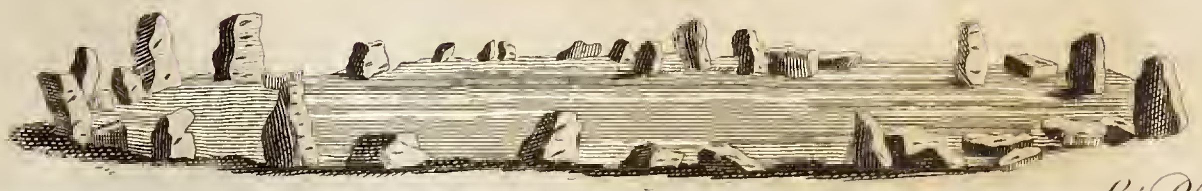


Druidical CIRCLE



Scot Philad.

added to any homogeneal colour, that colour will not vaniſh, nor change its ſpecies, but be diluted; and by adding more white, it will become continually more diluted. Laſtly, if red and violet be mixed, there will be generated, according to their various proportions, various purples, ſuch as are not like, in appearance, to the colour of any homogeneal light; and of theſe purples, mixed with blue and yellow, other new colours may be compoſed.

III. *Out of three of the primary colours, red, yellow, and blue, to produce all the other priſmatic colours, and all that are intermediate to them.*

Fig. 2. Provide three panes of glaſs of about five inches ſquare; and divide each of them, by parallel lines, into five equal parts. Take three ſheets of very thin paper; which you muſt paint, lightly, one blue, another yellow, and the third red (D). Then paſte on one of the glaſſes five pieces of the red paper; one of which muſt cover the whole glaſs, the ſecond only the four lower diviſions, the third the three lower, the fourth the two loweſt, and the fifth the laſt diviſion only. On the other two glaſſes five pieces of the blue and yellow papers muſt be paſted in like manner. You muſt alſo have a box of about ſix inches long, and the ſame depth and width as the glaſſes; it muſt be black on the inſide: let one end be quite open, and in the oppoſite end there muſt be a hole large enough to ſee the glaſſes completely. It muſt alſo open at the top, that the glaſſes may be placed in it conveniently.

When you have put any one of theſe glaſſes in the box, and the open end is turned toward the ſun, you will ſee five diſtinct ſhades of the colour it contains. If you place the blue and yellow glaſſes together, in a ſimilar direction, you will ſee five ſhades of green diſtinctly formed. When the blue and red glaſſes are placed, a bright violet will be produced; and by the red and yellow, the ſeveral ſhades of orange.

Fig. 3. If, inſtead of placing theſe glaſſes in a ſimilar poſition, you place the ſide AB of the yellow glaſs againſt the ſide BD of the blue, you will ſee all the various greens that are produced by nature (E); if the blue and red glaſſes be placed in that manner, you will have all the poſſible varieties of purples, violets, &c.; and, laſtly, if the red and orange glaſſes be ſo placed, there will be all the intermediate colours, as the marygold, aurora, &c.

IV. *By means of the three primary colours, red, yellow, and blue, together with light and ſhade, to produce all the gradations of the priſmatic colours.*

On ſeven ſquare panes of glaſs, paſte papers that are painted with the ſeven priſmatic colours, in the ſame manner as in the laſt experiment. The colours for the orange, green, indigo, and violet, may be made by mixing the other three. Then with biſtre (F), well diluted, ſhade a ſheet of very thin paper, by laying it light on both its ſides. With pieces of this paper cover four-fifths of a glaſs, of the ſame ſize with the others, by laying one piece on the four loweſt diviſions, another on the three loweſt, a third on the two loweſt, and the fourth on the loweſt diviſion only, and leaving the top diviſion quite uncovered. When one of the coloured glaſſes is placed in the box, together with the glaſs of ſhades, ſo that the ſide AB of the one be applied to the ſide BC of the other, as in fig. 3. the ſeveral gradations of colours will appear ſhaded in the ſame manner as a drapery judiciouſly painted with that colour.

It is on this principle that certain French artiſts have proceeded in their endeavours to imitate, by deſigns printed in colours, paintings in oil: which they do by four plates of the ſame ſize, on each of which is engraved the ſame deſign. One of theſe contains all the ſhades that are to be repreſented, and which are painted either black or with a dark grey. One of the three other plates is coloured with blue, another with red, and the third with yellow; each of them being engraved in thoſe parts only which are to repreſent that colour (G); and the engraving is either ſtronger or weaker, in proportion to the tone of colour that is to be repreſented (H).

Theſe four plates are then paſſed alternately under the preſs, and the mixture of their colours produces a print that bears no ſmall reſemblance to a painting. It muſt be confeſſed, however, that what has been hitherto done of this kind falls far ſhort of that degree of perfection of which this art appears ſuſceptible. If they who engrave the beſt in the manner of the crayon were to apply themſelves to this art, there is reaſon to expect

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(D) Water-colours muſt be uſed for this purpoſe: the blue may be that of Pruſſia, and very bright; the red, carmine; and the yellow, gambooge, mixed with a little ſaffron. Theſe colours muſt be laid very light and even, on both ſides of the paper.

(E) In the firſt poſition of the glaſſes, the quantity of blue and yellow being equal, the ſame ſort of green was conſtantly viſible: but by thus inverting the glaſſes, the quantity of the colours being conſtantly unequal, a very pleaſing variety of tints is produced.

(F) The biſtre here uſed muſt be made of ſoot, not that in ſtone.

(G) When a red drapery is required, it is engraved on the plate aſſigned to that colour; and ſo of yellow and blue: but if one of the other colours be wanting, ſuppoſe violet, it muſt be engraved on thoſe that print the red and blue: and ſo of the reſt. The plates of this kind have been hitherto engraved in the manner of mezzotinto; but theſe, unleſs they are ſkilfully managed, ſoon become ſmutty. Engravings in the manner of the crayon will perhaps anſwer better.

(H) The principal difficulty in this ſort of engraving ariſes from a want of a ſkilful management, in giving each plate that preciſe degree of engraving which will produce the tone of colour required. If a bright green is to be repreſented, there ſhould be an equal quantity of graving on the red and yellow plates: but if an olive green, the yellow plate ſhould be engraved much deeper than the red.

expect they would produce far more finiſhed pieces than we have hitherto ſeen.

V. *To make figures appear of different colours ſucceſſively.*

Fig. 4. MAKE a hole in the window-ſhutter of a dark room, through which a broad beam of light may paſs, that is to be refracted by the large glaſs priſm ABC, which may be made of pieces of mirrors cemented together, and filled with water. Provide another priſm DEF, made of three pieces of wood; through the middle of this there muſt paſs an axis on which it is to revolve. This priſm muſt be covered with white paper; and each of its ſides cut through in ſeveral places, ſo as to repreſent different figures, and thoſe of each ſide ſhould likewiſe be different. The inſide of this priſm is to be hollow, and made quite black, that it may not reflect any of the light that paſſes through the ſides into it. When this priſm is placed near to that of glaſs, as in the figure, with one of its ſides EF perpendicular to the ray of light, the figures on that ſide will appear perfectly white: but when it comes into the poſition *g h*, the figures will appear yellow and red; and when it is in the poſition *k l*, they will appear blue and violet. As the priſm is turned round its axis, the other ſides will have a ſimilar appearance. If inſtead of a priſm, a four or five ſided figure be here uſed, the appearances will be ſtill further diverſified.

This phenomenon ariſes from the different refrangibility of the rays of light. For when the ſide EF is in the poſition *g h*, it is more ſtrongly illuminated by the leaſt refrangible rays; and wherever they are predominant, the object will appear red or yellow. But when it is on the poſition *k l*, the more refrangible rays being then predominant, it will appear tinged with blue and violet.

VI. *The ſolar magic lantern.*

PROCURE a box, of about a foot high, and eighteen inches wide, or ſuch other ſimilar dimenſions as you ſhall think fit; and about three inches deep. Two of the oppoſite ſides of this box muſt be quite open; and in each of the other ſides let there be a groove, wide enough to paſs a ſtiff paper or paſteboard. This box muſt be faſtened againſt a window on which the ſun's rays fall direct. The reſt of the window ſhould be cloſed up, that no light may enter. Provide ſeveral ſheets of ſtiff paper, which muſt be blacked on one ſide. On theſe papers cut out ſuch figures as you ſhall think proper: and placing them alternately in the grooves of the box, with their blacked ſides towards you, look at them through a large and clear glaſs priſm; and if the light be ſtrong, they will appear to be painted with the moſt lively colours in nature. If you cut on one of theſe papers the form of the rainbow, about three quarters of an inch wide, you will have a lively repreſentation of that in the atmoſphere.

This experiment may be further diverſified, by paſting very thin papers, lightly painted with different colours, over ſome of the parts that are cut out: which will appear to change their colours when viewed through the priſm, and to ſtand out from the paper, at different diſtances, according to the different degrees of refrangibility of the colours with which they are painted. For greater convenience, the priſm may be placed in a ſtand on a table, at the height of your eye, and made to turn round on an axis, that when you have got an agreeable proſpect, you may fix it in that poſition.

VII. *The priſmatic camera obſcura.*

MAKE two holes F, *f*, in the ſhutter of a dark chamber, near to each other; and againſt each hole place a priſm ABC, and *a b c*, in a perpendicular direction, that their ſpectrums NM may be caſt on the paper in a horizontal line, and coincide with each other; the red and violet of the one being in the ſame part with thoſe of the other. The paper ſhould be placed at ſuch a diſtance from the priſms that the ſpectrum may be ſufficiently dilated. Provide ſeveral papers nearly of the ſame dimenſions with the ſpectrum, croſs theſe papers, and draw lines parallel to the diviſions of the colours. In theſe diviſions cut out ſuch figures as you ſhall find will have an agreeable effect, as flowers, trees, animals, &c. When you have placed one of theſe papers in its proper poſition, hang a black cloth or paper behind it, that none of the rays that paſs through may be reflected and confuſe the phenomenon. The figures cut on the paper will then appear ſtrongly illuminated with all the original colours of nature. If while one of the priſms remains at reſt, the other be revolved on its axis, the continual alteration of the colours will afford a pleaſing variety; which may be further increaſed by turning the priſm round in different directions. Fig. 5.

When the priſms are ſo placed that the two ſpectrums become coincident in an inverted order of their colours, the red end of one falling on the violet end of the other; if they be then viewed through a third priſm DH, held parallel to their length, they will no longer appear coincident, but in the form of two diſtinct ſpectrums, *pt* and *nm* (fig. 6.), croſſing one another in the middle, like the letter X: the red of one ſpectrum and the violet of the other, which were coincident at NM, being parted from each other by a greater refraction of the violet to *p* and *m*, than that of the red to *n* and *t*.

This experiment may be further diverſified by adding two other priſms, that ſhall form a ſpectrum in the ſame line, and contiguous in the other; by which not only the variety of figures, but the viciſſitude of colours, will be conſiderably augmented.

The diatonic ſcale of colours.

THE illuſtrious Newton, in the courſe of his inveſtigations of the properties of light, diſcovered that the length of the ſpaces which the ſeven primary colours poſſeſs in the ſpectrum, exactly correſponds to thoſe of chords that ſound the ſeven notes in the diatonic ſcale of muſic. As is evident by the following experiment.

On a paper in a dark chamber, let a ray of light be largely refracted into the ſpectrum AFTMGP, and mark the preciſe boundaries of the ſeveral colours, as *a*, *b*, *c*, *&c.* Draw lines from thoſe points perpendicular to the oppoſite ſide, and you will find that the ſpaces M *r f* F, by which the red is bounded: *r g e f*, by which the orange is bounded; *q p e d*, by which the yellow is bounded, *&c.* will be in exact proportion Fig. 7.

to

to the diviſions of a muſical chord for the notes of an octave; that is, as the intervals of theſe numbers 1, $\frac{8}{9}$, $\frac{5}{6}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{3}{5}$, $\frac{9}{16}$, $\frac{1}{2}$.

IX. *Colorific muſic.*

Father Castel, a Frenchman, in a curius book he has publiſhed on chromatics, ſuppoſes the note *ut* to anſwer to blue in the priſmatic colours; the note *re* to yellow, and *mi* to red. The other tones he refers to the intermediate colours; from whence he conſtructs the following gamut of colorific muſic:

Ut	Blue
Ut ſharp	Sea-green
Re	Bright green
Re ſharp	Olive green
Mi	Yellow
Fa	Aurora
Fa ſharp	Orange
Sol	Red
Sol ſharp	Crimſon
La	Violet
La ſharp	Blue Violet
Si	Sky blue
Ut	Blue

This gamut, according to his plan, is to be continued in the ſame manner for the following octave; except that the colours are to be more vivid.

He ſuppoſes that theſe colours, by ſtriking the eye in the ſame ſucceſſion as the ſounds (to which he makes them analogous) do the ear, and in the ſame order of time, they will produce a correſpondent ſenſation of pleaſure in the mind. It is on theſe general principles, which F. Caſtel has dilucidated in his treatiſe, that he has endeavoured, though with little ſucceſs, to eſtabliſh his ocular harpſichord.

The conſtruction of this inſtrument, as here explained, will ſhow that the effects produced by colours by no means anſwer thoſe of ſounds, and that the principal relation there is between them conſiſts in the duration of the time that they reſpectively affect the ſenſes.

Fig. 8. Between two circles of paſteboard, of ten inches diameter, AB and CD, incloſe a hollow paſteboard cylinder E, 18 inches long. Divide this cylinder into ſpaces half an inch wide, by a ſpiral line that runs round it from top to bottom, and divide its ſurface into ſix equal parts by parallel lines drawn between its two extremities; as is expreſſed in the figure.

Let the circle AB, at top, be open; and let that at bottom, CD, be cloſed, and ſupported by an axis or ſcrew, of half an inch diameter, which muſt turn freely in a nut placed at the bottom of a box we ſhall preſently deſcribe. To the axis juſt mentioned adjuſt a wooden wheel G, of two inches and a half in diameter, and that has 12 or 15 teeth, which take the endleſs ſcrew H. Let this cylinder be incloſed in a box ILMN (fig. 9.) whoſe baſe is ſquare, and at whoſe bottom there is a nut in which the axis F turns. Obſerve that the endleſs ſcrew H ſhould come out of the box, that it may receive the handle O, by which the cylinder is to be turned.

This box being cloſed all round, place over it a tin covering A, which muſt be perforated in different parts; from this cover there muſt hang three or four lights, ſo placed that they may ſtrongly illumine the inſide of the cylinder. In one ſide of this box (which ſhould be covered with paſteboard) cut eight apertures, *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, of half an inch wide, and $\frac{1}{3}$ of an inch high; they muſt be directly over each other, and the diſtance between them muſt be exactly two inches. It is by theſe openings, which here correſpond to the muſical notes, that the various colours analogous to them are to appear; and which being placed on the paſteboard cylinder, as we have ſhown, are reflected by means of the lights placed within it. Fig. 9.

It is eaſy to conceive, that when the handle O is turned, the cylinder in conſequence riſing half an inch, if it be turned five times round, it will ſucceſſively ſhow, at the openings made in the ſide of the box, all thoſe that are in the cylinder itſelf, and which are ranged according to the direction of the inclined lines drawn on it. It is therefore according to the duration of the notes which are to be expreſſed, that the apertures on the cylinder are to be cut. Obſerve, that the ſpace between two of the parallel lines drawn vertically on the cylinder, is equal to one meaſure of time; therefore, for every turn of the cylinder, there are ſix meaſures, and thirty meaſures for the air that is to be played by this inſtrument.

The ſeveral apertures being made in the ſide of the cylinder, in conformity to the notes of the tune that is to be expreſſed, they are to be covered with double pieces of very thin paper, painted on both ſides with the colours that are to repreſent the muſical notes.

This experiment might be executed in a different manner, and with a much greater extent; but as the entertainment would not equal the trouble and expence, we have thought it ſufficient to give the above piece, by which the reader will be enabled to judge how far the analogy ſuppoſed by F. Caſtel really exiſts.

Chronic, Chronicle.

CHRONIC, or chronical, among phyſicians, an appellation given to diſeaſes that continue a long time; in contradiſtinction to thoſe that ſoon terminate and are called *acute*.

CHRONICLE, in matters of literature, a ſpecies or kind of hiſtory diſpoſed according to the order of time, and agreeing in moſt reſpects with annals. See Annals.

Parian Chronicle. See *Arundelian Marbles*. Since that article was printed, in which an abſtract was given of Mr Robertſon's doubts and obſervations reſpecting the authenticity of the Parian Chronicle, one or two publications have ſince appeared in anſwer, but none of them calculated to remove the objections or materially to affect the arguments that had been ſtated with ſo much learning and ingenuity againſt it. The following ſtrictures, however, with which the Monthly Reviewers have concluded their critique of Mr Robertſon's performance, ſeem to merit conſideration.

Chronicle.

Monthly Review, Jan. 1787.

On Objection I. *That the characters have no certain or unequivocal marks of antiquity*, the Reviewers remark, that this ſeems rather to be an anſwer to a defender of the inſcription, than an objection. If a zealous partizan of the marble ſhould appeal to its characters and orthography, as deciſive proofs of its being genuine, it would be proper enough to anſwer, that theſe circumſtances afford no certain criterion of authenticity. But in this word *certain* ſculks an unlucky ambiguity. If it means demonſtrative, it muſt be allowed that no inſcription can be proved to be certainly genuine from theſe appearances; but if it means no more than highly probable, many inſcriptions poſſeſs ſufficient internal evidence to give their claims this degree of certainty. The true queſtion is, Has not the Parian Chronicle every mark of antiquity that can be expected in a monument claiming the age of 2000 years? The letters Γ and Ξ are, by Mr R's own confeſſion, ſuch as occur in genuine inſcriptions; and to ſay in anſwer, that an impoſtor might copy the forms of theſe letters from other inſcriptions, is already to ſuppoſe the inſcription forged, before it is rendered probable by argument. The learned author of the Diſſertation ſeems to betray ſome doubt of his own concluſion; for he adds, p. 56. "that the antiquity of an inſcription can never be proved by the mere form of the letters, becauſe the moſt ancient characters are as eaſily counterfeited as the modern." But this objection is equally applicable to all other ancient inſcriptions; and is not to the purpoſe, if the preſent inſcription has any peculiar marks of impoſture in its characters and orthography. "The characters do not reſemble the Sigean, the Nemean, or the Delian inſcriptions." Mr R. anſwers this objection himſelf, by adding, "which are ſuppoſed to be of a more ancient date." The oppoſite reaſon to this will be a ſufficient anſwer to the other objection, "that they do not reſemble the Farneſian pillars or the Alexandrian MS." If "they differ in many reſpects from the Marmor Sandvicenſe," they may be preſumed to agree in many. "They ſeem to reſemble, more than any other, the alphabet taken by Montfaucon from the Marmor Cyzicenum." Thus it appears that the Parian Chronicle moſt nearly reſembles the two inſcriptions, to whoſe age it moſt nearly approaches.

When Mr R. adds, that the letters "are ſuch as an ordinary ſtone-cutter would probably make, if he were employed to engrave a Greek inſcription, according to the alphabet now in uſe," he muſt be underſtood *cum grano ſalis*. The engraver of a fac ſimile generally omits ſome nice and minute touches in taking his copy; but, even with this abatement, we dare appeal to any adept in Greek calligraphy, whether the ſpecimen facing p. 56, will juſtify our author's obſervation? "The ſmall letters (ο, Θ, Ω) intermixed among the larger, have an air of affectation and artifice." Then has the greater part of ancient inſcriptions an air of affectation and artifice. For the ο is perpetually engraved in this diminutive ſize; and Ω being of a kindred ſound, and Θ of a kindred ſhape, how can we wonder that all three ſhould be repreſented of the ſame magnitude? In the inſcription which immediately follows the marble in Dr Chandler's edition, N° XXIV. theſe very three letters are never ſo large as the reſt, and often much ſmaller; of which there are inſtances in the three firſt lines. See alſo two medals in the ſecond part of Dorville's Siculà, Tab. XVI. Numb. 7, 9.

"From the archaiſms, ſuch as εγ Λυκαρειας, εγ Κυβελοις, εμ Παρωι, &c. &c. no concluſion can be drawn in favour of the authenticity of the inſcription." Yet ſurely every thing common to it with other inſcriptions, confeſſedly genuine, creates a reaſonable preſumption in its favour. "But what reaſon could there be for theſe archaiſms in the Parian Chronicle? We do not uſually find them in Greek writers of the ſame age, or even of a more early date." The reaſon is, according to our opinion, that ſuch archaiſms were then in uſe: this we know from other inſcriptions, in which ſuch archaiſms (or, as our author afterward calls them, barbariſms) are frequent. Nothing can be inferred from the Greek writers, unleſs we had their autographs. The preſent ſyſtem of orthography in our printed Greek books is out of the queſtion. Again, "The inſcription ſometimes adopts and ſometimes neglects theſe archaiſms, as in lines 4, 12, 27, 52, 63, 67." This inconſiſtency either is no valid objection, or if it be valid, will demoliſh not only almoſt every other inſcription, but almoſt every writing whatſoever. For example, in the inſcription juſt quoted, N° XXIV. we find τοΝ βασιλεα, l. 20. and οταΜ πεμπτηι, 34. A little farther, N° XXVI. l. 31. we have εΓ Μαγνησιας, 57. 73. 81. εΚ Μαγνησιας, and 106. 108. εΚΓ Μαγνησιας. The Corcyrean inſcription (Montfaucon, Diar. Ital. p. 420) promiſcuouſly uſes εΚδανειζομαι and εΓδανειζομαι. In Engliſh, who is ſurpriſed to find *has* and *hath*, *a hand* and *an hand*, *a uſeful* and *an uſeful*, in the works of the ſame author? We could produce inſtances of this inaccuracy from the ſame page, nay from the ſame ſentence.

"The authenticity of thoſe inſcriptions, in which theſe archaiſms appear, muſt be eſtabliſhed, before they can be produced in oppoſition to the preſent argument." This is, we cannot help thinking, rather too ſevere a reſtriction. If no inſcription may be quoted before it be proved genuine, the learned author of the Diſſertation need not be afraid of being confuted; for nobody will engage with him on ſuch conditions. Perhaps the reverſe of the rule will be thought more equitable; that every inſcription be allowed to be genuine, till its authenticity be rendered doubtful by probable arguments. We will conclude this head with two ſhort obſervations. In Selden's copy, l. 26. was written ΠΟΗΣΙΝ, which the later editors have altered to ΠΟΙΗΣΙΝ, but without reaſon, the other being the more ancient way of writing, common in MSS. and ſometimes found on inſcriptions. (See G. Koen's Notes on *Gregorius de Dialectis*, p. 30.) In l. 83. the marble has Καλλεου, for which Palmer wiſhed to ſubſtitute Καλλιου. Dr Taylor refutes him from the *Marmor Sandvicenſe*, obſerving at the ſame time, that this orthography occurs in no other place whatever except in theſe two monuments. Is it likely that two engravers ſhould by chance coincide in the ſame miſtake, or that the forger of the Parian Chronicle (if it be forged) ſhould have ſeen the *Marmor Sandvicenſe*, and taken notice of this peculiarity with the intention of afterward employing it in the fabrication of an impoſture?

The Reviewers next proceed to conſider, but more briefly, the other objections.

II. *It is not probable that the Chronicle was engraved for private uſe.* 1. *Becauſe it was ſuch an expence, as few learned Greeks were able to afford.* If only a *few* were able to afford it, ſome one of thoſe *few* might be willing to incur it. But let Mr R. conſider how likely it is that a modern, and probably a needy Greek, ſhould be more able to afford it in the laſt century, than a learned Greek 2000 years ago! 2. *A manuſcript is more readily circulated.* Do men never prefer cumbrous ſplendor to cheapneſs and convenience? And if this compoſition, inſtead of being engraved on marble, had been committed to parchment, would it have had a better chance of coming down to the preſent age? Such a flying ſheet would ſoon be loſt; or, if a copy had, by miracle, been preſerved to us, the objections to its being genuine would be more plauſible than any that have been urged againſt the inſcription. What Mr R. ſays about the errors to which an inſcription is liable, &c. will only prove that chronological inſcriptions ought not to be engraved; but not that they never were. We allow that the *common* method of writing in the reign of Ptolemy Philadelphus was NOT on STONES. But it was common enough to occur to the mind of any perſon who wiſhed to leave behind him a memorial at once of his learning and magnificence.

III. This objection, *that the marble does not appear to be engraved by public authority*, we ſhall readily admit, though Bentley (Diſſ. on Phalaris, p. 251.) leans to the contrary opinion. In explaining this objection, the learned diſſertator obſerves, that though the expreſſion, αρχοντος εμ Παρωι, would lead us to ſuppoſe that the inſcription related to Paros, not a ſingle circumſtance in the hiſtory of that iſland is mentioned. But this expreſſion only ſhows that the author was an inhabitant of Paros, and intended to give his readers a clue, or *parapegma*, by the aid of which they might adjuſt the general chronology of Greece to the dates of their own hiſtory. "It is as abſurd as would be a marble in Jamaica containing the revolutions of England." We ſee no abſurdity in ſuppoſing a book to be written in Jamaica containing the revolutions of England. The natives of Paros were not unintereſted in events relating to the general hiſtory of Greece, particularly of Athens; and how can we tell whither the author were an *inquilinus* or a native of the iſland; whether he thought it a place beneath his care; or whether he had devoted a ſeparate inſcription to the chronology of Paros?

IV. *It has been frequently obſerved, that the earlier periods of the Grecian hiſtory are involved in darkneſs and confuſion.* Granted. It follows then, that "an author who ſhould attempt to ſettle the dates of the earlier periods would frequently contradict preceding, and be contradicted by ſubſequent, writers: that he would naturally fall into miſtakes: and at beſt could only hope to adopt the moſt probable ſyſtem. But the difficulty of the taſk, or the impoſſibility of ſucceſs, are not ſufficient to prove that no man has been raſh or mad enough to make the attempt." On the contrary, we know that many have made it. What a number of diſcordant opinions has Mr R. himſelf given us from the ancients concerning the age of Homer? This conſideration will in part obviate another objection, that the Parian Chronicle does not agree with any ancient author. For if the ancients contradict one another, how could it follow more than one of them? and why might not the author, without any imputation of ignorance or raſhneſs, ſometimes depart from them all? If indeed he diſagrees with them when they are unanimous, it might furniſh matter for ſuſpicion; though even this would be far from a deciſive argument, unleſs the ancients were ſo extremely unlike the moderns, as never to be fond of ſingular and paradoxical poſitions.

V. *This Chronicle is not once mentioned by any writer of antiquity.* How many of thoſe inſcriptions, which are preſerved to the preſent day, are mentioned by claſſical authors? Verrius Flaccus compoſed a Roman kalendar, which, as a monument of his learning and induſtry, was engraved on marble, and fixed in the moſt public part of Preneſte. Fragments of this very kalendar were lately dug up at Preneſte, and have been publiſhed by a learned Italian. Now, if the paſſage of Suetonius, which informs us of this circumſtance, had been loſt, would the ſilence of the Latin writers prove that the fragments were not genuine remains of antiquity? It may be ſaid that the caſes are not parallel; for not a ſingle author mentions the Parian Chronicle, whereas Suetonius does mention Verrius's Roman kalendar. To this we anſwer, It is dangerous to deny the authenticity of any monument on the ſlender probability of its being caſually mentioned by a ſingle author. We ſhall alſo obſerve, that this fact of the Hemicyclium of Verrius will anſwer ſome part of the Diſſertator's ſecond objection: "The Parian Chronicle is not an inſcription that might have been concealed in a private library." Why not? it is of no extraordinary bulk; and might formerly have been concealed in a private library, or in a private room, with as much eaſe as many inſcriptions are now concealed in very narrow ſpace. But unleſs the monument were placed in ſome conſpicuous part of the iſland, and obtruded itſelf on the notice of every traveller, the wonder will in great meaſure ceaſe why it is never quoted by the ancients. Of the nine authors named in p. 109, had any one ever viſited Paros? If Pauſanias had travelled thither, and publiſhed his deſcription of the place, we might perhaps expect to find ſome mention of this marble in ſo curious and inquiſitive a writer. But though the inſcription exiſted, and were famous at Paros, there ſeems no neceſſity for any of the authors whoſe works are ſtill extant to have known or recorded it. If there be, let this learned antagoniſt point out the place where this mention ought to have been made. If any perſons were bound by a ſtronger obligation than others to ſpeak of the Parian inſcription, they muſt be the profeſſed chronologers; but alas! we have not the entire works of ſo much as a ſingle ancient chronologer: It is therefore impoſſible to determine whether this Chronicle were quoted by any ancient. And ſuppoſing it had been ſeen by ſome ancient, whoſe writings ſtill remain, why ſhould he make particular mention of it? Many authors, as we know from their remains, very freely copied their predeceſſors without naming them. Others, finding only a collection of bare events in the inſcription, without hiſtorical proofs or reaſons, might entirely neglect it, as deſerving no credit. Mr R. ſeems to lay much ſtreſs on the preciſe, exact, and particular ſpecification of the events, p. 109. But he ought to reflect, that this abrupt and poſitive method of ſpeaking is not only uſual, but neceſſary, in ſuch ſhort ſyſtems of chronology as the marble contains, where events only, and their dates, are ſet down, unaccompanied by any examination of evidences for and againſt, without ſtating any computation of probabilities, or deduction of reaſons. When therefore a chronological writer had undertaken to reduce the general hiſtory of Greece into a regular and conſiſtent ſyſtem, admitting that he was acquainted with this inſcription, what grounds have we to believe that he would ſay any thing about it? Either his ſyſtem coincided with the Chronicle or not: if it coincided, he would very probably diſdain to prop his own opinions with the unſupported aſſertions of another man, who, as far as he knew was not better informed than himſelf. On the other hand, if he differed from the authority of the marble, he might think it a ſuperfluous exertion of complaiſance, to refute, by formal demonſtration, a writer who had choſen to give no reaſons for his own opinion. We ſhall paſs hence to

Objection VII. With reſpect to the parachroniſms that Mr R. produces, we ſhall without heſitation grant, that the author of the inſcription may have committed ſome miſtakes in the chronology, as perhaps concerning Phidon, whom he ſeems to have confounded with another of the ſame name, &c. But theſe miſtakes will not conclude againſt the antiquity of the inſcription, unleſs we at the ſame time reject many of the principal Greek and Roman writers, who have been convicted of ſimilar errors. We return therefore to

Objection VI. *Some of the facts ſeem to have been taken from authors of a later date.* We have endeavoured impartially to examine and compare the paſſages quoted in proof of this objection; but we are obliged to confeſs, that we do not perceive the fainteſt traces of theft or imitation. One example only deſerves to be excepted; to which we ſhall therefore pay particular attention.

"The names of ſix; and, if the lacunæ are properly ſupplied, the names of twelve cities, appear to have been engraved on the marble, exactly as we find them in Ælian's Various Hiſtory. But there is not any imaginable reaſon for this particular arrangement. It does not correſpond with the time of their foundation, with their ſituation in Ionia, with their relative importance, or with the order in which they are placed by other eminent hiſtorians."

The chance of ſix names, ſays Mr R. being placed by two authors in the ſame order, is as 1 to 720; of 12, as 1 to 479,001,600. "It is therefore utterly improbable that theſe names would have been placed in this order on the marble, if the author of the inſcription had not tranſcribed them from the hiſtorian."

On this argument we ſhall obſerve, 1. That the very contrary concluſion might poſſibly be juſt, that the hiſtorian tranſcribed from the inſcription. Yet we ſhall grant that in the preſent caſe this is improbable, eſpecially if the author of the Various Hiſtory be the ſame Ælian, who, according to Philoſtratus, Vit. Sophiſt. II. 31. never quitted Italy in his life. But an intermediate writer might have copied the marble, and Ælian might have been indebted to him. 2dly, We ſee no reaſon to allow, that the *lacunæ* are properly ſupplied. Suppoſe we ſhould aſſert, that the names ſtood originally thus: Miletus, Epheſus, Erythræ, Clazomenæ, Lebedos, Chios, Phocæa, Colophon, Myus, Priene, Samos, Teos. In this arrangement, only four names would be together in the ſame order with Ælian; and from theſe Miletus muſt be excepted, becauſe there is an obvious reaſon for mentioning that city firſt. Three only will then remain; and ſurely that is too ſlight a reſemblance to be conſtrued into an imitation. For Pauſanias and Paterculus, quoted by our author, p. 154, have both enumerated the ſame twelve cities, and both agree in placing the five laſt in the ſame order; nay, the ſix laſt, if Voſſius's conjecture that TEUM ought to be inſerted in Paterculus after Myum TEM be as true as it is plauſible. But who imagines that Pauſanias had either opportunity or inclination to copy Paterculus? 3dly, Allowing that the names were engraved on the marble exactly in the order that Ælian has choſen, is there no way of ſolving the phenomenon but by ſuppoſing that one borrowed from the other? Seven authors at leaſt (Mr R ſeems to ſay more, p. 154, 5.) mention the colonization of the ſame cities: how many authors now loſt may we reaſonably conjecture to have done the ſame? If therefore the compoſer of the Chronicle and Ælian lighted on the ſame author, the former would probably preſerve the ſame arrangement that he found, becauſe in tranſcribing a liſt of names, he could have no temptation to deviate; and the latter would certainly adhere faithfully to his original, becauſe he is a notorious and ſervile plagiariſt. Mr R. indeed thinks, p. 158, that if a ſucceeding writer had borrowed the words of the inſcription, he would not have ſuppreſſed the name of the author. This opinion muſt fall to the ground, if it be ſhown that Ælian was accuſtomed to ſuppreſs the names of the authors to whom he was obliged. Ælian has given a liſt of fourteen celebrated gluttons; and, elſewhere, another of twenty-eight drunkards (from which, by the way, it appears, that people were apt to eat and drink rather too freely in ancient as well as modern times); and both theſe liſts contain exactly the ſame names in the ſame order with Atheneus. Now, it is obſervable, that fourteen names may be tranſpoſed 87,178,291,200 different ways, and that twenty-eight names admit of 304,888,344,611,713,860,501,504,000,000 different tranſpoſitions, &c. &c. Ælian therefore tranſcribed them from Atheneus? yet Ælian never mentions Atheneus in his Various Hiſtory. So that whether Ælian copied from the marble, or only drew from a common ſource, he might, and very probably would, conceal his authority.

VIII. *The hiſtory of the diſcovery of the Marbles is obſcure and unſatisfactory.*

In p. 169, it is ſaid to be "related with ſuſpicious circumſtances, and without any of thoſe clear and unequivocal evidences which always diſcriminate truth from falſehood." The queſtion then is finally decided. If the inſcription has not any of thoſe evidences which truth always poſſeſſes, and which falſehood always wants, it is moſt certainly forged. The learned diſſertator ſeems for a moment to have forgotten the modeſt character of a *doubter*, and to perſonate the dogmatiſt. But waving this, we ſhall add, that, as far as we can ſee, no no appearance of fraud is diſcoverable in any part of the tranſaction. The hiſtory of many inſcriptions is related in a manner equally unſatisfactory; and if it could be clearly proved that the marble was dug up at Paros, what would be eaſier for a critic, who is determined at any rate to object, than to ſay, that it was buried there in order to be afterward dug up? If the perſon who brought this treaſure to light had been charged on the ſpot with forging it, or concurring in the forgery, and had then refuſed to produce the external evidences of its authenticity, we ſhould have a right to queſtion, or perhaps to deny, that it was genuine. But no ſuch objection having been made or hinted, at the original time of its diſcovery, it is unreaſonable to require ſuch teſtimony as it is now impoſſible to obtain. "There is nothing ſaid of it in Sir T. Roe's negotiations." What is the inference? That Sir Thomas knew nothing of it, or believed it to be ſpurious, or forged it, or was privy to the forgery? Surely nothing of this kind can be pretended. But let our author account for the circumſtance if he can. To us it ſeems of no conſequence on either ſide. "Peireſc made no effort to recover this precious relic; and from his compoſure he ſeems to have entertained ſome ſecret ſuſpicious of its authenticity." Peireſc would have had no chance of recovering it after it was in the poſſeſſion of lord Arundel's agents. He was either a real or a pretended patron of letters; and it became him to affect to be pleaſed that the inſcription had come into England, and was illuſtrated by his learned friend Selden. John F. Gronovius had, with great labour and expence, collated Anna Comnena's Alexiades, and intended to publiſh them. While he was waiting for ſome other collations, they were intercepted, and the work was publiſhed by another. As ſoon as Gronovius heard this unpleaſant news, he anſwered, that learned men were engaged in a common cauſe; that if one prevented another in any publication, he ought rather to be thanked for lightening the burden; than blamed for interfering. But who would conclude from this anſwer, that Gronovius thought the Alexiades ſpurious, or not worthy of any regard?

Mr R. calculates, that the venders of the marble received 200 pieces. But here again we are left in the dark, unleſs we knew the preciſe value of theſe pieces. Perhaps they might be equal to an hundred of our pounds, perhaps only to fifty. Beſides, as they at firſt bargained with Samſon Piereſc's ſuppoſed Jew agent for fifty pieces only, they could not have forged the inſcription with the clear proſpect of receiving more; neither does it appear that they were paid by Samſon. It is fully as reaſonable to ſuppoſe fraud on the one ſide as on the other; and if Samſon, after having the marble in his poſſeſſion, refuſed or delayed to pay the ſum ſtipulated, he might, in conſequence of ſuch refuſal or delay, be thrown into priſon, and might, in revenge, damage the marble before the owners could recover it. We own this account of ours to be a romance; but it is lawful to combat romance with romance.

IX. *The world has been frequently impoſed upon by ſpurious books and inſcriptions; and therefore we ſhould be extremely cautious with regard to what we receive under the venerable name of antiquity.*

Much truth is obſervable in this remark. But the danger lies in applying ſuch general apophthegms to particular caſes. In the firſt place, it muſt be obſerved, that no forged books will exactly ſuit Mr R.'s purpoſe, but ſuch as pretend to be the author's own hand-writing; nor any inſcriptions, but ſuch as are ſtill extant on the original materials, or ſuch as were known to be extant at the time of their pretended diſcovery. Let the argument be bounded by theſe limits, and the number of forgeries will be very much reduced. We are not in poſſeſſion of Cyriacus Anconitanus's book; but if we were governed by authority, we ſhould think that the teſtimony of Reineſius in his favour greatly overbalances all that Auguſtinus has ſaid to his prejudice. The opinion of Reineſius is of the more weight, becauſe he ſuſpects Urſinus of publiſhing counterfeit monuments. We likewiſe find the moſt eminent critics of the preſent age quoting Cyriacus without ſuſpicion (*Vid.* Ruhnken. in Timæi Lex. Plat. p. 10. apud Ceon, ad Gregor. p. 140.) The doctrine advanced in the citation from Hardouin is exactly conformable to that writer's uſual paradoxes. He wanted to deſtroy the credit of all the Greek and Latin writers. But inſcriptions hung like a millſtone about the neck of his project. He therefore reſolved to make ſure work, and to deny the genuineneſs of as many as he ſaw convenient: to effect which purpoſe, he intrenches himſelf in a general accuſation. If the author of the diſſertation had quoted a few more paragraphs from Hardouin, in which he endeavours, after his manner, to ſhow the forgery of ſome inſcriptions, he would at once have adminiſtered the poiſon and the antidote. But to the reveries of that learned madman, reſpecting Greek ſuppoſititious compoſitions of this nature, we ſhall content ourſelves with oppoſing the ſentiments of a modern critic, whoſe judgment on the ſubject of ſpurious inſcriptions will not be diſputed. Maffei, in the introduction to the third book, c. 1. p. 51. of his admirable, though unfiniſhed, work *de Arte Critica Lapidaria*, uſes theſe words: *Inſcriptionum Græce loquentium commentitias, ſi cum Latinis comparemus, deprehendi paucas; neque enim ullum omnino eſt, in tanta debacchantium falſariorum libidine, monumenti genus, in quod ii ſibi minus licere putaverint. Argumenta eſt, pauciſſimas uſque in hanc diem ab eruditis viris, et in hoc literarum genere plurimum verſatis rejectas eſſe, falſique damnatas.*

Books of CHRONICLES, a canonical writing of the Old Teſtament. It is uncertain which were written firſt, *The Books of Kings*, or *The Chronicles*, ſince they each refer to the other. However it be, the latter is often more full and comprehenſive than the former. Whence the Greek interpreters call theſe two books Παραλειπομενα, *Supplements*, *Additions*, becauſe they contain ſome circumſtances which are omitted in the other hiſtorical books. The Jews make but one book of the Chronicles, under the title of *Dibre-Haiamim*, i. e. *Journals or Annals*. Ezra is generally believed to be the author of theſe books. It is certain they were written after the end of the Babyloniſh captivity and the firſt year of the reign of Cyrus, of whom mention is made in the laſt chapter of the ſecond book.

The *Chronicles*, or *Paraleipomena*, are an abridgement

ment of all the ſacred hiſtory, from the beginning of the Jewiſh nation to their firſt return from the captivity taken out of thoſe books of the Bible which we ſtill have, and out of other annals which the author had then by him. The deſign of the writer was to give the Jews a ſeries of their hiſtory. The firſt book relates to the riſe and propagation of the people of Iſrael from Adam, and gives a punctual and exact account of the reign of David. The ſecond book ſets down the progreſs and end of the kingdom of Judah, to the very year of their return from the Babyloniſh captivity.

CHRONOGRAM, a ſpecies of falſe wit, conſiſting in this, that a certain date or epocha is expreſſed by numeral letters of one or more verſes; ſuch is that which makes the motto of a medal ſtruck by Guſtavus Adolphus in 1632:

ChrIſtVs DVX; ergo trIVMphVs.

CHRONOLOGY,

1 How divided.

TREATS of time, the method of meaſuring its parts, and adapting theſe, when diſtinguiſhed by proper marks and characters, to paſt tranſactions, for the illuſtration of hiſtory. This ſcience therefore conſiſts of two parts. The firſt treats of the proper meaſurement of time, and the adjuſtment of its ſeveral diviſions; the ſecond of fixing the dates of the various events recorded in hiſtory, and ranging them, according to the ſeveral diviſions of time, in the order in which they happened.

2 Chronology unknown to the ancients.

3 Inaccurate methods of computing time at firſt made uſe of.

Chronology, comparatively ſpeaking, is but of modern date. The ancient poets appear to have been entirely unacquainted with it; and Homer, the moſt celebrated of them all, mentions nothing like a formal kalendar in any part of his writings. In the moſt early periods, the only meaſurement of time was by the ſeaſons, the revolutions of the ſun and moon; and many ages muſt have elapſed before the mode of computation by dating events came into general uſe. Several centuries intervened between the era of the olympic games and the firſt hiſtorians; and ſeveral more between theſe and the firſt authors of chronology. When time firſt began to be reckoned, we find its meaſures very indeterminate. The ſucceſſion of Juno's prieſteſſes at Argos ſerved Hellanicus for the regulation of his narrative; while Ephorus reckoned his matters by generations. Even in the hiſtory of Herodotus and Thucydides, we find no regular date for the events recorded; nor was there any attempt to eſtabliſh a fixed era, until the time of Ptolemy Philadelphus, who attempted it by comparing and correcting the dates of the olympiads, the kings of Sparta, and the ſucceſſion of the prieſteſſes of Juno at Argos. Eratoſthenes and Apollodorus digeſted the events recorded by them according to the ſucceſſion of the olympiads and of the Spartan kings.

4 Ancient hiſtorians not to be credited.

The uncertainty of the meaſures of time in the moſt early periods renders the hiſtories of thoſe times equally uncertain; and even after the invention of dates and eras, we find the ancient hiſtorians very inattentive to them, and inaccurate in their computations. Frequently their eras and years were reckoned differently without their being ſenſible of it, or at leaſt without giving the reader any information concerning it; a circumſtance which has rendered the fragments of their works now remaining of very little uſe to poſterity. The Chaldean and Egyptian writers are generally acknowledged to be fabulous; and Strabo acquaints us, that Diodorus Siculus, and the other early hiſtorians of Greece, were ill informed and credulous. Hence the diſagreement among the ancient hiſtorians, and the extreme confuſion and contradiction we meet with on comparing their works. Hellanicus and Aceſilaus diſagreed about their genealogies; the latter rejected the traditions of Heſiod. Timæus accuſed Ephorus of falſehood, and the reſt of the world accuſed Timæus. The moſt fabulous legends were impoſed on the world by Herodotus; and even Thucydides and Diodorus, generally accounted able hiſtorians, have been convicted of error. The chronology of the Latins is ſtill more uncertain. The records of the Romans were deſtroyed by the Gauls; and Fabius Pictor, the moſt ancient of their hiſtorians, was obliged to borrow the greateſt part of his information from the Greeks. In other European nations the chronology is ſtill more imperfect and of a later date; and even in modern times, a conſiderable degree of confuſion and inaccuracy has ariſen from want of attention in the hiſtorians to aſcertain the dates and epochs with preciſion.

5 Utility of chronology, liſt of chronologers, &c.

From theſe obſervations it is obvious how neceſſary a proper ſyſtem of chronology muſt be for the right underſtanding of hiſtory, and likewiſe how very difficult it muſt be to eſtabliſh ſuch a ſyſtem. In this, however, ſeveral learned men have excelled, particularly Julius Africanus, Euſebius of Cæſarea, George Cyncelle, John of Antioch, Dennis, Petau, Cluviar, Calviſius, Uſher, Simſon Marſham, Blair, and Playfair. It is founded, 1. On aſtronomical obſervations, particularly of the eclipſes of the ſun and moon, combined with the calculations of the eras and years of different nations. 2. The teſtimonies of credible authors. 3. Thoſe epochs in hiſtory which are ſo well atteſted and determined, that they have never been controverted. 4. Ancient medals, coins, monuments, and inſcriptions. None of theſe, however, can be ſufficiently intelligible without an explanation of the firſt part, which, we have already obſerved, conſiders the diviſions of time, and of which therefore we ſhall treat in the firſt place.

6 Of the diviſion of time into days.

The moſt obvious diviſion of time is derived from the apparent revolutions of the celeſtial bodies, particularly of the ſun, which by the viciſſitudes of day and night becomes evident to the moſt barbarous and ignorant nations. In ſtrict propriety of ſpeech the word *day* ſignifies only that portion of time during which the ſun diffuſes light on any part of the earth; but in the moſt comprehenſive ſenſe, it includes the night alſo, and is called by chronologers a *civil* day; by aſtronomers a *natural*, and ſometimes an *artificial*, day.

7 Civil, ſolar, &c. days defined.

By a civil day is meant the interval betwixt the ſun's departure from any given point in the heavens and next return to the ſame, with as much more as anſwers to its diurnal motion eaſtward, which is at the rate of 59 minutes and 8 ſeconds of a degree, or 3 minutes and 57 ſeconds of time. It is alſo called a *ſolar* day, and is longer than a *ſidereal* one, inſomuch that, if the former be divided into 24 equal parts or hours, the latter will conſiſt only of 23 hours 56 minutes. The apparent inequality of the ſun's motion, likewiſe, ariſing from the obliquity of the ecliptic, produces another inequality in the length of the days: and hence the difference betwixt real and apparent time, ſo that the apparent motion of the ſun cannot always be a true meaſure of duration. Thoſe inequalities, however, are capable of being reduced to a general ſtandard, which furniſhes an exact meaſure throughout the year; whence ariſes the difference between mean and apparent time, as is explained under the article ASTRONOMY.

8 Different ways of computing the beginning of the day.

There have been very conſiderable differences among nations with regard to the beginning and ending of their days. The beginning of the day was counted from ſunriſe by the Babylonians, Syrians, Perſians, and Indians. The civil day of the Jews was begun from ſunriſe, and their ſacred one from ſunſet; the latter mode of computation being followed by the Athenians, Arabs, ancient Gauls, and other European nations. According to ſome, the Egyptians began their day at ſunſet, while others are of opinion that they computed from noon or from ſunriſe; and Pliny informs us that they computed their civil day from one midnight to another. It is probable, however, that they had different modes of computation in different provinces or cities. The Auſonians, the moſt ancient inhabitants of Italy, computed the day from midnight; and the aſtronomers of Cathay and Oighur in the Eaſt Indies reckoned in the ſame manner. This mode of computation was adopted by Hipparchus, Copernicus, and other aſtronomers, and is now in common uſe among ourſelves. The *aſtronomical* day, however, as it is called, on account of its being uſed in aſtronomical calculations, commences at noon, and ends at the ſame time the following day. The Mahometans reckon from one twilight to another. 9 Strange method of computation in Italy. In Italy, the civil day commences at ſome indeterminate point after ſunſet: whence the time of noon varies with the ſeaſon of the year. At the ſummer ſolſtice, the clock ſtrikes 16 at noon, and 19 at the time of the winter ſolſtice. Thus alſo the length of each day differs by ſeveral minutes from that immediately preceding or following it. This variation requires a conſiderable difficulty in adjuſting their time by clocks. It is accompliſhed, however, by a ſudden movement which corrects the difference when it amounts to a quarter of an hour; and this it does ſometimes at the end of eight days, ſometimes at the end of 15, and ſometimes at the end of 40. Information of all this is given by a printed kalendar, which announces, that from the 16th of February, for inſtance, to the 24th, it will be noon at a quarter paſt 18; from the 24th of February to the 6th of March, it will be noon at 18 o'clock preciſely; from the firſt of June to the 13th of July, the hour of noon will be at 16 o'clock; on the 13th of July it will be at half an hour after 16; and ſo on throughout the different months of the year. This abſurd method of meaſuring the day continues, notwithſtanding ſeveral attempts to ſuppreſs it, throughout the whole of Italy, a few provinces only excepted.

10 Various ſubdiviſions of the day.

The ſubdiviſions of the day have not been leſs various than the computations of the day itſelf. The moſt obvious diviſion, and which could at no time, nor in no age, be miſtaken, was that of morning and evening. In proceſs of time the two intermediate points of noon and midnight were determined; and this diviſion into quarters was in uſe long before the invention of hours.

From this ſubdiviſion probably aroſe the method uſed by the Jews and Romans of dividing the day and night into four vigils or watches. The firſt began at ſun-riſing, or ſix in the morning; the ſecond at nine; the third at twelve; and the fourth at three in the afternoon. In like manner the night was divided into four parts; the firſt beginning at ſix in the evening, the ſecond at nine, the third at twelve, and the fourth at three in the morning. The firſt of theſe diviſions was called by the Jews the *third* hour of the day; the ſecond the *ſixth*; the third the *ninth*; and the fourth the *twelfth*, and ſometimes the *eleventh*. Another diviſion in uſe, not only among the nations abovementioned, but the Greeks alſo, was that which reckoned the firſt quarter from ſunſet to midnight; the ſecond from midnight to ſunriſe; the third, or morning watch, from morning to noon; and the fourth from noon to ſunſet.

11 Inventions of hours uncertain.

It is uncertain at what time the more minute ſubdiviſion of the day into hours firſt commenced. It does not appear from the writings of Moſes that he was acquainted with it, as he mentions only the morning, mid-day, evening, and ſunſet. Hence we may conclude, that the Egyptians at that time knew nothing of it, as Moſes was well ſkilled in their learning. According to Herodotus, the Greeks received the knowledge of the twelve hours of the day from the Babylonians. It is probable, however, that the diviſion was actually known and in uſe before the name *hour* was applied to it; as Cenſorinus informs us that the term was not made uſe of in Rome for 300 years after its foundation; nor was it known at the time the twelve tables were conſtructed.

The eaſtern nations divide the day and night in a very ſingular manner; the origin of which is not eaſily diſcovered. The Chineſe have five watches in the night, which are announced by a certain number of ſtrokes on a bell or drum. They begin by giving one ſtroke, which is anſwered by another; and this is repeated at the diſtance of a minute or two, until the ſecond watch begin, which is announced by two ſtrokes; and ſo on throughout the reſt of the watches. By the ancient Tartars, Indians, and Perſians, the day was divided into eight parts, each of which contained ſeven hours and a half. 12 Method of computation on the coaſt of Malabar. The Indians on the coaſt of Malabar divide the day into ſix parts, called *najika*: each of theſe ſix parts is ſubdivided into 60 others, called *venaigas*; the venaiga into 60 *birpes*, the birpe into 10 *kenikans*; the kenikan into four *mattires*; the mattire into eight *kannimas* or *caignodes*; which diviſions, according to our mode of computation, ſtand as follows.

Najika,

Najika,	Venaiga,	Birpe,	Kenikan,	Mattire,	Caignode.
24 min.	24 ſec.	4 ſec.	$\frac{2}{5}$ ſec.	$\frac{1}{10}$ ſec.	$\frac{1}{80}$ ſec.

The day of the Chineſe is begun at midnight, and ends with the midnight following. It is divided into twelve hours, each diſtinguiſhed by a particular name and figure. They alſo divide the natural day into 100 parts, and each of theſe into 100 minutes; ſo that the whole contains 10,000 minutes. In the northern parts of Europe, where only two ſeaſons are reckoned in the year, the diviſions of the day and night are conſiderably larger than with us. In Iceland the 24 hours are divided into eight parts; the firſt of which commences at three in the morning; the ſecond at five; the third at half an hour after eight; the fourth at eleven; the fifth at three in the afternoon; the ſixth at ſix in the evening; the ſeventh, at eight, and the laſt at midnight. In the eaſtern part of Turkeſtan, the day is divided into twelve equal parts, each of which is diſtinguiſhed by the name of ſome animal. Theſe are ſubdivided into eight *keh;* ſo that the whole 24 hours contain 96 *keh*.

13
Diviſions of the hour into minutes, &c.

The modern diviſions of the hour in uſe among us are into minutes, ſeconds, thirds, fourths, &c. each being a ſixtieth part of the former ſubdiviſion. By the Chaldæans, Jews, and Arabians, the hour is divided into 1080 ſcruples; ſo that one hour contains 60 minutes, and one minute 18 ſcruples. The ancient Perſians and Arabs were likewiſe acquainted with this diviſion; but the Jews are ſo fond of it, that they pretend to have received it in a ſupernatural manner. "Iſſachar (ſay they) aſcended into heaven, and brought from thence 1080 parts for the benefit of the nation."

14
Methods of announcing the hours.

The diviſion of the day being aſcertained, it ſoon became an object to indicate in a public manner the expiration of any particular hour or diviſion; as without ſome general knowledge of this kind, it would be in a great meaſure impoſſible to carry on buſineſs. The methods of announcing this have been likewiſe very different. Among the Egyptians it was cuſtomary for the prieſts to proclaim the hours like watchmen among us. The ſame method was followed at Rome; nor was there any other method of knowing the hours until the year 293 B. C. when Papirius Curſor firſt ſet up a ſun-dial in the Capitol. A ſimilar method is practiſed among the Turks, whoſe prieſts proclaim from the top of their moſques, the cock-crowing, day-break, mid-day, three o'clock in the afternoon, and twilight, being their appointed times of worſhip.

15
Invention of inſtruments for this purpoſe.

As this mode of proclaiming the hour could not but be very inconvenient as well as imperfect, the introduction of an inſtrument which every one could have in his poſſeſſion, and which might anſwer the ſame purpoſe, muſt have been conſidered as a valuable acquiſition. One of the firſt of theſe was the clepſydra or water clock*. Various kinds of theſe were in uſe among the Egyptians at a very early period. The invention of the inſtrument is attributed to Thoth or Mercury, and it was afterwards improved by Cteſibus of Alexandria. It was a common meaſure of time among the Greeks, Indians, and Chaldæans, as well as the Egyptians, but was not introduced into Rome till the time of Scipio Naſica. The Chineſe aſtronomers have long made uſe of it; and by its means divided the zodiac into twelves parts; but it is a very inaccurate meaſure of time, varying, not only according to the quantity of water in the veſſel, but according to the ſtate of the atmoſphere.

The clepſydra was ſucceeded by the gnomon or ſun-dial.—This, at firſt, was no more than a ſtile erected perpendicularly to the horizon; and it was a long time before the principles of it came to be thoroughly underſtood. The invention is with great probability attributed to the Babylonians, from whom the Jews received it before the time of Ahaz, when we know that a ſun-dial was already erected at Jeruſalem. The Chineſe and Egyptians alſo were acquainted with the uſe of the dial at a very early period, and it was conſiderably improved by Anaximander or Anaximenes; one of whom is for that reaſon looked upon to be the inventor. Various kinds of dials, however, were invented and made uſe of in different nations long before their introduction at Rome. The firſt erected in that city, as has been already mentioned, was that by Papirius Curſor; and 30 years after, Valerius Miſſala brought one from Sicily, which was uſed in Rome for no leſs than 99 years, though conſtructed for a Sicilian latitude, and conſequently incapable of ſhowing the hours exactly in any other place; but at laſt another was conſtructed by L. Philippus, capable of meaſuring time with greater accuracy.

It was long after the invention of dials before mankind began to form any idea of clocks; nor is it well known at what period they were firſt invented. A clock was ſent by Pope Paul I. to Pepin king of France, which at that time was ſuppoſed to be the only one in the world. A very curious one was alſo ſent to Charles the Great from the khalif Haroun Alraſchid, which the hiſtorians of the time ſpeak of with ſurpriſe and admiration: but the greateſt improvement was that of Mr Huygens, who added the pendulum to it. Still, however, the inſtruments for dividing time were found to be inaccurate for nice purpoſes. The expanſion of the materials by heat, and their contraction by cold, would cauſe a very perceptible alteration in the going of an inſtrument in the ſame place at different times of the year, and much more if carried from one climate to another. Various methods have been contrived to correct this; which indeed can be done very effectually at land by a certain conſtruction of the pendulum; but at ſea, where a pendulum cannot be uſed, the inaccuracy is of conſequence much greater: nor was it thought poſſible to correct the errors ariſing from theſe cauſes in any tolerable degree, until the late invention of Mr Harriſon's time-piece, which may be conſidered as making perhaps as near an approach to perfection as poſſible.

16
Of weeks.

Having thus given an account of the more minute diviſions of time, with the methods of meaſuring them, we muſt now proceed to the larger; which more properly belong to chronology, and which muſt be kept on record, as no inſtrument can be made to point them out. Of theſe the diviſion into weeks of ſeven days is one of the moſt ancient, and probably took place from the creation of the world. Some, indeed, are of opinion, that the week was invented ſome

* See *Clepſydra.*

ſome time after for the more convenient notation of time; but whatever may be in this, we are certain that it is of the higheſt antiquity, and even the moſt rude and barbarous nations have made uſe of it. It is ſingular indeed that the Greeks, notwithſtanding their learning ſhould have been ignorant of this diviſion; and M. Goguet informs us, that they were almoſt the only nation who were ſo. By them the month of 30 days was divided into three times 10, and the days of it named accordingly. Thus the 15th day of the month was called the *ſecond fifth*, or fifth of the ſecond tenth; the 24th was called the *third fourth*, or the fourth day of the third tenth. This method was in uſe in the days of Heſiod, and it was not until ſeveral ages had elapſed, that the uſe of weeks was received into Greece from the Egyptians. The inhabitants of Cathay, in the northern part of China, were likewiſe unacquainted with the week of ſeven days, but divided the year into ſix parts of 60 days each. They had alſo a cycle of 15 days, which they uſed as a week. The week was likewiſe unknown to the ancient Perſians and to the Mexicans; the former having a different name for every day of the month, and the latter making uſe of a cycle of 13 days. By almoſt all other nations the week of ſeven days was adopted.

17 Of holidays

It is remarkable, that one day in the week has always been accounted as ſacred by every nation. Thus Saturday was conſecrated to pious purpoſes among the Jews, Friday by the Turks, Tueſday by the Africans of Guinea, and Sunday by the Chriſtians. Hence alſo the origin of *Feriæ* or holidays, frequently made uſe of in ſyſtems of Chronology; and which aroſe from the following circumſtance. In the church of Rome the old eccleſiaſtical year began with Eaſter-week; all the days of which were called *Feriæ* or *Feriati*, that is, holy, or ſacred days; and in proceſs of time the days of other weeks came to be diſtinguiſhed by the ſame appellation, for the two following reaſons: 1. Becauſe every day ought to be holy in the eſtimation of a Chriſtian. 2. Becauſe all days are holy to eccleſiaſtics, whoſe time ought to be entirely devoted to religious worſhip.—The term *week* is ſometimes uſed to ſignify ſeven years, not only in the prophetical writings, but likewiſe by profane authors; thus Varro, in his book inſcribed *Hebdomades*, informs, that he had then entered the 12th week of his years.

18 Of months.

The next diviſion of time ſuperior to weeks, is that of *months*. This appears to have been, if not coeval with the creation, at leaſt in uſe before the flood. As this diviſion is naturally pointed out by the revolution of the moon, the months of all nations were originally lunar; until after ſome conſiderable advances had been made in ſcience, the revolutions of that luminary were compared with the ſun, and thus the limits of the month fixed with greater accuracy. The diviſion of the year into 12 months, as being founded on the number of full revolutions of the moon in that time, has alſo been very general; though Sir John Chardin informs us, that the Perſians divided the year into 24 months; and the Mexicans into 18 months of 20 days each. The months generally contained 30 days, or 29 and 30 days alternately; though this rule was far from being without exception. The months of the Latins conſiſted of 16, 18, 22, or 36 days; and Romulus gave his people a year of 10 months and 304 days. The Kamtſchadales divide the year into 10 months; reckoning the time proper for labour to be nine months, and the winter ſeaſon, when they are obliged to remain inactive, only as one month.

It has been a very ancient cuſtom to give names to the different months of the year, though this appears to have been more modern than the departure of the Iſraelites out of Egypt, as they would otherwiſe undoubtedly have carried it with them; but for a conſiderable time after their ſettlement in Canaan, they diſtinguiſhed the months only by the names of firſt, ſecond, *&c.* After their return from the Babyloniſh captivity, they adopted the names given to the months by the Chaldæans. Other nations adopted various names, and arranged the months themſelves according to their fancy. From this laſt circumſtance ariſes the variety in the dates of the months; for as the year has been reckoned from different ſigns in the ecliptic, neither the number nor the quantity of months have been the ſame, and their ſituation has likewiſe been altered by the intercalations neceſſary to be made.

Theſe intercalations became neceſſary on account of the exceſs of the ſolar above the lunar year; and the months compoſed of intercalary days are likewiſe called *emboliſmal*. Theſe emboliſmal months are either *natural* or *civil*. By the former, the ſolar and lunar years are adjuſted to one another; and the latter ariſes from the defect of the civil year itſelf. The *ador* of the Jews, which always conſiſts of 30 days, is an example of the natural emboliſmal month.

The Romans had a method of dividing their months into kalends, nones, and ides. The firſt was derived from an old word *calo*, "to call"; becauſe, at every new moon, one of the lower claſs of prieſts aſſembled the people, and called over, or announced, as many days as intervened betwixt that and the nones, in order to notify the difference of times and the return of feſtivals. The 2d, 3d, 4th, 5th, 6th, and 7th of March, May, July, and October, were the nones of theſe months; but in the other months were the 2d, 3d, 4th and 5th days only. Thus the 5th of January was its nones; the 4th was *pridie nonarum;* the third, *tertio nonarum*, &c. The ides contained eight days in every month, and were nine days diſtant from the nones. Thus the 15th day of the four months already mentioned was the ides of them; but in the others the 13th was accounted as ſuch; the 12th was *pridie iduum*, and the 11th *tertio iduum*. The ides were ſucceeded by the kalends; the 14th of January, for inſtance, being the 19th kalend of February; the 15th was the 18th kalend; and ſo on till the 31ſt of January, which was *pridie kalendarum;* and February 1ſt was the kalends.

19 Aſtronomical and civil months.

Among the European nations the month is either aſtronomical or civil. The former are meaſured by the motion of the heavenly bodies; the civil conſiſts of a certain number of days ſpecified by the laws, or by the civil inſtitutions of any nation or ſociety. The aſtronomical months, being for the moſt part regulated by the motions of the ſun and moon, are thus divided into ſolar and lunar, of which the former is ſometimes alſo called *civil*. The aſtronomical ſolar month is the time which the ſun takes up in paſſing through a ſign of the ecliptic. The lunar month is periodical, ſynodical, ſidereal, and civil. The ſynodical lunar month is the time that paſſes between any conjunction of the moon with the ſun and the conjunction following. It includes the motion of the ſun eaſtward during that time; ſo that a mean lunation conſiſts of 29d. 12h. 44′ 2″ 8921. The ſidereal lunar month is the time of the mean revolution of the moon with regard to the fixed ſtars. As the equinoctial points go backwards about 4″ in the ſpace of a lunar month, the moon muſt, in conſequence of this retroceſſion, arrive at the equinox ſooner than at any fixed ſtar, and conſequently the mean ſidereal revolution muſt be longer than the mean periodical one. The latter conſiſts of 27d. 7h. 43′ 4″ 6340. The civil lunar month is computed from the moon, to anſwer the ordinary purpoſes of life; and as it would have been inconvenient, in the computation of lunar months, to have reckoned odd parts of days, they have been compoſed of 30 days, or of 29 and 30 alternately, as the neareſt round numbers. When the month is reckoned from the firſt appearance of the moon after her conjunction, it is called the *month of illumination*. The Arabs, Turks, and other nations, who uſe the era of the Hegira, follow this method of computation. As twelve lunar months however, are 11 days leſs than a ſolar year, Julius Cæſar ordained that the month ſhould be reckoned from the courſe of the ſun, and not of the moon; and that they ſhould conſiſt of 30 and 31 days alternately, February only excepted, which was to conſiſt of 28 days commonly, and of 29 in leap-years.

19 Of years.

The higheſt natural diviſion of time is into years. At firſt, however, it is probable that the courſe of the ſun through the ecliptic would not be obſerved, but that all nations would meaſure their time by the revolutions of the moon. We are certain, at leaſt, that the Egyptian year conſiſted originally of a ſingle lunation; though at length it included two or three months, and was determined by the ſtated returns of the ſeaſons. As the eaſtern nations, however, particularly the Egyptians, Chaldeans, and Indians, applied themſelves in very early periods to aſtronomy, they found, by comparing the motions of the ſun and moon together, that one revolution of the former included nearly 12 of the latter. Hence a year of 12 lunations was formed, in every one of which were reckoned 30 days; and hence alſo the diviſion of the ecliptic into 360 degrees. The luniſolar year, conſiſting of 360 days, was in uſe long before any regular intercalations were made; and hiſtorians inform us, that the year of all ancient nations was luniſolar. Herodotus relates, that the Egyptians firſt divided the year into 12 parts by the aſſiſtance of the ſtars, and that every part conſiſted of 30 days. The Thebans corrected this year by adding 5 intercalary days to it. The old Chaldean year was alſo reformed by the Medes and Perſians; and ſome of the Chineſe miſſionaries have informed us, that the luniſolar year was alſo corrected in China: and that the ſolar year was aſcertained in that country to very conſiderable exactneſs. The Latin year, before Numa's correction of it, conſiſted of 360 days, of which 304 were divided into ten months; to which were added two private months not mentioned in the kalendar.

20 Explanation of a paſſage in Herodotus.

The imperfection of this method of computing time is now very evident. The luniſolar year was about 5¼ days ſhorter than the true ſolar year, and as much longer than the lunar. Hence the months could not long correſpond with the ſeaſons, and even in ſo ſhort a time as 34 years, the winter months would have changed places with thoſe of ſummer. From this rapid variation, Mr Playfair takes notice that a paſſage in Herodotus, by which the learned have been exceedingly puzzled, may receive a ſatisfactory ſolution, *viz.* that "in the time of the ancient Egyptian kings, the ſun had twice ariſen in the place where it had formerly ſet, and twice ſet where it had ariſen." By this he ſuppoſes it is meant, "that the beginning of the year had twice gone through all the ſigns of the ecliptic; and that the ſun had riſen and ſet twice in every day and month of the year." This, which ſome have taken for a proof of moſt extravagant antiquity, he further obſerves, might have happened in 138 years only; as in that period there would be a difference of nearly two years between the ſolar and lunar year. Such evident imperfections could not but produce a reformation every where; and accordingly we find that there was no nation which did not adopt the method of adding a few intercalary days at certain intervals. We are ignorant, however, of the perſon who was the firſt inventor of this method. The Theban prieſts attributed the invention to Mercury or Thoth; and it is certain that they were acquainted with the year of 365 days at a very early period. The length of the ſolar year was repreſented by the celebrated golden circle of Oſymandyas of 365 cubits circumference; and on every cubit of which was inſcribed a day of the year, together with the helaical riſings and ſettings of the ſtars. The monarch is ſuppoſed to have reigned in the 11th or 13th century before the Chriſtian era.

21 Great Egyptian year, or canicular cycle.

21 Of the time when it commenced.

The Egyptian ſolar year being almoſt ſix hours ſhorter than the true one, this inaccuracy, in proceſs of time produced another revolution; for ſome circumſtances attending which ſerve to fix the date of the diſcovery of the length of the year, and which from the above deſcription of the golden circle, we may ſuppoſe to have been made during the reign of Oſymandyas. The inundation of the Nile was annually announced by the heliacal riſing of Sirius, to which the reformers of the kalendar adjuſted the beginning of the year, ſuppoſing that it would have remained immoveable. In a number of years, however, it appeared that their ſuppoſitions in this were ill-founded. By reaſon of the inequality abovementioned, the heliacal riſings of Sirius gradually advanced nearly at the rate of one day in four years; ſo that in 1461 years it completed a revolution, by ariſing on every ſucceeding day of the year, and returning to the point originally fixed for the beginning of the year. This period, equal to 1460 Julian years, was termed the *great Egyptian year*, or *canicular cycle*. From the accounts we have of the time that the canicular cycle was renewed, the time of its original commencement may be gathered with tolerable certainty. This happened, according to Cenſorinus, in the 138th year of the Chriſtian æra. Reckoning backward therefore from this time for 1460 years, we come to the year B. C. 1322, when the ſun was in Cancer, about 14 or 15 days after the ſummer ſolſtice

ſolſtice, which happened on July 5th. The Egyptians uſed no intercalation till the time of Auguſtus, when the corrected Julian year was received at Alexandria by his order; but even this order was obeyed only by the Greeks and Romans who reſided in that city; the ſuperſtitious natives refuſing to make any addition to the length of a year which had been ſo long eſtabliſhed among them.

22 Uncertainty of the time when the true ſolar year was diſcovered.

We are not informed at what preciſe period the true year was obſerved to conſiſt of nearly ſix hours more than the 365 days. Though the prieſts of Thebes claim the merit of the diſcovery, Herodotus makes no mention of it; neither did Thales, who introduced the year of 365 days into Greece, ever uſe any intercalation. Plato and Eudoxus are ſaid to have obtained it as a ſecret from the Egyptians about 80 years after Herodotus, and to have carried it into Greece; which ſhowed, that the knowledge of this form of the year was at that time recent, and only known to a few learned men.

23 Years of the Jews, &c.

The year of the ancient Jews was luniſolar; and we are informed by tradition, that Abraham preſerved in his family, and tranſmitted to poſterity, the Chaldean form of the year, conſiſting of 360 days; which remained the ſame without any correction until the date of the era of Nabonaſſar. The ſolar year was adopted among them after their return from the Babyloniſh captivity; but when ſubjected to the ſucceſſors of Alexander in Syria, they were obliged to admit the lunar year into their kalendar. In order to adjuſt this year to the courſe of the ſun, they added at certain periods a month to Adar, formerly mentioned, and called it *Ve Adar*. They compoſed alſo a cycle of 19 years, in ſeven of which they inſerted the intercalary month. This correction was intended to regulate the months in ſuch a manner, as to bring the 15th of Niſan to the equinoctial point; and likewiſe the courſes of the ſeaſons and feaſts in ſuch a manner, that the corn might be ripe at the paſſover as the law required.

24 Reformation of the kalendar by Julius Cæſar and pope Gregory.

We ſhall not take up the reader's time with any further account of the years made uſe of by different nations, all of which are reſolved at laſt into the luniſolar, it will be ſufficient to mention the improvements in the kalendar made by the two great reformers of it, Julius Cæſar, and Pope Gregory XIII. The inſtitution of the Roman year by Romulus has been already taken notice of; but as this was evidently very imperfect, Numa, on his advancement to the throne, undertook to reform it. With a deſign to make a complete lunar year of it, he added 50 days to the 304 of Romulus; and from every one of his months, which conſiſted of 31 and 30 days, he borrowed one day. Of theſe additional days he compoſed two months; calling the one January, and the other February. Various other corrections and adjuſtments were made; but when Julius Cæſar obtained the ſovereignty of Rome, he found that the months had conſiderably receded from the ſeaſons to which Numa had adjuſted them. To bring them forward to their places, he formed a year of 15 months, or 445 days; which, on account of its length, and the deſign with which it was formed, has been called the *year of confuſion*. It terminated on the firſt of January 45 B. C. and from this period the civil year and months were regulated by the courſe of the ſun. The year of Numa being ten days ſhorter than the ſolar year, two days were added by Julius to every one of the months of January, Auguſt, and December; and one to April, June, September, and November. He ordained likewiſe, that an intercalary day ſhould be added every fourth year to the month of February, by reckoning the 24th day, or ſixth of the kalends of March, twice over. Hence this year was ſtyled *biſſextile*, and alſo *leap-year*, from its leaping a day more than a common year.

The Julian year has been uſed by modern chronologers, as being a meaſure of time extremely ſimple and ſufficiently accurate. It is ſtill, however, ſomewhat imperfect; for as the true ſolar year conſiſts of 365d. 5h. 48′ 45¼″, it appears that in 131 years after the Julian correction, the ſun muſt have arrived one day too ſoon at the equinoctial point. During Cæſar's reign the vernal equinox had been obſerved by Soſigenes on the 25th of March; but by the time of the Nicene council it had gone backward to the 21ſt. The cauſe of the error was not then known; but in 1582, when the equinox happened on the 11th of March it was thought proper to give the kalendar its laſt correction. Pope Gregory XIII. having invited to Rome a conſiderable number of mathematicians and aſtronomers, employed ten years in the examination of their ſeveral formulæ, and at laſt gave the preference to that of Aloſia and Antoninus Lelius, who were brothers. Ten days were now cut off in the month of October, and the 4th of that month was reckoned the 15th. To prevent the ſeaſons from receding in time to come, he ordained that one day ſhould be added every fourth or biſſextile year as before; and that the 1600th year of the Chriſtian era, and every fourth century thereafter, ſhould be a biſſextile or leap year. One day therefore is to be intercalated in the years 2000, 2400, 2800, &c. but in the other centuries, as 1700, 1800, 1900, 2100, &c. it is to be ſuppreſſed and theſe are to be reckoned as common years. Even this correction, however, is not abſolutely exact; but the error muſt be very inconſiderable, and ſcarce amounting to a day and a half in 5000 years.

25 Commencement of the year.

The commencement of the year has been determined by the date of ſome memorable event or occurrence, ſuch as the creation of the world, the univerſal deluge, a conjunction of planets, the incarnation of our Saviour, &c. and of courſe has been referred to different points in the ecliptic. The Chaldæan and the Egyptian years were dated from the autumnal equinox. The eccleſiaſtical year of the Jews began in the ſpring; but in civil affairs, they retained the epoch of the Egyptian year. The ancient Chineſe reckoned from the new moon neareſt to the middle of Aquarius; but, according to ſome recent accounts, the beginning of their year was transferred (B. C. 1740) to the new moon neareſt to the winter ſolſtice. This likewiſe is the date of the Japaneſe year. Diemſchid, or Gemſchid, king of Perſia, obſerved, on the day of his public entry into Perſepolis, that the ſun entered into Aries. In commemoration of this fortunate event and coincidence, he ordained the beginning of the year to be removed from the autumnal to the vernal equinox. This epoch was denominated *Neuruz*, viz. new-day; and is ſtill celebrated with great pomp and feſtivity.

(See Epochs). The ancient Swediſh year commenced at the winter ſolſtice, or rather at the time of the ſun's appearance in the horizon, after an abſence of about 40 days. The feaſt of this epoch was ſolemniſed on the 20th day after the ſolſtice. Some of the Grecian ſtates computed from the vernal, ſome from the autumnal equinox, and others from the ſummer tropic. The year of Romulus commenced in March, and that of Numa in January. The Turks and Arabs date the year from the 16th of July and the American Indians reckon from the firſt appearance of the new moon of the vernal equinox. The church of Rome has fixed new-year's-day on the Sunday that correſponds with the full moon of the ſame ſeaſon. The Venetians, Florentines, and Piſans in Italy, and the inhabitants of Treves in Germany, begin the year at the vernal equinox. The ancient clergy reckoned from the 25th of March; and this method was obſerved in Britain, until the introduction of the new ſtyle (A. D. 1752); after which the year commenced on the 1ſt day of January.

26 Of cycles.

Beſides the natural diviſions of time ariſing immediately from the revolutions of the heavenly bodies, there are others formed from ſome of the leſs obvious conſequences of theſe revolutions, which are called *cycles*, from the Greek κυκλος, *a circle*. The moſt remarkable of theſe are the following.

1. The *cycle of the ſun* is a revolution of 28 years, in which time the days of the months return again to the ſame days of the week; the ſun's place to the ſame ſigns and degrees of the ecliptic on the ſame months and days, ſo as not to differ one degree in 100 years; and the leap-years begin the ſame courſe over again with reſpect to the days of the week on which the days of the months fall.

27 Golden number.

The *cycle of the moon*, commonly called the *golden number*, is a revolution of 19 years; in which time the conjunctions, oppoſitions, and other aſpects of the moon, are within an hour and a half of being the ſame as they were on the ſame days of the months 19 years before. The *indiction* is a revolution of 15 years, uſed only by the Romans for indicating the times of certain payments made by the ſubjects to the republic: It was eſtabliſhed by Conſtantine, A. D. 312.

28 To find the year of any cycle.

The year of our Saviour's birth, according to the vulgar era, was the 9th year of the ſolar cycle, the firſt year of the lunar cycle; and the 312th year after his birth was the firſt year of the Roman indiction. Therefore, to find the year of the ſolar cycle, add 9 to any given year of Chriſt, and divide the ſum by 28, the quotient is the number of cycles elapſed ſince his birth, and the remainder is the cycle for the given year; If nothing remains, the cycle is 28. To find the lunar cycle, add one to the given year of Chriſt, and divide the ſum by 19; the quotient is the number of cycles elapſed in the interval, and the remainder is the cycle for the given year: If nothing remains, the cycle is 19. Laſtly, ſubtract 312 from the given year of Chriſt, and divide the remainder by 15; and what remains after this diviſion is the indiction for the given year: If nothing remains, the indiction is 15.

29 Variation of the golden numbers.

Although the above deficiency in the lunar circle of an hour and an half every 19 years be but ſmall, yet in time it becomes ſo ſenſible as to make a whole natural day in 310 years. So that, although this cycle be of uſe, when the golden numbers are rightly placed againſt the days of the months in the kalendar, as in the Common Prayer Books, for finding the days of the mean conjunctions or oppoſitions of the ſun and moon, and conſequently the time of Eaſter; it will only ſerve for 310 years, old ſtile. For as the new and full moons anticipate a day in that time, the golden numbers ought to be placed one day earlier in the kalendar for the next 310 years to come. Theſe numbers were rightly placed again the days of new moon in the kalendar, by the council of Nice, A. D. 325; but the anticipation, which has been neglected ever ſince, is now grown almoſt into 5 days: And therefore all the golden numbers ought now to be placed five days higher in the kalendar for the old ſtile than they were at the time of the ſaid council; or 6 days lower for the new ſtyle, becauſe at preſent it differs 11 days from the old.

30 To find the golden number.

In the firſt of the following tables the golden numbers under the months ſtand againſt the days of new moon in the left-hand column, for the new ſtyle; adapted chiefly to the ſecond year after leap-year, as being the neareſt mean for all the four; and will ſerve till the year 1900. Therefore to find the day of new moon in any month of a given year till that time, look for the golden number of that year under the deſired month, and againſt it you have the day of new moon in the left hand column. Thus, ſuppoſe it were required to find the day of new moon in September 1789; the golden number for that year is 4, which I look for under December, and right againſt it in the left-hand column you will find 17, which is the day of new moon in that month. *N. B.* If all the golden numbers, except 17, and 6, were ſet one day lower in the table, it would ſerve from the beginning of the year 1900 till the end of the year 2199. The table at the end of this ſection ſhows the golden number for 4000 years after the birth of Chriſt, by looking for the even hundreds of any given year at the left-hand, and for the reſt to make up that year at the head of the table; and where the columns meet, you have the golden number (which is the ſame both in old and new ſtyle) for the given year. Thus, ſuppoſe the golden number was wanted for the year 1789; look for 1700 at the left-hand of the table, and for 89 at the top of it; then guiding your eye downward from 89 to over-againſt 1700, you will find 4, whch is the golden number for that year.

But becauſe the lunar cycle of 19 years ſometimes includes five leap-years, and at other times only four, this table will ſometimes vary a day from the truth in leap-years after February. And it is impoſſible to have one more correct, unleſs we extend it to four times 19 or 76 years; in which there are 19 leap-years without a remainder. But even then to have it of perpetual uſe, it muſt be adapted to the old ſtyle; becauſe, in every centurial year not diviſible by 4, the regular courſe of leap-years is interrupted in the new, as will be the caſe in the year 1800.

31 Dionyſian period, or cycle of Eaſter.

2. The *cycle of Eaſter*, alſo called the *Dionyſian period*, is a revolution of 532 years, found by multiplying the ſolar cycle 28 by the lunar cycle 19. If the new moons did not anticipate upon this cycle, Eaſter-day would always

always be the Sunday next after the firſt full moon which follows the 21ſt of March. But, on account of the above anticipation, to which no proper regard was had before the late alteration of the ſtyle, the eccleſiaſtic Eaſter has ſeveral times been a week different from the true Eaſter within this laſt century: which inconvenience is now remedied by making the table, which uſed to find Eaſter for ever, in the Common Prayer Book, of no longer uſe than the lunar difference from the new ſtyle will admit of.

The earlieſt Eaſter poſſible is the 22d of March, the lateſt the 25th of April. Within theſe limits are 35 days, and the number belonging to each of them is called the *number of direction;* becauſe thereby the time of Eaſter is found for any given year.

32
Dominical letter.

The firſt ſeven letters of the alphabet are commonly placed in the annual almanacs, to ſhow on what days of the week the days of the months fall throughout the year. And becauſe one of thoſe ſeven letters muſt neceſſarily ſtand againſt Sunday, it is printed in a capital form, and called the *dominical letter;* the other ſix being inſerted in ſmall characters, to denote the other ſix days of the week. Now, ſince a common Julian year contain 365 days, if this number be divided by 7 (the number of days in a week) there will remain one day. If there had been no remainder, it is plain the year would conſtantly begin on the ſame day of the week: but ſince one remains, it is plain, that the year muſt begin and end on the ſame day of the week; and therefore the next year will begin on the day following. Hence, when January begins on Sunday, A is the dominical or Sunday letter for that year: Then, becauſe the next year begins on Monday, the Sunday will fall on the ſeventh day, to which is annexed the ſeventh letter G, which therefore will be the dominical letter for all that year: and as the third year will begin on Tueſday, the Sunday will be on the ſixth day; therefore F will be the Sunday letter for that year. Whence it is evident, that the Sunday letters will go annually in a retrograde order, thus, G, F, E, D, C, B, A. And, in the courſe of ſeven years, if they were all common ones, the ſame days of the week and dominical letters would return to the ſame days of the months. But becauſe there are 366 days in a leap-year, if this number be divided by 7, there will remain two days over and above the 52 weeks of which the year conſiſts. And therefore, if the leap-year begins on Sunday, it will end on Monday; and the next year will begin on Tueſday, the firſt Sunday whereof muſt fall on the ſixth of January, to which is annexed the letter F, and not G, as in common years. By this means, the leap-year returning every fourth year, the order of the dominical letter is interrupted; and the ſeries cannot return to its firſt ſtate till after four times ſeven, or 28 years; and then the ſame days of the months return in order to the ſame days of the week as before.

TABLE I.

Days.	*Jan.*	*Feb.*	*March*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
1	9		9	17	17	6				11		19
2		17			6	14	14	3	11		19	
3	17	6	17	6			3	11		19	8	8
4	6		6	14	14	3			19	8		16
5		14			3	11	11	19	8		16	
6	14	3	14	3			19			16	5	5
7	3		3	11	11	19		8	16			13
8		11			19	8	8	16	5	5	13	
9	11	19	11	19						13		2
10			19	8	8	16	16	5	13		2	10
11	19	8					5	13	2	2	10	
12	8	16	8	16	16	5				10		18
13					5	13	13	2	10		18	7
14	16	5	16	5			2	10	18	18	7	
15	5		5	13	13	2				7		15
16		13		2	2	10	10	18	7		15	
17	13	2	13			18	18	7		15	4	4
18	2		2	10	10				15			12
19		10		18	18	7	7	15	4	4	12	
20	10	18	10				15			12	1	1
21	18		18	7	7	15		4	12			9
22		7			15	4	4	12	1	1	9	
23	7	15	7	15			12			9	17	17
24			15	4	4	12		1	9			6
25	15	4			12		1	9	17	17	6	
26	4		4	12		1				6		15
27		12		1	1	9	9	17	6		14	
28	12	1	12		9		17	6	14	14	3	3
29	1		1	9		17				3		11
30					17	6	6	14	3		11	
31	9		9				14	3		11		19

TABLE II.

Table, *ſhowing the Golden Number, (which is the ſame both in the Old and New Stile), from the Chriſtian Era, to A. D.* 4000.

Hundreds of Years.			Years leſs than an hundred.																		
			0 19 38 57 76 95	1 20 39 58 77 96	2 21 40 59 78 97	3 22 41 60 79 98	4 23 42 61 80 99	5 24 43 62 81	6 25 44 63 82	7 26 45 64 83	8 27 46 65 84	9 28 47 66 85	10 29 48 67 86	11 30 49 68 87	12 31 50 69 88	13 32 51 70 89	14 33 52 71 90	15 34 53 72 91	16 35 54 73 92	17 36 55 74 93	18 37 56 75 94
0	1900	3800	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
100	2000	3900	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5
200	2100	4000	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10
300	2200	&c.	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
400	2300	—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1
500	2400	—	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6
600	2500	—	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11
700	2600	—	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
800	2700	—	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2
900	2800	—	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7
1000	2900	—	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12
1100	3000	—	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1200	3100	—	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3
1300	3200	—	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8
1400	3300	—	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13
1500	3400	—	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1600	3500	—	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4
1700	3600	—	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9
1800	3700	—	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14

33 Julian period.

From the multiplication of the ſolar cycle of 28 years into the lunar cycle of 19 years, and the Roman indiction of 15 years, ariſes the great Julian period, conſiſting of 7980 years, which had its beginning 764 years before Strauchius's ſuppoſed year of the creation (for no later could all the three cycles begin together), and it is not yet completed: And therefore it includes all other cycles, periods, and eras. There is but one year in the whole period that has the ſame numbers for the three cycles of which it is made up: And therefore, if hiſtorians had remarked in their writings the cycles of each year, there had been no diſpute about the time of any action recorded by them.

34 To find the year of the Julian period.

The Dionyſian or vulgar era of Chriſt's birth was about the end of the year of the Julian period 4713: and conſequently the firſt year of his age, according to that account, was the 4714th year of the ſaid period. Therefore, if to the current year of Chriſt we add 4713, the ſum will be the year of the Julian period. So the year 1789 will be found to be the 6502d year of that period. Or, to find the year of the Julian period anſwering to any given year before the firſt year of Chriſt, ſubtract the number of that given year from 4471, and the remainder will be the year of the Julian period. Thus, the year 585 before the firſt year of Chriſt) which was the 584th before his birth) was the 4129th year of the ſaid period. Laſtly, to find the cycles of the ſun, moon, and indiction for any given year of this period, divide the given year by 28, 19, and 15; the three remainders will be the cycles ſought, and the quotients the numbers of cycles run ſince the beginning of the period. So in the above 4714th year of the Julian period, the cycle of the ſun was 10, the cycle of the moon 2, and the cycle of the indiction 4; the ſolar cycle having run through 168 courſes, the lunar 248, and the indiction 314.

35 Year of Chriſt's birth when ſettled.

The vulgar era of Chriſt's birth was never ſettled till the year 527, when Dionyſius Exiguus, a Roman abbot, fixed it to the end of the 4713th year of the Julian period, which was four years too late; for our Saviour was born before the death of Herod, who ſought to kill him as ſoon as he heard of his birth. And, according to the teſtimony of Joſephus [*B.* xvii. *ch.* 8.), there was an eclipſe of the moon in the time of Herod's laſt illneſs: which eclipſe appears by our aſtronomical tables to have been in the year of the Julian period 4710, March 13th, at 3 hours paſt midnight, at Jeruſalem. Now, as our Saviour muſt have been born ſome months before Herod's death, ſince in the interval he was carried into Egypt, the lateſt time in which we can fix the true æra of his birth is about the end of the 4709th year of the Julian period.

36 Eras or Epochs.

As there are certain fixed points in the heavens from which aſtronomers begin their computations, ſo there are

are certain points of time from which hiſtorians begin to reckon; and theſe points or roots of time are called *eras* or *epochs*. The moſt remarkable eras are, thoſe of the Creation, the Greek Olympiads, the building of Rome, the era or Nabonaſſar, the death of Alexander, the birth of Chriſt, the Arabian Hegira, and the Perſian Jeſdegird: All which, together with ſeveral others of leſs note, have their beginnings fixed by chronologers to the years of the Julian period, to the age of the world at thoſe times, and to the years before and after the year of Chriſt's birth.

37 Hiſtoric chronology

Having thus treated, as fully as our limits will admit, of the various diviſions of time, we muſt now conſider the ſecond part of chronology, *viz.* that which more immediately relates to hiſtory, and which has already been obſerved to have the four following foundations: 1. Aſtronomical obſervations, particularly of eclipſes. 2. The teſtimonies of credible authors. 3. Epochs in hiſtory univerſally allowed to be true. 4. Ancient medals, coins, monuments, and inſcriptions. We ſhall conſider theſe four principal parts in the order they here ſtand.

I.

38 Of eclipſes of the ſun and moon.

It is with great reaſon that the eclipſes of the ſun and moon, and the aſpects of the other planets, have been called public and celeſtial characters of the times, as their calculations afford chronologers infallible proofs of the preciſe epochs in which a great number of the moſt ſignal events in hiſtory have occurred. So that in chronological matters we cannot make any great progreſs, if we are ignorant of the uſe of aſtronomic tables, and the calculation of eclipſes. The ancients regarded the latter as prognoſtics of the fall of empires, of the loſs of battles, of the death of monarchs, *&c.* And it is to this ſuperſtition, to this wretched ignorance, that we happily owe the vaſt labour that hiſtorians have taken to record ſo great a number of them. The moſt able chronologers have collected them with ſtill greater labour. Calviſius, for example, founds his chronology on 144 eclipſes of the ſun, and 127 of the moon, that he ſays he had calculated. The grand conjunction of the two ſuperior planets, Saturn and Jupiter, which, according to Kepler, occurs once in 800 years in the ſame point of the zodiac, and which has happened only eight times ſince the creation (the laſt time in the month of December (1603), may alſo furniſh chronology with inconteſtable proofs. The ſame may be ſaid of the tranſit of Venus over the ſun, which has been obſerved in our days, and all the other uncommon poſitions of the planets. But among theſe celeſtial and natural characters of times, there are alſo ſome that are named *civil* or *artificial*, and which, nevertheleſs, depend on aſtronomic calculation.

Such are the ſolar and lunar cycles; the Roman indiction; the feaſt of Eaſter; the biſſextile year; the jubilees; the ſabbatic years; the combats and Olympic games of the Greeks; and hegira of the Mahometans, *&c.* And to theſe may be added the periods, eras, epochs, and years of different nations, ancient and modern. We ſhall only remark on this occaſion, that the period or era of the Jews commences with the creation of the world; that of the ancient Romans with the foundation of the city of Rome; that of the Greeks at the eſtabliſhment of the Olympic games; that of Nebuchadnezzar, with the advancement of the firſt king of Babylon to the throne; the Yezdegerdic years, with the laſt king of the Perſians of that name; the hegira of the Turks with the flight of Mahomet from Mecca to Medina, *&c.* The year of the birth of Chriſt was the 4713th year of the Julian period, according to the common method of reckoning. Aſtronomical chronology teaches us to calculate the preciſe year of the Julian period in which each of theſe epochs happened.

II.

39 Of the teſtimony of authors.

The teſtimony of authors is the ſecond principal part of hiſtoric chronology. Though no man whatever has a right to pretend to infallibility, or to be regarded as a ſacred oracle, it would, however, be making a very unjuſt judgment of mankind, to treat them all as dupes or impoſtors; and it would be an injury offered to public integrity, were we to doubt the veracity of authors univerſally eſteemed, and of facts that are in themſelves right worthy of belief. It would be even a kind of infatuation to doubt that there have been ſuch cities as Athens, Sparta, Rome, Carthage, *&c.* or that Xerxes reigned in Perſia, and Auguſtus in Rome: whether Hannibal ever was in Italy; or that the emperor Conſtantine built Conſtantinople, *&c.* The unanimous teſtimony of the moſt reſpectable hiſtorians will not admit any doubt of theſe matters. When an hiſtorian is allowed to be completely able to judge of an event, and to have no intent of deceiving by his relation, his teſtimony is irrecuſable. But to avoid the danger of adopting error for truth, and to be ſatisfied of a fact that appears doubtful in hiſtory, we may make uſe of the four following rules, as they are founded in reaſon.

1. We ought to pay a particular regard to the teſtimonies of thoſe who wrote at the ſame time the events happened, and that have not been contradicted by any cotemporary author of known authority. Who can doubt, for example, of the truth of the facts related by admiral Anſon, in the hiſtory of his voyage round the world? The admiral ſaw all the facts there mentioned with his own eyes, and publiſhed his book when two hundred companions of his voyage were ſtill living in London, and could have contradicted him immediately, if he had given any falſe or exaggerated relations.

2. After the cotemporary authors, we ſhould give more credit to thoſe who lived near the time the events happened, than thoſe who lived at a diſtance.

3. Thoſe doubtful hiſtories, which are related by authors that are but little known, can have no weight if they are at variance with reaſon, or eſtabliſhed tradition.

4. We muſt diſtruſt the truth of a hiſtory that is related by modern authors, when they do not agree among themſelves in ſeveral circumſtances, nor with ancient hiſtorians, who are to be regarded as original ſources. We ſhould eſpecially doubt the truth of thoſe brilliant portraits, that are drawn at pleaſure by ſuch as never knew the perſons they are intended for, and even made ſeveral centuries after their deceaſe.

The moſt pure and moſt fruitful ſource of ancient hiſtory

hiſtory is doubtleſs to be found in the Holy Bible. Let us here for a moment ceaſe to regard it as divine, and let us preſume to conſider it as a common hiſtory. Now, when we regard the writers of the books of the Old Teſtament, and conſider them ſometimes as authors, ſometimes as ocular witneſſes, and ſometimes as reſpectable hiſtorians; whether we reflect on the ſimplicity of the narration, and the air of truth that is there conſtantly viſible; or, when we conſider the care that the people, the governments, and the learned men of all ages, have taken to preſerve the true text of the Bible; or that we have regard to the happy conformity of the chronology of the holy ſcriptures with that of profane hiſtory: or, if we obſerve the admirable harmony that is between theſe books and the moſt reſpectable hiſtorians, as Joſephus and others: and laſtly, when we conſider that the books of the holy ſcripture furniſh us alone with an accurate hiſtory of the world from the creation, through the line of patriarchs, kings, judges, and princes of the Hebrews; and that we may, by its aid, form an almoſt intire ſeries of events down to the birth of Chriſt, or the time of Auguſtus, which comprehends a ſpace of about 4000 years, ſome ſmall interruptions excepted, and which are eaſily ſupplied by profane hiſtory: when all theſe reflections are juſtly made, we muſt conſtantly allow that the ſcriptures form a book which merits the firſt rank among all the ſources of ancient hiſtory. It has been objected, that this book contains contradictions; but the moſt able interpreters have reconciled theſe ſeeming contradictions. It has been ſaid, that the chronology of the Hebrew text and the Vulgate do not agree with the chronology of the verſion of the Septuagint; but the ſoundeſt critics have ſhown that they may be made to agree. It has been obſerved, moreover, that the ſcriptures abound with miracles and prodigies; but they are miracles that have really happened: and what ancient hiſtory is there that is not filled with miracles, and other marvellous events? And do we for that reject their authority? Cannot the true God be ſuppoſed to have performed thoſe miracles which Pagan hiſtorians have attributed to their falſe divinities? Muſt we pay no regard to the writings of Livy, becauſe his hiſtory contains many fabulous relations?

III.

40 Epochs.

THE *epochs* form the third principal part of chronology. Theſe are thoſe fixed points in hiſtory that have never been conteſted, and of which there can, in fact, be no doubt. Chronologers fix on the events that are to ſerve as epochs, in a manner quite arbitrary; but this is of little conſequence, provided the dates of theſe epochs agree, and that there is no contradiction in the facts themſelves. When we come to treat expreſsly on hiſtory, we ſhall mention, in our progreſs, all the principal epochs.

IV.

41 Medals, &c.

MEDALS, monuments, and inſcriptions, form the fourth and laſt principal part of chronology. It is ſcarce more than 150 years ſince cloſe application has been made to the ſtudy of theſe; and we owe to the celebrated Spanheim the greateſt obligations, for the progreſs that is made in this method: his excellent work, *De præſtantia et uſu numiſmatum antiquorum*, has ſhown the great advantages of it; and it is evident that theſe monuments are the moſt authentic witneſſes that can be produced. It is by the aid of medals that M. Vailant has compoſed his judicious hiſtory of the kings of Syria, from the time of Alexander the Great to that of Pompey: they have been, moreover, of the greateſt ſervice in elucidating all ancient hiſtory, eſpecially that of the Romans; and even ſometimes that of the middle age. Their uſe is more fully ſpoken of in the article MEDALS. What we here ſay of medals, is to be underſtood equally, in its full force, of ancient inſcriptions, and of all other authentic monuments that have come down to us.

Every reader, endowed with a juſt diſcernment will readily allow that theſe four parts of chronology afford clear lights, and are excellent guides to conduct us through the thick darkneſs of antiquity. That impartiality, however, which directs us to give a faithful relation of that which is true and falſe, of the certainty and uncertainty of all the ſciences, obliges us here freely to confeſs, that theſe guides are not infallible, nor the proofs that they afford mathematical demonſtrations. In fact, with regard to hiſtory in general, and ancient hiſtory in particular, ſomething muſt be always left to conjecture and hiſtoric faith. It would be an offence againſt common probity, were we to ſuffer ourſelves to paſs over in ſilence thoſe objections which authors of the greateſt reputation have made againſt the certainty of chronology. We ſhall extract them from their own works; and we hope that their is no magiſtrate, theologian, or public profeſſor in Europe, who would be mean enough to accuſe us of a crime, for not unworthily diſguiſing the truth.

1. The prodigious difference there is between the Septuagint Bible and the Vulgate, in point of chronology, occaſions an embarraſſment, which is the more difficult to avoid as we cannot poſitively ſay on which ſide the error lies. The Greek Bible counts, for example, from the creation of the world to the birth of Abraham, 1500 years more than the Hebrew and Latin Bibles, *&c.* 2. How difficult is it to aſcertain the years of the judges of the Jewiſh nation, in the Bible? What darkneſs is ſpread over the ſucceſſion of the kings of Judah and Iſrael? The calculation of time is there ſo inaccurate, that the ſcripture never marks if they are current or complete years. For we cannot ſuppoſe that a patriarch, judge, or king, lived exactly 60, 90, 100, or 969 years, without any odd months or days. 3. The different names that the Aſſyrians, Egyptains, Perſians and Greeks, have given to the ſame prince, have contributed not a little to embarraſs all ancient chronology. Three or four princes have borne the name of Aſſuerus, though they had alſo other names. If we did not know that Nabucodonoſor, Nabucodroſor, and Nabucolaſſar, were the ſame name, or the name of the ſame man, we ſhould ſcarcely believe it. Sargon is Senacherib; Ozias is Azarias; Sedecias is Mathanias; Joachas is alſo called Sellum; Aſaraddon, which is pronounced indifferently Eſarhaddon and Aſarhaddon, is called Aſenaphar by the Cuthæans; and by an oddity of which we do not know the origin, Sardanapalus is called by

by the Greeks Tenos Concoleros. 4. There remain to us but few monuments of the firſt monarchs of the world. Numberleſs books have been loſt, and thoſe which have came down to us are mutilated or altered by tranſcribers. The Greeks began to write very late. Herodotus, their firſt hiſtorian, was of a credulous diſpoſition, and believed all the fables that were related by the Egyptain prieſts. The Greeks were in general vain, partial, and held no nation in eſteem but their own. The Romans were ſtill more infatuated with notions of their own merit and grandeur, their hiſtorians were altogether as unjuſt as was their ſenate, toward other nations that were frequently far more reſpectable. 5. The eras, the years, the periods and epochs, were not the ſame in each nation; and they, moreover, began at different ſeaſons of the year. All this has thrown ſo much obſcurity over chronology, that it appears to be beyond all human capacity totally to diſperſe it.

Chriſtianity itſelf had ſubſiſted near 1200 years, before they knew preciſely how many years had paſſed ſince the birth of our Saviour. They ſaw clearly that the vulgar era was defective, but it was a long time before they could comprehend that it required four whole years to make up the true period. Abbe Denis the Little, who in the year 532 was the firſt among the Chriſtians to form the era of that grand epoch, and to count the years from that time, in order to make their chronology altogether Chriſtian, erred in his calculation, and led all Europe into his error. They count 132 contrary opinions of different authors concerning the year in which the Meſſiah appeared on the earth. M. Vallemont names 64 of them, and all celebrated writers. Among all theſe authors, however, there is none that reckon more than 7000, nor leſs than 3700 years. But even this difference is enormous. The moſt moderate fix the birth of Chriſt in the 4000th year of the world. The reaſons, however, on which they found their opinion, appear to be ſufficiently arbitrary.

Be theſe matters, however, as they may, the wiſdom of Providence has ſo diſpoſed all things, that there remain ſufficient lights to enable us nearly to connect the ſeries of events: for in the firſt 3000 years of the world, where profane hiſtory is defective we have the chronology of the Bible to direct us; and after that period, where we find more obſcurity in the chronology of the holy ſcriptures, we have, on the other hand, greater lights from profane authors. It is at this period that begins the time which Varro calls *hiſtoric*: as, ſince the time of the Olympiads, the truth of ſuch events as have happened ſhines clear in hiſtory. Chronology, therefore, draws its principal lights from hiſtory; and in return, ſerves it as a guide. Referring the reader, therefore, to the article HISTORY, and the *Chart* thereto annexed, we ſhall conclude the preſent article with

A CHRONOLOGICAL TABLE *of Remarkable Events, Diſcoveries, and Inventions, from the Creation to the Year* 1789.

Bef. Chriſt.

4008 THE creation of the world, and Adam and Eve
4007 The birth of Cain, the firſt who was born of a woman.
3017 Enoch, for his piety, is tranſlated to heaven.
2352 The old world is deſtroyed by a deluge which continued 377 days.
2247 The tower of Babel is built about this time by Noah's poſterity; upon which God miraculouſly confounds their language, and thus diſperſes them into different nations.
2237 About this time, Noah is, with great probability, ſuppoſed to have parted from his rebellious offspring, and to have led a colony of ſome of the more tractable into the eaſt, and there either he, or one of his ſucceſſors to have founded the ancient Chineſe monarchy.
2234 The celeſtial obſervations are begun at Babylon, the city which firſt gave birth to learning and the ſciences.
2188 Miſraim, the ſon of Ham, founds the kingdom of Egypt, which laſted 1663 years, down to the conqueſt of Cambyſes, in 525 before Chriſt.
2059 Ninus, the ſon of Belus, founds the kingdom of Aſſyria, which laſted above 1000 years, and out of its ruins were formed the Aſſyrians of Babylon, thoſe of Nineveh, and the kingdom of the Medes.
1985 The covenant of God made with Abram, when he leaves Haran to go into Canaan, which begin, the 430 years of ſojourning.
1961 The cities of Sodom and Gomorra are deſtroyed for their wickedneſs by fire from heaven.
1856 The kingdom of Argos, in Greece, begins under Inachus.
1822 Memnon, the Egyptain, invents the letters.
1715 Prometheus firſt ſtruck fire from flints.
1635 Joſeph dies in Egypt.
1574 Aaron born in Egypt; 1490, appointed by God firſt high-prieſt of the Iſraelites.
1571 Moſes, brother to Aaron, born in Egypt, and adopted by Pharaoh's daghter, who educates him in all the learning of the Egyptains.
1556 Cecrops brings a colony of Saites from Egypt into Attica, and begins the kingdom of Athens in Greece.
1555 Moſes performs a number of miracles in Egypt; and departs from that kingdom, together with 600,000 Iſraelites, beſides children, which completed the 430 years of ſojourning. They miraculouſly paſs through the Red Sea, and come to the deſart of Sinai, where Moſes receives from God, and delivers to the people, the Ten Commandments, and the other laws, and ſets up the tabernacle, and in it the ark of the covenant.
1546 Scamander comes from Crete into Phrygia, and begins the kingdom of Troy.
1515 The Iſraelites, after ſojourning in the wilderneſs forty years, are led under Joſhua into the land of Canaan, where they fix themſelves, after having ſubdued the natives; and the period of the ſabbatical year commences.
1503 The deluge of Deucalion.
1496 The council of Amphictyons eſtabliſhed at Thermopylæ.
1493 Cadmus carried the Phenician letters into Greece and built the citadel of Thebes.
1490 Sparta built by Lacedemon.

Before Chriſt.

1485 The firſt ſhip that appeared in Greece was brought from Egypt by Danaus, who arrived at Rhodes, and brought with him his fifty daughters.
1480 Troy built by Dardanus.
1452 The Pentateuch, or five firſt books of Moſes, are written in the land of Moab, where he died the year following, aged 110.
1406 Iron is found in Greece, from the accidental burning of the woods.
1344 The kingdom of Mycenæ begins.
1326 The Iſthmian games inſtituted at Corinth.
1325 The Egyptian canicular year began July 20th.
1307 The Olympic games inſtituted by Pelops.
1300 The Lupercalia inſtituted.
1294 The firſt colony came from Italy into Sicily.
1264 The ſecond colony came from Italy into Sicily.
1252 The city of Tyre built.
1243 A colony of Arcadians conducted by Evander into Italy.
1233 Carthage founded by the Tyrians.
1225 The Argonautic expedition.
1204 The rape of Helen by Paris, which gave riſe to the Trojan war, ending with the deſtruction of the city in 1184.
1176 Salamis in Cyprus built by Teucer.
1152 Aſcanius builds Alba Longa.
1130 The kingdom of Sicyon ended.
1124 Thebes built by the Bœotians.
1115 The mariner's compaſs known in China.
1104 The expedition of the Heraclidæ into Peloponneſus; the migration of the Dorians thither; and the end of the kingdom of Mycenæ.
1102 The kingdom of Sparta commenced.
1070 The kingdom of Athens ended.
1051 David beſieged and took Jeruſalem.
1044 Migration of the Ionian colonies.
1008 The Temple is ſolemnly dedicated by Solomon.
996 Solomon prepared a fleet on the Red Sea to ſend to Ophir.
986 Samos and Utica in Africa built.
979 The kingdom of Iſrael divided.
974 Jeruſalem taken and plundered by Shiſhak king of Egypt.
911 The prophet Elijah flouriſhed.
894 Money firſt made of gold and ſilver at Argos.
884 Olympic games reſtored by Iphitus and Lycurgus.
873 The art of ſculpture in marble found out.
869 Scales and meaſures invented by Phidon.
864 The city of Carthage, in Africa, enlarged by queen Dido.
821 Nineveh taken by Arbaces.
814 The kingdom of Macedon begins.
801 The city of Capua in Compania built.
799 The kingdom of Lydia began.
786 The ſhips called *Triremes* invented by the Corinthians.
779 The race of kings in Corinth ended.
776 The era of the Olympiads began.
760 The Ephori eſtabliſhed at Sparta.
758 Syracuſe built by Archias of Corinth.
754 The government of Athens changed.
753 Era of the building of Rome in Italy by Romulus, firſt king of the Romans.
747 The era of Nabonaſſar commenced on the 26th of February; the firſt day of Thoth.
746 The government of Corinth changed into a republic.
743 The firſt war between the Meſſenians and Spartans.
724 Mycenæ reduced by the Spartans.
723 A colony of the Meſſenians ſettled at Rhegium in Italy.
720 Samaria taken, after three years ſiege, and the kingdom of Iſreal finiſhed by Salmanazer king of Aſſyria, who carries the ten tribes into captivity.
The firſt eclipſe of the moon on record.
713 Gela in Sicily built.
703 Corcyra, now Corfu, founder of the Corinthians.
702 Ecbatan in Media built by Deioces.
685 The ſecond Meſſenian war under Ariſtomenes.
670 Byzantium (now Conſtantinople) built by a colony of Athenians.
666 The city of Alba deſtroyed.
648 Cyrene in Africa founded.
634 Cyaxares beſieges Nineveh, but is obliged to raiſe the ſiege by an incurſion of the Scythians, who remained maſters of Aſia for 28 years.
624 Draco publiſhed his inhuman laws at Athens.
610 Pharaoh Necho attempted to make a canal from the Nile to the Red Sea, but was not able to accompliſh it.
607 By order of the ſame monarch, ſome Phenicians ſailed from the Red Sea round Africa, and returned by the Mediterranean.
606 The firſt captivity of the Jews by Nebuchadnezzar. Nineveh deſtroyed by Cyaxares.
600 Thales, of Miletus, travels into Egypt, conſults the prieſts of Memphis, acquires the knowledge of geometry, aſtronomy, and philoſophy; returns to Greece, calculates eclipſes, gives general notions of the univerſe, and maintains that an only Supreme Intelligence regulates all its motions.
Maps, globes, and the ſigns of the zodiac, invented by Anaximander, the ſcholar of Thales.
598 Jehoiakin, king of Judah, is carried away captive, by Nebuchadnezzar, to Babylon.
594 Solon made Archon at Athens.
591 The Pythian games inſtituted in Greece, and tragedy firſt acted.
588 The firſt irruption of the Gauls into Italy.
586 The city of Jeruſalem taken, after a ſiege of 18 months.
582 The laſt captivity of the Jews by Nebuchadnezzar.
581 The Iſthmian games reſtored.
580 Money firſt coined at Rome.
571 Tyre taken by Nebuchadnezzar after a ſiege of 13 years.
566 The firſt cenſus at Rome, when the number of citizens was found to be 84,000.
562 The firſt comedy at Athens acted upon a moveable ſcaffold.
559 Cyrus the firſt king of Perſia.
538 The kingdom of Babylon finiſhed; that city being

ing taken by Cyrus, who, in 536, gives an edict for the return of the Jews.
534 The foundation of the temple laid by the Jews.
526 Learning is greatly encouraged at Athens, and a public library firſt founded.
520 The ſecond edict to rebuild Jeruſalem.
515 The ſecond temple at Jeruſalem is finiſhed under Darius.
510 Hippias baniſhed from Athens.
509 Tarquin, the ſeventh and laſt king of the Romans, is expelled, and Rome is governed by two conſuls, and other republican magiſtrates, till the battle of Pharſalia, being a ſpace of 461 years.
508 The firſt alliance between the Romans and Carthaginians.
507 The ſecond cenſus at Rome, 130,000 citizens.
504 Sardis taken and burnt by the Athenians, which gave occaſion to the Perſian invaſion of Greece.
498 The firſt dictator appointed at Rome.
497 The Saturnalia inſtituted at Rome.
The number of citizens 150,700.
493 Tribunes created at Rome; or, in 488.
490 The battle of Marathon, September 28th.
486 Æſchylus, the Greek poet, firſt gains the prize of tragedy.
483 Queſtors created at Rome.
481 Xerxes, king of Perſia, begins his expedion againſt Greece.
480 The defence of Thermopylæ by Leonidas, and the ſea-fight at Salamis.
476 The number of Roman citizens reduced to 103,000
469 The third Meſſenian war.
466 The number of Roman citizens increaſed to 124,214.
458 Ezra is ſent from Babylon to Jeruſalem, with the captive Jews and the veſſels of gold and ſilver, &c. being ſeventy weeks of years, or 490 years before the crucifixion of our Saviour.
456 The Ludi Seculares firſt celebrated at Rome.
454 The Romans ſend to Athens for Solon's laws.
451 The Decemvirs created at Rome, and the laws of the twelve tables compiled and ratified.
449 The Decemvirs baniſhed.
445 Military tribunes, with conſular power, created at Rome.
443 Cenſors created at Rome.
441 The battering Ram invented by Artemones.
432 The Metonic cycle began July 15th.
431 The Peloponneſian war began, and laſted 27 years.
430 The hiſtory of the Old Teſtament finiſhes about this time.
A plague over the known world.
Malachi the laſt of the prophets.
405 The Athenians entirely defeated by Lyſander, which occaſions the loſs of the city, and ruin of the Athenian power.
401 The retreat of the 10,000 Greeks under Xenophon. The 30 tyrants expelled from Athens, and democratic government reſtored.
400 Socrates, the founder, of moral philoſophy among the Greeks, believes the immortality of the ſoul, a ſtate of rewards and puniſhments; for which, and other ſublime doctrines, he is put to death by the Athenians, who ſoon after repent, and erect to his memory a ſtatue of braſs.
399 The feaſt of Lectiſternium inſtituted. Catapultæ invented by Dionyſius.
394 The Corinthian war begun.
390 Rome burnt by the Gauls.
387 The peace of Antalcidas between the Greeks and Perſians.
The number of Roman citizens amounted to 152,583.
384 Dionyſius begins the Punic war.
379 The Bœtian war commences.
377 A general conſpiracy of the Greek ſtates againſt the Lacedemonians.
373 A great earthquake in Peloponneſus.
371 The Lacedemonians defeated by Epaminondas at Leuctra.
367 Prætors eſtabliſhed in Rome. The Licinian law paſſed.
363 Epaminondas killed at the battle of Mantinea.
359 The obliquity of the ecliptic obſerved to be 23° 49′ 10″.
358 The Social war began.
357 Dionyſius expelled from Syracuſe.
A tranſit of the moon over Mars obſerved.
356 The ſacred war begun in Greece.
Birth of Alexander the Great.
343 Dionyſius II. expelled from Syracuſe.
Commencement of the Syracuſian era.
338 Philip of Macedon gains the battle of Chæronæa, and thus attains to the Sovereignty of Greece.
335 Thebes taken and raſed by Alexander the Great.
334 The Perſians defeated at Granicus, May 22d.
333 They are again defeated at Iſſus in Cilicia, October.
332 Alexander takes Tyre and marches to Jeruſalem.
331 Alexandria built.
Darius entirely defeated at Arbela.
330 Alexander takes Babylon, and the principal cities of the Perſian Empire.
The Calippic period commences.
328 Alexander paſſes Mount Caucaſus, and marches into India.
327 He defeats Porus, an Indian prince, and founds ſeveral cities.
326 The famous ſedition of Corcyra.
324 His family exterminated, and his dominions parted by his officers.
323 Alexander the Great dies at Babylon.
315 Rhodes almoſt deſtroyed by an inundation.
311 The Appian way, aqueducts, &c. conſtructed at Rome.
308 The cities of Greece recovered their liberties for a ſhort time.
307 Antioch, Seleucia, Laodicea, and other cities, founded by Seleucus.
301 Antigonus defeated and killed at Ipſus.
299 The firſt barbers came from Sicily to Rome.
294 The number of effective men in Rome amounts to 270,000.
293 The firſt ſun-dial erected at Rome by Papirius Curſor.

285 Dionyſius, of Alexandria, began his aſtronomical era on Monday June 26, being the firſt who found the exact ſolar year to conſiſt of 365 days 5 hours and 49 minutes.

The watch-tower of Pharos at Alexandria built.

Ptolemy Philadelphus, king of Egypt, employs 72 interpreters to tranſlate the Old Teſtament into the Greek languages, which is called the *Septuagint*.

284 The foundations of the Achæan republic laid.

283 The college and library founded at Alexandria.

282 The Tarentine war begins.

280 Pyrrhus invades Italy.

279 A cenſus at Rome. The number of citizens 278,222.

269 The firſt coining of ſilver at Rome.

265 The number of Roman citizens augmented to 292,224.

264 The firſt Punic war begins, and continues 23 years. The Chronology of the Arundelian marbles compoſed.

262 A tranſit of Mercury over the Bull's horn; the planet being in 23° of ♉, and the ſun in 29° 30′ ♈.

260 Provincial queſtors eſtabliſhed at Rome.

The Romans firſt concern themſelves in naval affairs, and defeat the Carthaginians at ſea.

255 Regulus, the Roman Conſul, defeated and taken priſoner by the Carthaginians under Xantippus.

252 A cenſus at Rome. The number of citizens 297,897.

247 Another cenſus. The number of citizens, 251,212,

246 The records of China deſtroyed.

241 Concluſion of the firſt Punic war.

240 Comedies firſt acted at Rome.

237 Hamilcar, the Carthaginian, cauſes his ſon Hannibal, at nine years old, to ſwear eternal enmity to the Romans.

236 The Tartars expelled from China.

235 Rome at peace with other nations. The temple of Janus ſhut.

231 Corſica and Sardinia ſubdued by the Romans.

The firſt divorce at Rome.

230 The obliquity of the ecliptic obſerved by Eratoſthenes to be 23° 51′ 20″.

224 The Coloſſus at Rhodes overturned by an earthquake.

219 The art of ſurgery introduced at Rome.

218 Commencement of the ſecond Punic war.

Hannibal paſſes the Alps and invades Italy.

216 The Romans defeated at Cannæ, May 21ſt.

214 Syracuſe beſieged by Marcellus.

209 A cenſus at Rome. The number of citizens 227,107.

208 Aſdrubal invades Italy; but is defeated and killed.

206 Gold firſt coined at Rome.

202 Hannibal defeated by Scipio at Zama.

201 Concluſion of the ſecond Punic war.

194 Sparta and Hither Spain ſubdued by the Romans.

192 A cenſus at Rome. The number of citizens 243,704.

191 Antiochus defeated by the Romans at Thermopylæ.

190 The firſt Roman army enters Aſia, and from the ſpoils of Antiochus brings the Aſiatic luxury firſt to Rome.

188 The Spartans obliged to renounce the inſtitutions of Lycurgus.

179 A cenſus at Rome. The number of citizens 273,244.

173 The Jewiſh high-prieſthood ſold by Antiochus Epiphanes.

170 Paper invented in China.

The temple of Jeruſalem plundered by Antiochus.

169 A cenſus at Rome. The number of citizens 212,805.

168 Macedon reduced to the form of a Roman province.

The firſt library erected at Rome.

165 The temple of Jeruſalem purified by Judas Maccabeus.

164 A cenſus at Rome. The number of citizens 327,032.

162 Hipparchus began his aſtronomical obſervations at Rhodes.

161 Philoſophers and rhetoricians baniſhed from Rome.

150 The third Punic war commenced.

146 Corinth deſtroyed.

Carthage, the rival to Rome, is raſed to the ground by the Romans.

A remarkable comet appeared in Greece.

143 Hipparchus began his new cycle of the moon, conſiſting of 111,035 days.

141 The Numantine war commenced.

135 The hiſtory of the Apocrypha ends.

133 Numantia deſtroyed by Scipio.

124 A cenſus at Rome. The number of citizens 390,736.

105 The Cimbri and Tuetones defeated the Romans.

102 The Tuetones and Ambrones defeated by Marius.

88 Rome beſieged by the chiefs of the Marian faction.

82 Sylla created perpetual dictator at Rome.

69 A cenſus at Rome. The number of citizens 450,000.

66 Cataline's conſpiracy.

55 Julius Cæſar makes his firſt expedition into Britain.

Craſſus defeated and killed by the Parthians.

51 Gaul reduced to a Roman province.

50 A cenſus at Rome. The number of citizens 320,000.

48 The battle of Pharſalia, between Cæſar and Pompey, in which the latter is defeated.

The Alexandrian library, conſiſting of 400,000 valuable books, burnt by accident.

45 The war of Africa, in which Cato kills himſelf.

The ſolar year introduced by Cæſar.

44 Cæſar, the greateſt of the Roman conquerors, after having fought fifty pitched battles, and ſlain 1,192,000 men, is killed in the ſenate-houſe by conſpirators.

42 The republicans defeated at Philippi.

31 The battle of Actium fought, in which Mark

Antony

Before Chriſt.

Anthony and Cleopatra are totally defeated by Octavius, nephew to Julius Cæſar.
30 Alexandria, in Egypt, is taken by Octavius, upon which Anthony and Cleopatra put themſelves to death, and Egypt is reduced to a Roman province.
29 A cenſus at Rome. The number of citizens 4,101,017.
27 Octavius, by a decree of the ſenate, obtains the title of Auguſtus Cæſar, and an abſolute exemption from the laws, and is properly the firſt Roman emperor.
The pantheon at Rome built.
19 Rome at the height of its glory.
The temple of Jeruſalem rebuilt by Herod.
Agrippa conſtructed the magnificent aqueducts at Rome.
8 A cenſus at Rome. The number of citizens 4,233,000.
5 The temple of Janus is ſhut by Auguſtus, as an emblem of univerſal peace, and
JESUS CHRIST is born, on Monday, December 25.

After Chriſt.

1 The Vulgar Chriſtian era commenced from January; the Saviour of the world being then five years of age.
8 Jeſus Chriſt diſputes with the doctors in the temple.
14 A cenſus at Rome, 4,037,000 citizens.
16 Mathematicians and magicians expelled from Rome.
17 Twelve cities in Aſia deſtroyed by an earthquake.
27 Pilate made governor of Judæa.
29 Jeſus baptiſed in Jordan by John.
33 He is crucified at Jeruſalem.
35 St Paul converted.
39 St Matthew writes his Goſpel.
Pontius Pilate kills himſelf.
A conjunction of Saturn, Jupiter, and Mars.
40 The name of Chriſtians firſt given at Antioch to the followers of Chriſt.
43 Claudius Cæſar's expedition into Britain.
44 St Mark writes his Goſpel.
50 London is founded by the Romans: 368, ſurrounded by ditto with a wall, ſome parts of which are ſtill obſervable.
51 Caractacus, the Britiſh king, is carried in chains to Rome.
52 The council of the Apoſtles at Jeruſalem.
55 St Luke writes his Goſpel.
56 Rotterdam built.
59 The emperor Nero puts his Mother and brothers to death.
————Perſecutes the Druids in Britain.
60 Chriſtianity introduced into Britain.
61 Boadicia, the Britiſh queen, defeats the Romans; but is conquered ſoon after by Suetonius, gogernor of Britain.
62 St Paul is ſent in bonds to Rome—writes his epiſtles between 51 and 66.
63 The Acts of the Apoſtles written.
A great earthquake in Aſia.
64 Rome ſet on fire, and burned for ſix days; upon which began (under Nero) the firſt perſecution againſt the Chriſtians.

After Chriſt.

65 Many prodigies ſeen about Jeruſalem.
66 St Peter and St Paul put to death.
70 While the factious Jews are deſtroying one another with mutual fury, Titus, the Roman general, takes Jeruſalem, which is raſed to the ground, and the plough made to paſs over it.
73 The philoſophers baniſhed from Rome by Veſpaſian.
79 The cities of Pompeii and Herculaneum deſtroyed by an eruption of Veſuvius.
80 The Capitol and Pantheon at Rome deſtroyed by fire.
83 The philoſophers expelled Rome by Domitian.
85 Julius Agricola, governor of South-Britain, to protect the civilized Britons from the incurſions of the Caledonians, builds a line of forts between the rivers Forth and Clyde; defeats the Caledonians under Galgacus on the Grampian hills; and firſt ſails round Britain, which he diſcovers to be an iſland.
86 The Capitoline games inſtituted by Domitian.
88 The ſecular games celebrated at Rome.
93 The empire of the Huns in Tartary deſtroyed by the Chineſe.
The Evangeliſt John baniſhed to Patmos.
94 The ſecond Perſecution of the Chriſtians under Domitian.
96 St John the Evangeliſt wrote his Revelation—his Goſpel in 97.
103 Dacia reduced to a Roman province.
105 A great earthquake in Aſia and Greece.
107 The third perſecution of the Chriſtians under Trajan.
114 Armenia reduced to a Roman province.
A great earthquake in China.
115 Aſſyria ſubdued by Trajan.
An inſurrection of the Jews, who murder 200,000 Greeks and Romans.
A violent earthquake at Antioch.
120 Nicomedia and other cities ſwallowed up by an earthquake.
121 The Caledonians reconquer from the Romans all the ſouthern parts of Scotland; upon which the emperor Adrian builds a wall between Newcaſtle and Carliſle; but this alſo proving ineffectual, Pollius Urbicus, the Roman general, about the year 134, repairs Agricola's forts, which he joins by a wall four yards thick.
130 Jeruſalem rebuilt by Adrian.
132 The ſecond Jewiſh war commenced.
135 The ſecond Jewiſh war ends, when they were all baniſhed Judea.
139 Juſtin writes his firſt apology for the Chriſtians.
141 A number of hereſies appear about this time.
146 The worſhip of Serapis introduced at Rome.
152 The emperor Antoninus Pius ſtops the perſecution againſt the Chriſtians.
An inundation of the Tyber, and an earthquake at Rhodes.
163 The fourth perſecution of the Chriſtians, under Marcus Aurelius Antoninus.
166 The Romans ſent Ambaſſadors to China.

168 A plague over the known world.
188 The Capitol at Rome deſtroyed by lightning.
191 A great part of Rome deſtroyed by fire.
203 The fifth perſecution of the Chriſtians, under Severus.
205 An earthquake in Wales.
209 Severus's wall in Britain built.
218 Two comets appeared at Rome. The courſe of the moſt remarkable from eaſt to weſt.
222 About this time the Roman empire begins to decline. The Barbarians begin their irruptions, and the Goths have annual tribute not to moleſt the empire.
225 Mathematicians allowed to teach publicly at Rome.
236 The ſixth perſecution of the Chriſtians, under Maximin.
241 The Franks firſt mentioned in hiſtory.
250 The ſeventh perſecution, under Decius.
252 A dreadful peſtilence broke out in Ethiopia, and ſpread over the world.
The eighth perſecution, under Gallus.
253 Europe ravaged by the Scythians and Goths.
258 The ninth perſecution, under Valerian.
260 Valerian is taken priſoner by Sapor, king of Perſia, and flead alive.
The Scythians ravaged the Roman empire
The temple of Diana at Epheſus burnt.
261 A great plague throughout the Roman empire.
262 Earthquakes in Europe, Aſia, and Africa, and three days of darkneſs.
273 The Romans took Palmyra.
274 Silk firſt brought from India; the manufactory of it introduced into Europe by ſome monks, 551; firſt worn by the clergy in England, 1534.
276 Wines firſt made in Britain.
277 The Franks ſettled in Gaul.
284 The Diocleſian era commenced auguſt 29th, or September 17th.
287 Carauſius proclaimed emperor of Britain.
289 A great comet viſible in Meſopotamia for 29 days.
291 Two emperors and two Cæſars march to defend the four quarters of the empire.
297 Alexandria deſtroyed by Diocleſian.
303 The tenth perſecution, under Diocleſian.
306 Conſtantine the Great begins his reign.
308 Cardinals firſt began.
312 Peſtilence all over the Eaſt.
Cycle of induction began.
313 The tenth perſecution ends by an edict of Conſtantine, who favours the Chriſtians, and gives full liberty to their religion.
314 Three biſhops, or fathers, are ſent from Britain to aſſiſt at the council of Arles.
315 Crucifixion aboliſhed.
321 Obſervation of Sunday enjoined.
323 The firſt general council at Nice, when 318 fathers attended, againſt Arius, the founder of Arianiſm, where was compoſed the famous Nicene Creed, which we attribute to them.
328 Conſtantine removes the ſeat of empire from Rome to Byzantium, which is thereafter called Conſtantinople.
330 A dreadful perſecution of the Chriſtians in Perſia, which laſts 40 years.
331 Conſtantine orders all the heathen temples to be deſtroyed.
334 300,000 Sarmatians revolted from their maſters.
341 The goſpel propagated in Ethiopia by Fomentius.
344 Neocæſarea ruined by an earthquake.
351 The heathens firſt called Pagans.
358 An hundred and fifty cities in Aſia and Greece overturned by an earthquake.
360 The firſt monaſtery founded near Poictiers in France, by Martin.
363 The Roman emperor Julian, ſurnamed the Apoſtate, endeavours in vain to rebuild the temple of Jeruſalem.
364 The Roman empire is divided into the eaſtern (Conſtantinople the capital) and weſtern (of which Rome continued to be the capital), each being now under the government of different emperors.
373 The Bible tranſlated into the Gothic language.
376 The Goths ſettled in Thrace.
379 The cycle of Theophilus commenced.
390 A fiery column ſeen in the air for 30 days.
400 Bells invented by biſhop Paulinus, of Campagnia.
401 Europe over-run by the Goths under Alaric.
404 Another irruption of the Goths.
The kingdom of Caledonia or Scotland revives under Fergus.
406 Third irruption of the Goths.
The Vandals, Alans, and Suevi, ſpread into France and Spain, by a conceſſion of Honorius, emperor of the Weſt.
408 The Chriſtian religion propagated in Perſia.
409 Rome taken and plundered by the Goths, Auguſt 24th.
412 The Vandals begin their kingdom in Spain.
413 The kingdom of Burgundy begun in Alſace.
414 The kingdom of Thoulouſe founded by the Viſigoths.
417 The Alans extirpated by the Goths.
419 Many cities in Paleſtine deſtroyed by an earthquake.
420 The kingdom of France begins upon the Lower Rhine, under Pharamond.
421 The Salique law promulgated.
426 The Romans, reduced to extremities at home, withdraw their troops from Britain, and never return; adviſing the Britons to arm in their own defence, and truſt to their own valour.
432 The goſpel preached in Ireland by St Patrick.
444 All Europe ravaged by the Huns.
446 The Britons now left to themſelves, are greatly haraſſed by the Scots and Picts, upon which they once more make their complaint to the Romans (which they intitle, *The Groans of the Britons*), but receive no aſſiſtance from that quarter.
447 Attila (ſurnamed the Scourge of God) with his Huns ravage the Roman empire.
449 Vortigern, king of the Britons, invites the Saxons into Britain, againſt the Scots and Picts.

452

452 The city of Venice founded.
455 The Saxons having repulſed the Scots and Picts, invite over more of their countrymen, and begin to eſtabliſh themſelves in Kent, under Hengiſt.
476 The weſtern empire is finiſhed, 523 years after the battle of Pharſalia; upon the ruins of which ſeveral new ſtates ariſe in Italy and other parts, conſiſting of Goths, Vandals, Huns, and other barbarians, under whom literature is extinguiſhed, and the works of the learned are deſtroyed.
480 A great earthquake at Conſtantinople, which laſted 40 days.
493 Italy reduced by Theodoric king of the Goths.
496 Clovis, king of France, baptized, and Chriſtianity begins in that kingdom.
506 The Jewiſh talmud publiſhed
508 Prince Arthur begins his reign over the Britons.
510 Paris made the capital of the French dominions.
515 Conſtantinople beſieged by Vitalianus, whoſe fleet is burnt by a ſpeculum of braſs made by Proclus.
516 The computing of time by the Chriſtian era is introduced by Dionyſius the monk.
517 Five years drought and famine in Paleſtine.
519 A bearded comit appears.
529 The codex of Juſtinian, the eaſtern emperor, is publiſhed.
534 The kingdom of the Vandals in Africa comes to an end, after having continued 105 years.
536 The manufacture of ſilk introduced at Conſtantinople by two Indian monks.
540 Antioch deſtroyed by the Perſians.
541 Baſilius the laſt conſul elected at Rome.
542 Antioch rebuilt.
543 An earthquake all over the world.
550 An earthquake in Paleſtine and Syria.
The kingdom of Poland founded.
551 An earthquake in Greece, attended with a great commotion in the ſea.
553 The empire of the Goths in Italy deſtroyed by Narſes.
A great earthquake at Conſtantinople.
557 Another violent earthquake at Conſtantinople, Rome, &c.
A terrible plague all over Europe, Aſia, and Africa, which continues near fifty years.
568 The Lombards founded a kingdom in Italy.
569 The Turks firſt mentioned in hiſtory.
The exarchate of Ravenna begins.
575 The firſt monarchy founded in Bavaria.
580 Antioch deſtroyed by an earthquake.
581 Latin ceaſed to be ſpoken about this time in Italy.
584 The origin of fiefs in France.
588 The city of Paris deſtroyed by fire.
589 Rome overflowed by the Tiber.
593 The Gaſcons eſtabliſhed themſelves in the country called by their name.
596 John of Conſtantinople aſſumes the title of univerſal biſhop.
597 Auguſtin the monk comes into England with forty monks.
599 A dreadful peſtilence in Africa.
604 St Paul's church in London founded.
605 The uſe of bells introduced into churches.
606 Here begins the power of the popes, by the conceſſions of Phocas, emperor of the Eaſt.
622 Mahomet, the falſe prophet, flies from Mecca to Medina, in Arabia, in the 44th year of his age, and 10th of his miniſtry, when he laid the foundation of the Saracen empire, and from whom the Mahometan princes to this day claim their deſcent. His followers compute their time from this era, which in Arabic is called *hegira*, i. e. "the Flight."
628 An academy founded at Canterbury.
632 The era of Jeſdegird commenced June 16th.
637 Jeruſalem is taken by the Saracens or followers of Mahomet.
641 Alexandria in Egypt is taken by ditto, and the grand library there burnt by order of Omar their caliph or prince.
643 The temple of Jeruſalem converted into a Mahometan moſque.
653 The Saracens now extend their conqueſts on every ſide, and retaliate the barbarities of the Goths and Vandals upon their poſterity.
They take Rhodes, and deſtroy the famous Coloſſus.
England invaded by the Danes.
660 Organs firſt uſed in churches.
663 Glaſs invented by a biſhop, and brought into England by a Benedictine monk.
669 Sicily invaded, and Syracuſe deſtroyed by the Saracens.
685 The Britons, after a brave ſtruggle of near 150 years, are totally expelled by the Saxons, and driven into Wales and Cornwall.
698 The Saracens take Carthage, and expel the Romans from Africa.
700 Cracow built, and the firſt prince of Poland elected.
704 The firſt province given to the Pope.
713 The Saracens conquer Spain.
714 France governed by Charles Martel.
718 The kindom of the Aſturias in Spain founded by Pelagio.
719 Chriſtianity promulgated in Germany.
726 The controverſy about images begins, and occaſions many inſurrections in the eaſtern empire.
727 Tax of Peter's pence begun by Ina king of Weſſex.
732 Charles Martel defeats the Saracens near Tours.
735 Inſtitution of the office of Pope's Nuncio.
746 Three years peſtilence in Europe and Aſia.
748 The computing of years from the birth of Chriſt began to be uſed in hiſtory.
749 The race of Abbas become caliphs of the Saracens, and encourage learning.
The empire of the Saracens divided into three.
752 The exarchate of Ravenna aboliſhed by Aſtolphus king of the Lombards.
755 Commencement of the Pope's temporal dominion.
762 The city of Bagdad upon the Tigris, is made the capital for the caliphs of the houſe of Abbas.

762 Burials, which formerly uſed to be in highways, permitted in towns.

792 An academy founded in Paris.

794 The Huns extirpated by Charlemagne.

797 Seventeen days of unuſual darkneſs.

800 Charlemagne, king of France, begins the empire of Germany, afterwards called the weſtern empire; gives the preſent names to the winds and months; endeavours to reſtore learning in Europe, but mankind are not yet diſpoſed for it, being ſolely engroſſed in military enterpriſes.

801 A great earthquake in France, Germany, and Italy.

807 Jan. 31. Jupiter eclipſed by the moon. March 17. A large ſpot ſeen on the ſun for eight days.

808 The firſt deſcent of the Normans on France.

825 The obliquity of the ecliptic obſerved by Benimula to be 23° 55′.

826 Harold, king of Denmark, dethroned by his ſubjects for being a Chriſtian.

The kingdoms of Navarre and Arragon founded.

832 Painters baniſhed out of the eaſtern empire.

836 The Flemings trade to Scotland for fiſh.

840 The Scots and Picts have a deciſive battle, in which the former prevail, and both kingdoms are united by Kenneth, which begins the ſecond period of the Scottiſh hiſtory.

842 Germany ſeparated from the empire of the Franks.

856 An earthquake over the greateſt part of the known world.

861 Ruric the firſt prince of Ruſſia began to reign.

864 The Danes begin their ravages in England.

867 Chriſtianity propagated in Bulgaria.

868 Egypt becomes independent on the caliphs of Bagdad.

872 Bells and clocks firſt uſed in Conſtantinople.

873 France diſtreſſed by locuſts and peſtilence.

874 Iceland peopled by the Norwegians.

Scotland invaded by the Danes.

875 A bearded comet appears in France.

878 Alfred the Great, after ſubduing the Daniſh invaders (againſt whom he fought 56 battles by ſea and land), compoſes his body of laws; divides England into counties, hundreds, tythings; in 890 erects county-courts, having founded the univerſity of Oxford in 886.

880 The obliquity of the ecliptic obſerved by Albategni to be 23° 35′.

886 The Hungarians ſettled near the Danube.

891 The firſt land-tax in England.

895 The monaſtery of Cluny founded.

905 A very remarkable comet appeared in China.

Rome taken by the Normans.

911. The obliquity of the ecliptic obſerved by Thebit to be 23° 33′ 30″.

912 The Normans eſtabliſh themſelves in Normandy.

913 The Danes become maſters of England.

915 The univerſity of Cambridge founded.

923 Fiefs eſtabliſhed in France.

925 Sigefroi elected firſt marquis of Brandenburgh.

928 The marquiſate of Miſnia eſtabliſhed.

937 The Saracen empire is divided by uſurpation into ſeven kingdoms.

941 Arithmetic brought into Europe.

961 Candia recovered from the Saracens.

967 Antioch recovered from the Saracens.

969 The race of Abbas extinguiſhed in Egypt.

975 Pope Boniface VII. is depoſed and baniſhed for his crimes.

977 Greece, Macedon, and Thrace, ravaged by the Bulgarians for ten years.

The Bohemians ſubdued by Otho.

979 Coronation oath firſt uſed in England.

Juries firſt inſtituted into ditto.

985 The danes under Sueno invaded England and Scotland.

987 The Carlovingian race in France ended.

991 The figures in arithmetic are brought into Europe by the Saracens from Arabia; letters of the alphabet were hitherto uſed.

993 A great eruption of Mount Veſuvius.

995 England invaded by the Danes and Norwegians.

996 Otho III. makes the empire of Germany elective.

999 Boleſlaus, the firſt king of Poland.

The obliquity of the ecliptic obſerved by Aboul-Waſi and Abu Hamed to be 23° 35′.

1000 Paper made of cotton rags was in uſe; that linen rags in 1170: the manufactory introduced into England at Deptford, 1588.

1002 The emperor Henry aſſumed the title of king of the Romans.

1005 All the old churches are rebuilt about this time in a new manner of architecture.

1006 A plague in Europe for three years.

1007 A great eruption of Veſuvius.

The obliquity of the ecliptic obſerved by Albatrunius to be 23° 35′.

1014 Sueno the Dane becomes maſter of England.

Sept. 28. Almoſt all Flanders laid under water by a ſtorm.

1015 Children forbidden by law to be ſold by their parents in England.

1017 Rain of the colour of blood for three days in Aquitain.

1022 A new ſpecies of muſic invented by Aretin.

1035 Togrul-Beg, or Tangrolipix, the Turkiſh ſultan, eſtabliſhes himſelf in Koraſan.

The kingdoms of Caſtile and Arragon began.

1040 The Danes, after ſeveral engagements with various ſucceſs, are about this time driven out of Scotland, and never again return in a hoſtile manner.

Smyrna deſtroyed by an earthquake.

1041 The Saxon line reſtored under Edward the Confeſſor.

1043 The Turks become formidable and take poſſeſſion of Perſia.

The Ruſſians come from Scythia, and land in Thrace.

1054 Leo IX, the firſt pope that kept up an army.

1055 The Turks take Bagdad, and overturn the empire of the Saracens.

1057 Malcolm III, king of Scotland, kills the tyrant Macbeth at Dunſinnan, and marries the princeſs Margaret, ſiſter to Edgar Atheling.

1061 Surnames appointed to be taken in Scotland by a parliament held in Forfar.

1065 The Turks take Jeruſalem from the Saracens.

1066 The conqueſt of England by William (ſurnamed the Baſtard) duke of Normandy, in the battle of Haſtings, where Harold is ſlain.

1070 The feudal law introduced into England.

1075 Henry IV. emperor of Germany, and the pope, quarrel about the nomination of the German biſhops. Henry, in penance, walks barefooted to the pope towards the end of January.

1076 Juſtices of the peace firſt appointed in England.

An earthquake in England.

Aſia Minor, having been two years under the power of Solyman, is from this time called Turky.

1080 Doomſday-book began to be compiled by order of William, from a ſurvey of all the eſtates in England, and finiſhed in 1086.

The Tower of London built by ditto, to curb his Engliſh ſubjects; numbers of whom fly to Scotland, where they introduce the Saxon or Engliſh language, are protected by Malcolm, and have lands given them.

1086 The order of Carthuſians eſtabliſhed by Bruno.

1090 The dynaſty of Bathineens or Aſſaſſins begins in Irak, and continues for 117 years.

1091 The Saracens in Spain, being hard preſſed by the Spaniards, call to their aſſiſtance Joſeph king of Morocco; by which the Moors get poſſeſſion of all the Saracen dominions in Spain.

1096 The firſt cruſade to the Holy Land is begun under ſeveral Chriſtian princes, to drive the infidels from Jeruſalem.

1098 The order of St Benedict inſtituted.

1099 Jeruſalem taken by the cruſaders; Godfrey elected king of it; and the order of knights of St John inſtituted.

1110 Edgar Atheling, the laſt of the Saxon princes, dies in England, where he had been permitted to reſide as a ſubject.

Learning revived at Cambridge.

Writing on paper made of cotton common about this time.

1118 The order of the knights Templars inſtituted, to defend the Sepulchre at Jeruſalem, and to protect Chriſtian ſtrangers.

1119 Bohemia erected into a kingdom.

1132 The kingdom of Portugal began.

1137 The pandect of Juſtinian found in the ruins of Amalphi.

1141 The factions of the Guelphs and Gibellines prevailed about this time.

1143 The Koran tranſlated into Latin.

1144 The Peripatetic philoſophy introduced into Germany.

1151 The canon law collected by Gratian, a monk of Bologna.

1154 Chriſtianity introduced into Finland.

1156 The city of Moſcow in Ruſſia founded.

1160 The order of the Carmelites inſtituted.

1163 London bridge, conſiſting of 19 ſmall arches, firſt built of ſtone.

1164 The teutonic order of religious knights begins in Germany.

1171 The dynaſty of Fatemites ended in Egypt; the ſovereigns of this country henceforth called Sultans.

1172 Henry II. king of England (and firſt of the Plantagenets), takes poſſeſſion of Ireland; which, from that period, has been governed by an Engliſh viceroy, or lord lieutenant.

1176 England is divided by Henry into ſix circuits, and juſtice is diſpenſed by itinerant judges.

1179 The univerſity of Padua founded.

1180 Glaſs windows began to be uſed in private houſes in England.

1181 The laws of England are digeſted about this time by Glanville.

1182 Pope Alexander III. compelled the kings of England and France to hold the ſtirrups of his ſaddle when he mounted his horſe.

1183 7000 Albigenſes maſſacred by the inhabitants of Berry.

1186 A conjunction of all the planets at ſunriſe September 16. The Sun in 30° ♍; Jupiter in 2° 3′ ♎; Venus in 3° 49′; Saturn in 8° 6′; Mercury in 4° 10′; Mars, 9° 8′; tail of the Dragon, 18° 23′ ♎.

1187 Jeruſalem taken by Saladin.

1192 The battle of Aſcalon, in Judea, in which Richard, king of England, defeates Saladin's army, conſiſting of 300,000 combatants.

1194 *Dieu et mon Droit*, firſt uſed as a motto by Richard, on a victory over the French.

1195 Denmark and Norway laid waſte by a dreadful tempeſt.

1198 Inſtitution of the order of the Holy Trinity.

1200 Chimnies were not known in England.

Surnames now began to be uſed; firſt among the nobility.

Univerſity of Salamanca in Spain founded.

1204 Conſtantinople taken by the French and Venetians.

The Inquiſition eſtabliſhed.

The empire of Trebizond eſtabliſhed.

1208 London incorporated, and obtained their firſt charter for electing their Lord Mayor and other magiſtrates from king John.

The order of *Fratres Minores* eſtabliſhed.

The pope excommunicates king John.

1209 The works of Ariſtotle imported from Conſtantinople into Europe.

The ſilk manufacture imported from Greece into Venice.

1210 The works of Ariſtotle condemned to be burnt at Paris.

The emperor Otho excommunicated by the pope.

Violent perſecution of the Albigenſes.

1215 Magna Charta is ſigned by king John and the barons of England.

Court of common pleas eſtabliſhed.

Orders of the Dominicans and Knights Hoſpitallers founded.

The doctrine of tranſubſtantiation introduced.

1216 King Alexander and the whole kingdom of

Scotland

Scotland excommunicated by the pope's legate.

1220 Aſtronomy and geography brought into Europe by the Moors.

1222 A great earthquake in Germany.

1223 A comet of extraordinary magnitude appeared in Denmark.

1226 A league formed againſt the Albigenſes by the French king and many prelates and lords.

1227 The Tartars, under Gingis-Kan, emerge from the northern parts of Aſia, over-run all the Saracen empire, and carry death and deſolation wherever they march.

1228 The univerſity of Thoulouſe founded.

1230 The kingdom of Denmark diſtreſſed by peſtilence.

The kingdoms of Leon and Caſtile united.

Pruſſia ſubdued by the Teutonic knights.

Univerſity of Naples founded.

1231 The Almageſt of Ptolemy tranſlated into Latin.

1233 The Inquiſition, begun in 1204, is now truſted to the Dominicans.

The houſes of London, and other cities in England, France, and Germany, ſtill thatched with ſtraw.

1238 The univerſity of Vienna founded.

1239 A writing of this year's date on paper made of rags ſtill extant.

1241 The Hanſeatic league formed.

Tin mines diſcovered in Germany.

1245 A clear red ſtar, like Mars, appears in Capricorn.

1250 Painting revived in Florence by Cimabue.

1251 Wales ſubdued, and Magna Charta confirmed.

1253 The famous aſtronomical tables are compoſed by Alonſo king of Caſtile.

1256 The order of the Auguſtines eſtabliſhed.

1258 The Tartars take Bagdad, which finiſhes the empire of the Saracens.

1260 The ſect of Flagellantes appeared in Italy.

1263 Acho king of Norway invades Scotland with 160 ſail, and lands 20,000 men at the mouth of the Clyde; but they are cut to pieces by Alexander III. who recovers the weſtern iſles.

1264 The commons of England firſt ſummoned to parliament about this time.

1268 The Tartars invade China.

1269 The Hamburgh company incorporated in England.

The obliquity of the ecliptic obſerved by Cozah Naſirodni to be 23° 30′.

1272 The academy of Florence founded.

1273 The empire of the preſent Auſtrian family begins in Germany.

The obliquity of the ecliptic obſerved by Cheou-king in China to be 23° 33′ 39″.

1274 The firſt commercial treaty betwixt England and Flanders.

1279 King Edward renounced his right to Normandy.

The mortmain act paſſed in England.

1282 Lewellyn, prince of Wales, defeated and killed by Edward I. who unites that principality to England.

A great peſtilence in Denmark.

8000 French murdered at the Sicilian veſpers.

Academy de la Cruſca founded.

1284 Edward II. born at Caernarvon, is the firſt prince of Wales.

1285 Alexander III. king of Scotland, dies, and that kingdom is diſputed by twelve candidates, who ſubmit their claims to the arbitration of Edward king of England; which lays the foundation of a long and deſolating war between both nations.

1290 The univerſity of Liſbon founded.

1291 Ptolemais taken by the Turks. End of the cruſades.

1293 There is a regular ſucceſſion of Engliſh parliaments from this year, being the 22d of Edward I.

1294 Parliaments eſtabliſhed in Paris.

1298 The preſent Turkiſh empire begins in Bithynia under Ottoman.

Silver-hafted knives, ſpoons, and cups, a great luxury.

Tallow candles ſo great a luxury, that ſplinters of wood were uſed for lights.

Wine ſold by apothecaries as a cordial.

The Scots defeated by the Engliſh at Falkirk.

1299 An earthquake in Germany.

Spectacles invented by a monk of Piſa.

The year of jubilee inſtituted by Boniface VIII.

1302 The mariner's compaſs invented, or improved, by Giovia, of Naples.

The univerſity of Avignon founded.

1307 The beginning of the Swiſs cantons.

Coal firſt uſed in England.

1308 The popes remove to Avignon in France for 70 years.

1310 Lincoln's inn ſociety eſtabliſhed.

The knights of St John take poſſeſſion of the iſle of Rhodes.

1314 The battle of Bannockburn, between Edward II. and Robert Bruce, which eſtabliſhes the latter on the throne of Scotland.

The cardinals ſet fire to the conclave and ſeparate, A vacancy in the papal chair for two years.

1315 Germany afflicted with famine and peſtilence.

1319 The univerſity of Dublin founded.

1320 Gold firſt coined in Chriſtendom; 1344 ditto in England.

An earthquake in England.

1323 A great eruption of Mount Ætna.

1325 The firſt treaty of commerce betwixt England and Venice.

1330 Gunpowder invented by a monk of Cologne.

1332 The pope accuſed of hereſy.

1336 Two Brabant weavers ſettle at York, which, ſays Edward III. may prove of great benefit to us and our ſubjects.

1337 The firſt comet whoſe courſe is deſcribed with an aſtronomical exactneſs.

Europe infeſted by locuſts.

1340 Heralds college inſtituted in England.

Copper-money firſt uſed in Scotland and Ireland.

1344 The firſt creation to titles by patents uſed by Edward III.

1345 Edward III. has four pieces of cannon, which gained him the battle of Creſſy.

1347 The battle of Durham, in which David, king of Scots, is taken, priſoner.

1349 The order of the Garter inſtituted in England by Edward III. altered in 1557, and conſiſts of 26 knights.
1352 The Turks firſt enter Europe.
1353 Aſia and Africa deſolated by locuſts.
1354 The money in Scotland till now the ſame as in England.
1356 The battle of Poictiers, in which king John of France and his ſon are taken priſoners by Edward the Black Prince.
1357 Coals firſt brought to London.
1358 Arms of England and France firſt quartered by Edward III.
University of Cologne founded.
Tamerlane began to reign in Perſia.
1362 The law pleadings in England changed from French to Engliſh as a favour of Edward III. to his people.
The military order of Janizaries eſtabliſhed among the Turks.
1365 The univerſities of Vienna and Geneva founded
1369 John Wickliffe an Engliſhman begins to call in queſtion the doctrines of the church of Rome about this time, whoſe followers are called Lollards.
1370 The office of Grand vizir eſtabliſhed.
1377 Inundation of the ſea in Flanders.
1378 Greenland diſcovered by a Venetian.
1381 Bills of Exchange firſt uſed in England.
1384 The firſt act of navigation in England; no goods to be exported or imported by Engliſhmen in foreign bottoms.
1386 A company of linen weavers from the Netherlands eſtabliſhed in London.
Windſor caſtle built by Edward III.
1387 The firſt Lord High Admiral of England inſtituted.
1388 The battle of Otterburn between Hotſpur and the earl of Douglas.
Bombs invented at Venloo.
1391 Cards invented in France for the king's amuſement.
1399 Weſtminſter abbey rebuilt and enlarged—Weſtminſter hall ditto.
Order of the bath inſtituted at the coronation of Henry IV. renewed in 1725; conſiſting of 38 knights.
1402 Tamerlane defeats and takes priſoner Bajazet the Turkiſh ſultan.
1405 The Canary iſlands diſcovered by Bathencourt a Norman.
1410 Guildhall, London, built.
Painting in oil-colours invented at Bruges by John Van-eyck.
1411 The univerſity of St Andrew's in Scotland founded.
1412 Algebra brought from Arabia into Europe.
1415 The battle of Agincourt gained over the French by Henry V. of England.
1420 The iſland of Madeira diſcovered by the Portugueſe.
1421 The revenue of England amounted to L.55,754.
1428 The ſiege of Orleans, the firſt blow to the Engliſh power in France.
1431 A great eathquake at Liſbon.
1432 Great inundations in Germany.
1437 The obliquity of the ecliptic obſerved by Ulug Beg to be 23° 30′ 17″.
1440 Printing invented by L. Koſter at Haerlam in Holland; brought into England by W. Caxton, a mercer of London, 1471.
1446 The Vatican library founded at Rome.
The ſea breaks in at Dort in Holland, and drowns 100,000 people.
1453 Conſtantinople taken by the Turks, which ends the eaſtern empire, 1123 years from its dedication by Conſtantine the great, and 2206 years from the foundation of Rome.
1454 The univerſity of Glaſgow in Scotland founded.
1457 Glaſs firſt manufactured in England.
1460 Engraving and etching on copper invented.
The obliquity of the ecliptic obſerved by Purbachius and Regiomontanus to be 23° 29′.
1473 The ſtudy of the Greek language introduced into France.
1477 The univerſity of Aberdeen in Scotland founded.
1479 Union of the kingdoms of Arragon and Caſtile.
1482 The coaſt of Guinea diſcovered by the Portugueſe.
A court of Inquiſition erected in Seville.
1483 Richard III. king of England and laſt of the Plantagenets, is defeated and killed at the battle of Boſworth, by Henry (Tudor) VII. which puts an end to the civil wars between the houſes of York and Lancaſter, after a conteſt of 30 years, and the loſs of 100,000 men.
1486 Henry eſtabliſhes fifty yeomen of the guards, the firſt ſtanding army.
1489 Maps and ſea charts firſt brought to England by Barth. Columbus.
1490 William Groceyn introduces the ſtudy of the Greek language into England.
The Moors, hitherto a formidable enemy to the native Spaniards, are entirely ſubdued by Ferdinand, and become ſubjects to that prince on certain conditions, which are ill obſerved by the Spaniards, whoſe clergy uſe the Inquiſition in all its tortures; and in 1609, near one million of the Moors are driven from Spain to the oppoſite coaſt of Africa, from whence they originally came.
1492 America firſt diſcovered by Columbus, a Genoeſe in the ſervice of Spain.
The Moors expelled from Granada, which they had poſſeſſed upwards of 800 years.
1495 The venereal diſeaſe introduced into Europe.
1496 The Jews and Moors baniſhed out of Portugal.
1497 The Portugueſe firſt ſail to the Eaſt Indies by the Cape of Good Hope.
South America diſcovered by Americus Veſpuſius, from whom it has its name.
1499 North America diſcovered, for Henry VII. by Cabot a Venetian.
1500 Maximilian divides the empire of Germany into ſix circles, and adds four more in 1512.
Brazil diſcovered by the Portugueſe. Florida diſcovered by John Cabot, an Engliſhman.
Painting in chiaro obſcuro diſcovered.
A great plague in England.
1505 Shillings firſt coined in England.

1507 The iſland of Madagaſcar diſcovered by the Portugueſe.

1509 Gardening introduced into England from the Netherlands, from whence vegetables were imported hitherto.

1510 The obliquity of the ecliptic obſerved by Wernenus to be 23° 28′ 30″.

1513 The battle of Flowden, in which James IV. king of Scotland is killed, with the flower of his nobility.

1514 Cannon bullets of ſtone ſtill in uſe.

1515 The firſt Polyglot Bible printed at Alcala.

The kingdom of Navarre annexed to that of Caſtile by Ferdinand.

1516 The kingdom of Algiers ſeized by Barbaroſſa.

1517 Martin Luther began the Reformation.

Egypt is conquered by the Turks.

The kingdom of the Mamalukes in Egypt overthrown by the Turks.

1518 Diſcovery of New Spain, and the Straits of Magellan.

1521 Henry VII. for his writings in favour of popery, receives the title of Defender of the Faith from his Holineſs.

1522 Rhodes taken by the Turks.

The firſt voyage round the world performed by a ſhip of Magellan's ſquadron.

1526 The inquiſition eſtabliſhed in Portugal.

Lutheraniſm eſtabliſhed in Germany.

1527 Rome taken and plundered by the Imperial army.

1528 Popery aboliſhed in Sweden.

1529 The name of Proteſtant takes its riſe from the reformed proteſting againſt the church of Rome, at the diet of Spires in Germany.

1530 Union of the Proteſtants at Smallcalde, December 22d.

Secretary of State's office eſtabliſhed in England.

1531 A great earthquake at Liſbon.

1532 The Court of Seſſion inſtituted in Scotland.

1533 Inſurrection of the Anabaptiſts in Weſtphalia.

1534 The reformation takes place in England, under Henry VIII.

Barbaroſſa ſeized on the kingdom of Tunis.

1535 The Reformation introduced into Ireland.

The ſociety of Jeſuits formed.

1539 The firſt Engliſh edition of the Bible authoriſed; the preſent tranſlation finiſhed 1611.

About this time cannon began to be uſed in ſhips.

Six hundred and forty-five religious houſes ſuppreſſed in England and Wales.

1540 The variation of the compaſs diſcovered by Sebaſtian Cabot.

The obliquity of the ecliptic obſerved by Copernicus to be 23° 28′ 8″.

Society of the Jeſuits eſtabliſhed, September 27.

1543 Silk ſtockings firſt worn by the French king; firſt worn in England by queen Eliz. 1561; the ſteel frame for weaving invented by the Rev. Mr Lee, of St John's College, Cambridge, 1589.

Pins firſt uſed in England, before which time the ladies uſed ſkewers.

Iron cannon and mortars made in England.

1544 Good lands let in England at one ſhilling per acre.

1545 The famous council of Trent begins, and continues 18 years.

1547 Firſt law in England eſtabliſhing the intereſt of money at 10 *per cent.*

1548 The Reformation gained ground in Poland.

1549 Lords lieutenants of counties inſtituted in England.

1550 Horſe guards inſtituted in England.

The bank of Venice eſtabliſhed about this time.

1552 Books of geography and aſtronomy deſtroyed in England, as being infected with magic.

The book of Common Prayer eſtabliſhed in England by act of Parliament.

1554 The kingdom of Aſtracan conquered by the Ruſſians.

1555 The Ruſſian company eſtabliſhed in England.

1558 Queen Elizabeth begins her reign.

1560 The reformation in Scotland completed by John Knox.

1561 Livonia ceded to Poland.

1563 Knives firſt made in England.

1565 Revolt of the Low Countries.

Malta attacked by the Turks.

1566 The 39 articles of the church of England eſtabliſhed.

1568 Queen Mary impriſoned in England.

Liberty of exerciſing the reformed religion granted to the Low Countries.

2569 Royal Exchange firſt built.

1571 The iſland of Cyprus taken by the Turks.

They are defeated at Lepanto.

1572 The great maſſacre of Proteſtants at Paris.

A new ſtar in Caſſiopæia obſerved by Cornelius Gemma. It appeared in November, and diſappeared in March.

1576 The exerciſe of the Proteſtant religion authoriſed in France. This toleration followed by a civil war.

1578 The firſt treaty of alliance betwixt England and the States General, January 7th.

1579 The Dutch ſhake off the Spaniſh yoke, and the republic of Holland begins.

Engliſh Eaſt-India company incorporated—eſtabliſhed 1600.

——Turkey company incorporated.

1580 Sir Francis Drake returns from his voyage round the world, being the firſt Engliſh circumnavigator.

Parochial regiſter firſt appointed in England.

The kingdom of Portugal ſeized by Philip of Spain.

1581 Copper money firſt uſed in France.

1582 Pope Gregory introduces the New Stile in Italy; the 5th of October being counted 15.

1583 Tobacco firſt brought from Virginia into England.

The firſt propoſal of ſettling a colony in America.

1587 Mary queen of Scots is beheaded by order of Elizabeth, after 18 years impriſonment.

1588 The Spaniſh Armada deſtroyed by Drake and other Engliſh admirals.

Henry IV. paſſes the edict of Nantes, tolerating the Proteſtants.

1588 Duelling with ſmall ſwords introduced into England.
1589 Coaches firſt introduced into England; hackney act 1693; increaſed to 1000 in 1770.
1590 Band of penſioners inſtituted in England.
Teleſcopes invented by Janſen, a ſpectacle maker in Germany.
1591 Trinity college, Dublin, founded.
1593 A great plague in London.
1594 The Jeſuits expelled from France.
The obliquity of the ecliptic obſerved by Bygius to be 23° 30′.
1595 The ſame obſerved by Tycho-Brache to be 23° 29′ 25″.
1596 A great earthquake at Japan.
1597 Watches firſt brought into England from Germany.
1598 The edict of Nantes by Henry IV. of France.
1602 Decimal arithmetic invented at Bruges.
1603 Queen Elizabeth (the laſt of the Tudors) dies, and nominates James VI. of Scotland as her ſucceſſor; which unites both kingdoms under the name of Great Britain.
1605 The Gun-powder-plot diſcovered at Weſtminſter; being a plot to blow up the king and both houſes of Parliament.
1606 Oaths of allegiance firſt adminiſtered in England.
1608 Colonies ſent from England to Virginia.
1609 The independency of the United States acknowledged by Spain.
1610 Galileo, of Florence, firſt diſcovers the ſatellites about the planet Jupiter, by the teleſcope lately invented in Germany.
Henry IV. is murdered at Paris by Ravaillac a prieſt.
Thermometers invented by Diebel, a Dutchman.
1611 Baronets firſt created in England by James I. May 22.
An earthquake at Conſtantinople; 200,000 perſons died there of the plague.
1612 The north-weſt paſſage to China attempted in vain by the Engliſh.
1614 Napier of Marcheſton, in Scotland, invents the logarithms.
Sir Hugh Middleton brings the new river to London from Ware.
1616 The firſt permanent ſettlement in Virginia.
1619 W. Harvey, an Engliſhman, confirms the doctrine of the circulation of the blood, which had been firſt broached by Servetus, a French phyſician, in 1553.
1620 The broad ſilk manufacture from raw ſilk, introduced into England.
Barbadoes diſcovered by Sir William Courteen.
Navarre united to France.
Copper-money firſt introduced in England.
1621 New England planted by the Puritans.
The two parties of Whigs and Tories formed in England.
1622 The Palatinate reduced by the Imperialiſts.
1623 The knights of Nova Scotia inſtituted.
1624 Maſſacre of the Engliſh at Amboyna.
1625 King James dies, and is ſucceeded by his ſon Charles I.
1625 The iſland of Barbadoes, the firſt Engliſh ſettlement in the Weſt Indies, is planted.
1631 The tranſit of Mercury over the ſun's diſk, firſt obſerved by Gaſſendi.
A great eruption of Veſuvius.
1632 The battle of Lutzen, in which Guſtavus Adolphus, king of Sweden, and head of the Proteſtants in Germany, is killed.
1633 Galileo condemned by the inquiſition at Rome.
Louiſiana diſcovered by the French.
1635 Province of Maryland planted by lord Baltimore.
Regular poſts eſtabliſhed from London to Scotland, Ireland, &c.
1636 A tranſit of Mercury over the Sun's diſk obſerved by Caſſini.
1639 A tranſit of Venus over the ſun's diſk firſt obſerved by Mr Horrox, November 24th. O. S. 3 h 15′ P. M.
1640 King Charles diſobliges his Scottiſh ſubjects: on which their army, under general Leſley, enters England, and takes Newcaſtle, being encouraged by the malecontents in England.
The maſſacre in Ireland, when 40,000 Engliſh Proteſtants were killed.
The independency of Portugal recovered by John duke of Braganza.
1642 King Charles impeaches five refractory members, which begins the civil wars in England.
1643 Exciſe on beer, ale, &c. firſt impoſed by parliament.
Barometers invented by Torricelli.
1648 A new ſtar obſerved in the tale of the Whale by Fabricius.
1649 Charles I. beheaded by Cromwell at Whitehall, January 30, aged 49.
Pendulums firſt applied to clocks by Huygens.
1651 The ſect called *Quakers* appeared in England.
1652 The Dutch colony at the Cape of Good Hope eſtabliſhed.
1654 Cromwell aſſumes the protectorſhip.
The air-pump invented by Otto Guericke of Magdeburg.
1655 The Engliſh, under Admiral Penn, take Jamaica from the Spaniards.
One of Saturn's ſatellites obſerved by Huygens.
1658 Cromwell dies, and is ſucceeded in the protectorſhip by his ſon Richard.
1660 King Charles II. is reſtored by Monk, commander of the army, after an exile of twelve years in France and Holland.
The people of Denmark, being oppreſſed by the nobles, ſurrender their privileges to Frederic III. who becomes abſolute.
1661 The obliquity of the ecliptic obſerved by Hevelius to be 23° 29′ 7″.
1662 The Royal Society eſtabliſhed at London by Charles II.
1663 Carolina planted; 1728, divided into ſeparate governments.
Pruſſia declared independent of Poland.
1664 The New Netherlands in North America conquered from the Swedes and Dutch by the Engliſh.

1665 The plague rages in London, and carries off 68,000 perſons.

The magic lanthorn invented by Kircher.

1666 The great fire of London began Sept. 2. and continued three days, in which were deſtroyed 13,000 houſes and 400 ſtreets.

Tea firſt uſed in England.

1667 The peace of Breda, which confirms to the Engliſh the New Netherlands, now the States of Pennſylvania, New York, and New Jerſey.

1668 ——ditto Aix la Chapelle.

St James's park planted, and made a thoroughfare for public uſe by Charles II.

1669 The iſland of Candia taken by the Turks.

1670 The Engliſh Hudſon's Bay company incorporated.

The obliquity of the ecliptic obſerved by Mengoli to be 23° 28′ 24″.

1672 Louis XIV. over-runs great part of Holland, when the Dutch opened their ſluices, being determined to drown their country, and retire to their ſettlements in the Eaſt Indies.

African company eſtabliſhed.

The obliquity of the ecliptic obſerved by Richer to be 23° 28′ 54″.

1677 The micrometer invented by Kircher.

1678 The peace of Nimeguen.

The habeas corpus act paſſed.

A ſtrange darkneſs at noon-day, Jan. 12.

1680 A great comet appeared, and from its nearneſs to our earth alarmed the inhabitants. It continued viſible from Nov. 3. to March 9.

William Penn, a Quaker, receives a charter for planting Pennſylvania.

1683 India ſtock ſold from 360 to 500 *per cent.*

1685 Charles II. dies, aged 55, and is ſucceeded by his brother James II.

The duke of Monmouth, natural ſon to Charles II. raiſes a rebellion, but is defeated at the battle of Sedgmore, and beheaded.

The edict of Nantes is revoked by Louis XIV. and the Proteſtants are greatly diſtreſſed.

1686 The Newtonian philoſophy publiſhed.

1687 The palace of Verſailles, near Paris, finiſhed by Louis XIV.

1688 The Revolution in Great Britain begins Nov. 5. King James abdicates, and retires to France, Dec. 3.

King William and Queen Mary, daughter and ſon-in-law to James, are proclaimed February 16.

Viſcount Dundee ſtands out for James in Scotland, but is killed by general Mackay at the battle of Killycrankie; upon which the Highlanders, wearied with repeated misfortunes, diſperſe.

Smyrna deſtroyed by an earthquake.

1689 The land-tax paſſed in England.

The toleration-act paſſed in ditto.

Several biſhops are deprived for not taking the oaths to William.

William Fuller, who pretended to prove the prince of Wales ſpurious, was voted by the commons to be a notorious cheat, impoſtor, and falſe accuſer.

1689 Epiſcopacy aboliſhed in Scotland.

1690 The battle of the Boyne, gained by William againſt James, in Ireland.

1691 The war in Ireland finiſhed, by ſurrender of Limerick to William.

The obliquity of the ecliptic obſerved by Flamſtead to be 23° 28′ 32″.

1692 The Engliſh and Dutch fleets, commanded by Admiral Ruſſel, defeat the French fleet off La Hogue.

The maſſacre of Glencoe in Scotland, Jan. 31. O. S.

Earthquakes in England and Jamaica, September 8.

Hanover made an electorate of the empire.

1693 Bayonets at the end of loaded muſkets firſt uſed by the French againſt the confederates in the battle of Turin.

Bank of England eſtabliſhed by King William.

The firſt public lottery was drawn this year.

1694 Queen Mary dies at the age of 33, and William reigns alone.

Stamp duties inſtituted in England.

1696 The peace of Ryſwick.

1699 The Scots ſettled a colony at the iſthmus of Darien in America, and called it *Caledonia*.

1700 Charles XII. of Sweden begins his reign.

King James II. dies at St Germains in the 68th year of his age.

1701 Pruſſia erected into a kingdom.

Society for the propagation of the goſpel in foreign parts eſtabliſhed.

1702 King William dies, aged 50, and is ſucceeded by Queen Anne, daughter to James II. who, with the Emperor and States General, renews the war againſt France and Spain.

the French ſent colonies to the Miſſiſipppi.

1703 The obliquity of the ecliptic obſerved by Bianchini to be 23° 28′ 25″.

1704 Gibraltar taken from the Spaniards by Admiral Rooke.

The battle of Blenheim won by the Duke of Marlborough and allies againſt the French.

The court of Exchequer inſtituted in England.

1706 The treaty of Union betwixt England and Scotland, ſigned July 22.

The battle of Ramilies won by Marlborough and the allies.

1707 The firſt Britiſh parliament.

The allies defeated at Almanza.

1708 Minorca taken from the Spaniards by General Stanhope.

The battle of Oudenarde won by Marlborough and the allies.

1709 Peter the Great, czar of Moſcovy, defeats Charles XII. at Poltowa, who flies to Turkey.

The battle of Malplaquet won by Marlborough and the allies.

1710 Queen Anne changes the whig miniſtry for others more favourable to the intereſt of her brother the late Pretender.

The cathedral church of St Paul, London, rebuilt by Sir Chriſtopher Wren in 37 years, at one million expence, by a duty on coals.

The Engliſh South-ſea company began.

1712 Duke of Hamilton and Lord Mohun killed in a duel in Hide-Park.

1713 The peace of Utrecht, whereby Newfoundland, Nova Scotia, New Britain, and Hudſon's bay, in North America, were yielded to Great Britain; Gibraltar and Minorca, in Europe, were alſo confirmed to the ſaid crown by this treaty.

1714 Queen Anne dies, at the age of 50, and is ſucceeded by George I.

Intereſt in England reduced to five *per cent.*

1715 Louis XIV. dies, and is ſucceeded by his great-grandſon Louis XV. the late king of France.

The rebellion in Scotland begins in September under the Earl of Mar, in favour of the Pretender. The action of Sheriffmuir, and the ſurrender of Preſton, both in November, when the rebels diſperſe.

The obliquity of the ecliptic obſerved by Louville to be 23° 28′ 24″.

1716 The Pretender married the princeſs Sobieſka, grand-daughter of John Sobieſki, late king of Poland.

An act paſſed for ſeptennial parliaments.

1718 Sardinia erected into a kingdom, and given to the duke of Savoy.

1719 The Miſſiſippi ſcheme at its height in France.

Lombe's ſilk-throwing machine, containing 26,586 wheels, erected at Derby in England: takes up one-eighth of a mile; one water-wheel moves the reſt; and in 24 hours it works 318,504,960 yards of organzine ſilk thread.

1720 The ſouth-ſea ſcheme in England begun April 7, was at its height at the end of June, and quite ſunk about September 29.

A great earthquake in China.

1724 An earthquake in Denmark.

1727 King George dies, in the 68th year of his age; and is ſucceeded by his only ſon, George II.

Inoculation firſt tried on criminals with ſucceſs.

Ruſſia, formerly a dukedom, is now eſtabliſhed as an empire.

The abberration of the fixed ſtars diſcovered and accounted for by Dr Bradley.

1732 Kouli Khan uſurps the Perſian throne, conquers the Mogul empire, and returns with two hundred thirty-one millions Sterling.

Several public-ſpirited gentleman begin the ſettlement of Georgia in North America.

1733 The Jeſuits expelled from Paraguay.

1736 Capt. Porteous having ordered his ſoldiers to fire upon the populace at an execution of a ſmuggler, is himſelf hanged by the mob at Edinburgh.

A tranſit of Mercury obſerved by Caſſini.

1737 A dreadful hurricane at the mouth of the Ganges, Oct. 10.

1738 Weſtminiſter bridge, conſiſting of 15 arches, begun; finiſhed in 1750, at the expence of 389,000 l. defrayed by parliament.

The order of St Januarius eſtabliſhed at Naples.

1739 Letters of marque iſſued out in Britain againſt Spain July 21. and war declared, Oct. 23.

The empire of Indoſtan ruined by Kouli Khan.

An intenſe froſt in Britain.

1743 The battle of Dettingen won by the Engliſh and allies in favour of the Queen of Hungary.

1743 A dreadful plague in Sicily.

1744 War declared againſt France.—Commodore Anſon returns from his voyage round the world.

1745 The allies loſe the battle at Fontenoy.

The rebellion breaks out in Scotland, and the Pretender's army defeated by the Duke of Cumberland at Culloden, April 16, 1746.

1746 Britiſh Linen Company erected.

Lima deſtroyed by an earthquake.

1747 Kouli Khan murdered.

1748 The peace of Aix-la-Chapelle, by which a reſtitution of all places taken during the war was to be made on all ſides.

1749 The intereſt on the Britiſh funds reduced to 3 *per cent.*

Britiſh herring-fiſhery incorporated.

The colony of Nova Scotia founded.

1750 Earthquake in England.

1751 Frederic prince of Wales, father to his preſent majeſty, died.

Antiquarian ſociety at London incorporated.

1752 The new ſtile introduced into Great Britain; the 3d of September being counted the 14th.

1753 The Britiſh muſeum erected at Montague-houſe.

Society of arts, manufactures, and commerce, inſtituted in London.

1754 A dreadful eruption of mount Ætna.

A great earthquake at Conſtantinople, Cairo, &c. Sept. 2d.

1755 Quito in Peru deſtroyed by an earthquake, April 28th.

Liſbon deſtroyed by an earthquake, Nov. 1ſt.

1756 146 Engliſhmen are confined in the black hole at Calcutta in the Eaſt Indies by order of the nabob, and 123 found dead next morning.

Marine ſociety eſtabliſhed at London.

The King of Pruſſia commenced hoſtilities in the month of Auguſt in Saxony. Defeats the Auſtrians at Lo.

1757 Damien attempted to aſſaſſinate the French king.

The King of Pruſſia invades Bohemia. Defeats the Auſtrians at Reichenberg, April 21ſt, and at Prague, May 6th. Repulſed by Count Daun at Kolin, June 18th.

The allies defeated by the French at Haſtenbeck, July 26th.

Convention of Cloſter Seven, Sep. 8th.

The king of Pruſſia defeats the French and Auſtrians at Roſbach, Nov. 5. The Pruſſians defeated near Breſlaw, Nov. 22d. The Auſtrians defeated at Liſſa, Dec. 5th.

1758 Senegal taken by the Britiſh, May 1ſt. They take Louiſbourg, July 27th.

The King of Pruſſia defeats the Ruſſians at Zorndorf, Auguſt 25th. Is defeated by Count Daun at Hoch-kirchen, Oct. 14th.

Goree taken by Commodore Keppel, Dec. 29th.

Attempt to aſſaſſinate the King of Portugal, Dec. 3.

1759 General Wolfe is killed in the battle of Quebec, which is gained by the Britiſh.

The French defeated by Prince Ferdinand at Bergen, April 13th.

Guadaloupe taken by the Britiſh, May 1ſt.

King of Pruſſia defeated by the Ruſſians at Cunerſdorf, Aug. 12th.

1759 The French fleet defeated by Admiral Hawke, Nov. 20th.

Balbec and Tripoli deſtroyed by an earthquake, Dec. 5th.

1760 King George II. dies October 25th, in the 77th year of his age, and is ſucceeded by his preſent majeſty, who, on the 22d of September 1761, married the princeſs Charlotte of Mecklenburgh Strelitz.

Blackfriars-bridge, conſiſting of 9 arches, begun, finiſhed 1770, at the expence of 152,840l. to be diſcharged by a toll.

A tranſit of Venus over the ſun June 6th.

Earthquakes in Syria Oct. 13th.

The King of Pruſſia defeats the Auſtrians at Torgau Nov. 3d.

1761 Pondicherry taken by Col. Coote Jan. 15th.

Belleiſle ſurrendered to the Britiſh Feb. 4th.

1762 War declared againſt Spain.

Peter III. emperor of Ruſſia, is depoſed, impriſoned, and murdered.

American philoſophical ſociety eſtabliſhed in Philadelphia.

George Auguſtus Frederic, prince of Wales, born Aug. 12th

Martinico ſurrended to the Britiſh Feb. 4th.

Havannah ſurrendered to ditto Aug. 12th.

Manilla taken by ditto Oct. 6th

1763 The definitive treaty of peace between Great Britain, France, Spain, and Portugal, concluded at Paris February 10th; which confirms to Great Britain the extenſive provinces of Canada, Eaſt and Weſt Florida, and part of Louiſiana, in North America: alſo the iſlands of Granada, St Vincent, Dominica, and Tobago, in the Weſt Indies.

The Jeſuits expelled from France.

1764 The parliament granted 10,000 l. to Mr Harriſon for his diſcovery of the longitude by his time-piece.

Famine and peſtilence in Italy.

An earthquuke at Liſbon.

1765 His majeſty's royal charter paſſed for incorporating the ſociety of artiſts.

An act paſſed annexing the ſovereignty of the iſland of Man to the crown of Great Britain.

1766 April 21ſt. a ſpot or macula of the ſun, more than thrice the bigneſs of our earth, paſſed the ſun's centre.

The American ſtamp-act repealed March 18th

A great earthquake at Conſtantinople.

The Jeſuits expelled from Bohemia and Denmark.

1767 The Jeſuits expelled from Spain, Venice, and Genoa, April 2d.

Martinico almoſt deſtroyed by an earthqnake.

The proteſtants tolerated in Poland Nov. 2d.

1768 Academy of painting eſtabliſhed in London.

The Turks impriſon the Ruſſian ambaſſador, and declare war againſt that empire.

The Jeſuits expelled from Naples, Malta, and Parma.

1769 Paoli fled from Corſica June 13th. The iſland then reduced by the French.

1770 An earthquake at St Domingo.

1771 Dr Solander and Mr Banks, in his Britannic majeſty's ſhip the Endeavour, Lieut. Cook, return from a voyage round the world, having made ſeveral important diſcoveries in the Southſeas.

An emigration of 500,000 Tourgouths from the coaſts of the Caſpian Sea to the frontiers of China.

1772 The King of Sweden changes the conſtitution from ariſtocracy to a limited monarchy.

The pretender marries a princeſs of Germany, grand-daughter of Thomas late Earl of Ayleſbury.

The emperor of Germany, Empreſs of Ruſſia, and the King of Pruſſia, ſtrip the King of Poland of a great part of his dominions, which they divide among themſelves, in violation of the moſt ſolemn treaties

1773 Captain Phipps is ſent to explore the North Pole; but having made 81 degrees, is in danger of being locked up by the ice, and his attempt to diſcover a paſſage in that quarter proves fruitleſs.

The Engliſh Eaſt India company having, by conqueſt or treaty, acquired the extenſive provinces of Bengal, Orixa, and Bahar, containing 15 millions of inhabitants, great irregularities are committed by their ſervants abroad; upon which government interferes, and ſends out judges &c. for the better adminiſtration of juſtice.

The war between the Ruſſians and the Turks proves diſgraceful to the latter, who loſe the Iſlands in the Archipelago, and by the ſea are every where unſucceſsful.

The ſociety of Jeſuits ſuppreſſed by the Pope's bull Auguſt 25th.

1774 Peace is proclaimed between the Ruſſians and the Turks.

The Britiſh parliament having paſſed an act laying a duty of 3d. *per* pound upon all teas imported into America, the coloniſts, conſidering this as a greivance, deny the right of the Britiſh parliament to tax them.

The American colonies ſend deputies to Philadelphia, who aſſume the title of *The Congreſs of the Thirteen United Provinces.*

1775 The the American war commences. Action at Bunker's Hill June 7th.

The Spaniards land near Algiers and are defeated July 8th.

1776 The congreſs declare the United States of America independent of the crown and parliament of Great Britain, 4th July.

The Americans receive a dreadful defeat at Long-Iſland Auguſt 27th.

1777 Philadelphia taken by the Britiſh Oct. 3d.

General Burgoyne with his army ſurrender to the Americans.

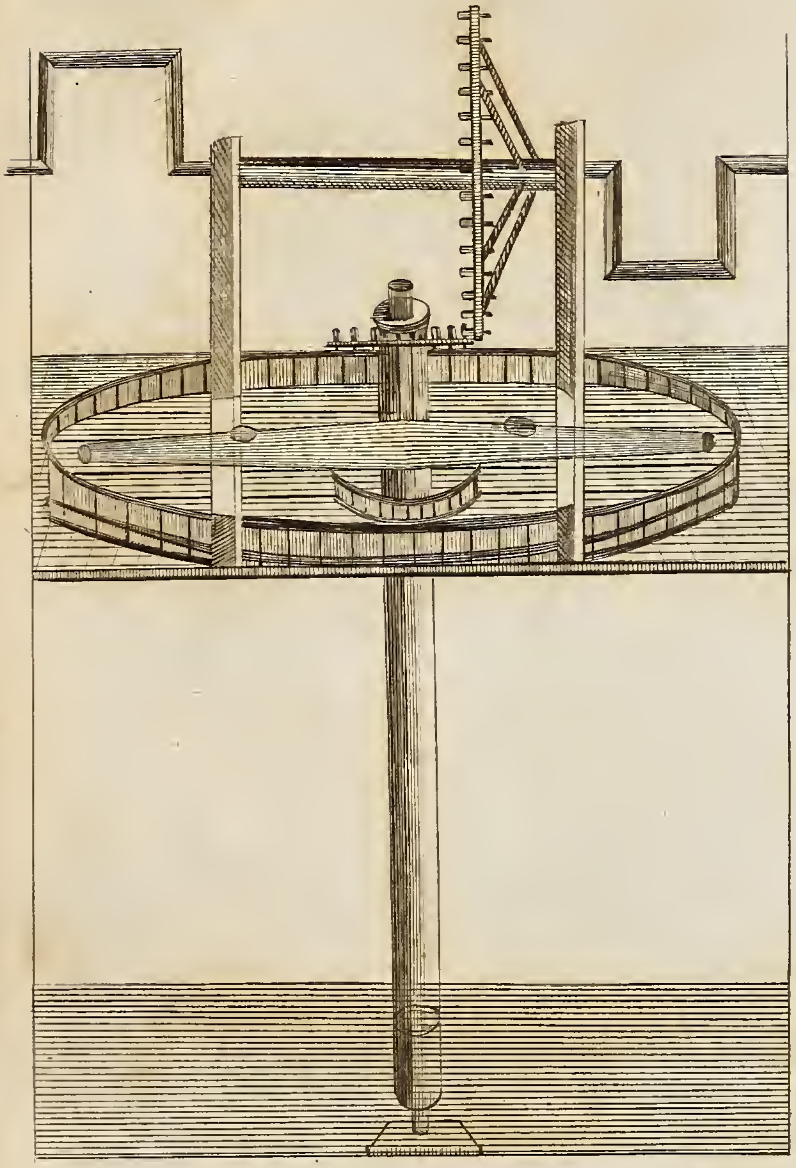
1778 Philadelphia evacuated by the Britiſh, June 18th.

1779 A moſt extraordinary eruption of Veſuvius Auguſt 8th.

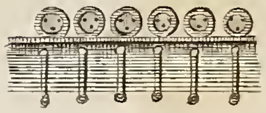
The ſiege of Gibraltar begun by the Spaniards July 8th.

Plate CXXXVI.

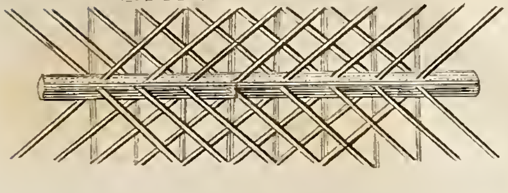
Centrifugal Machine.



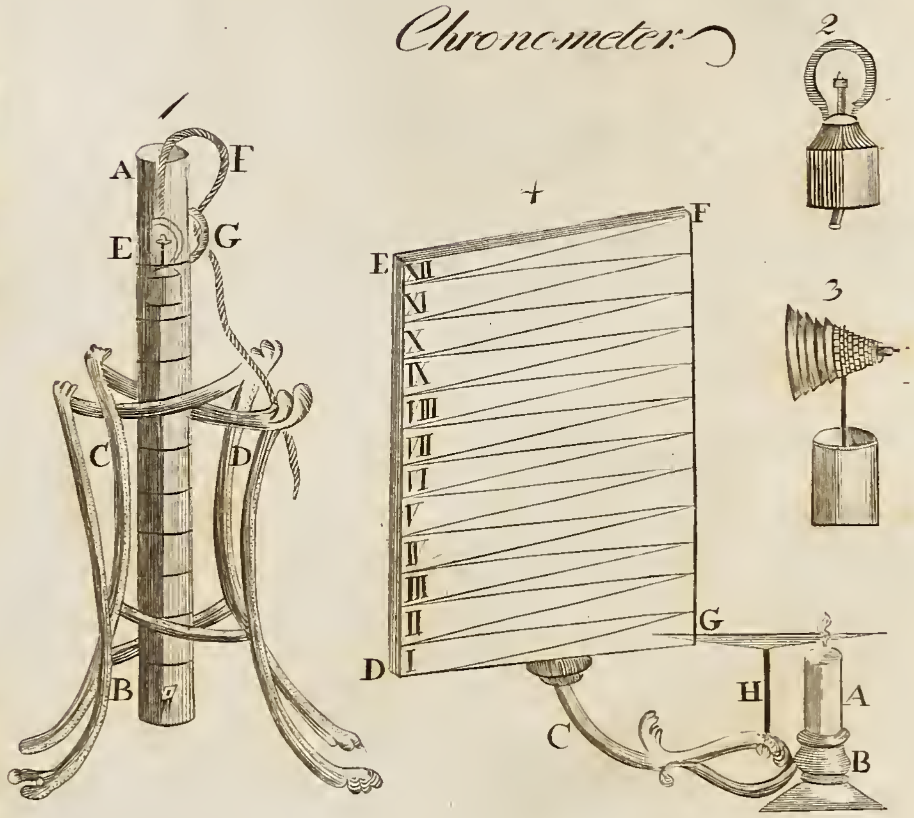
Chain-wales.



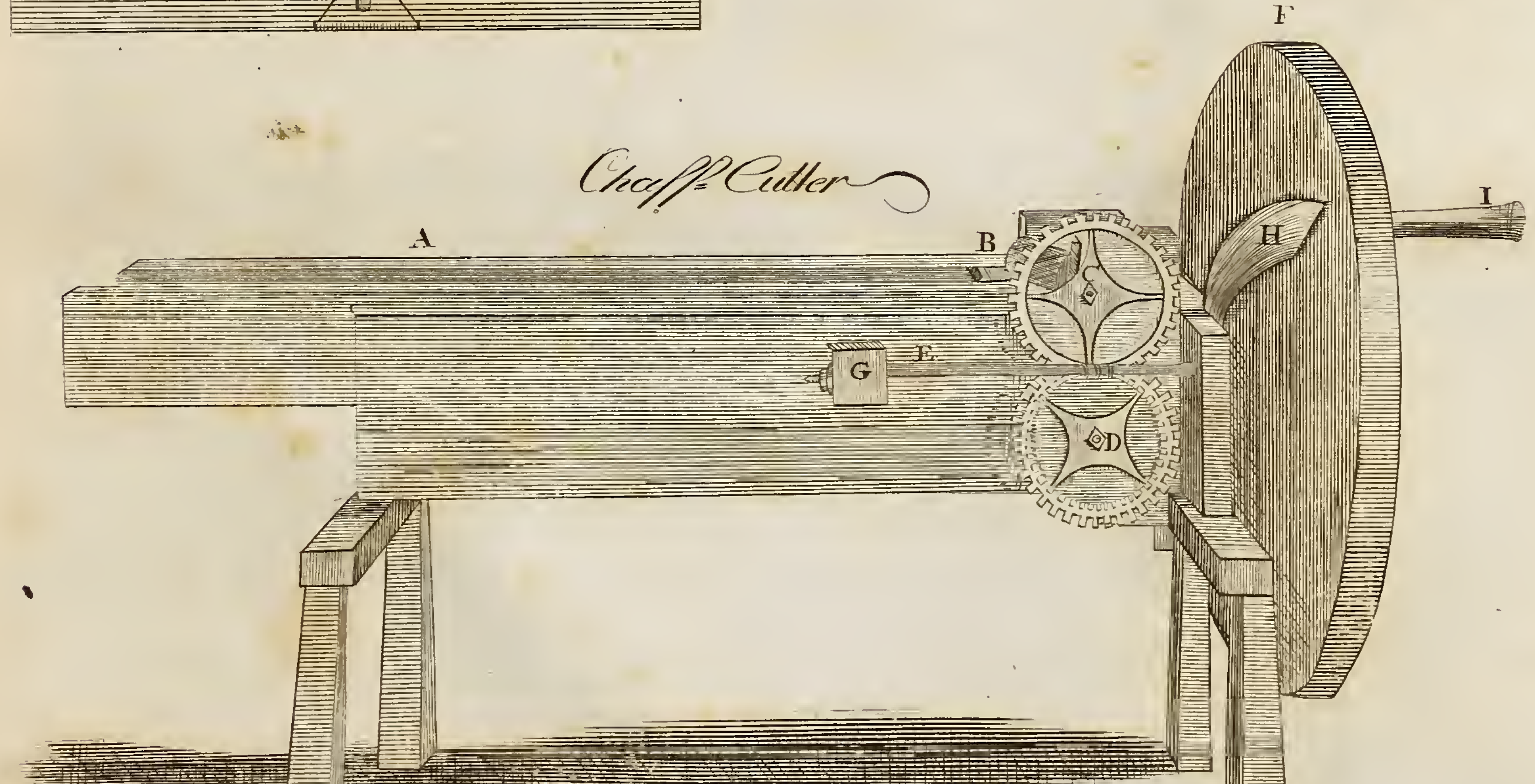
Cheval-de-Frise.



Chronometer.



Chaff-Cutter.



CHIMES.

Fig. 1.
The Notes of the 100 Psalm tune

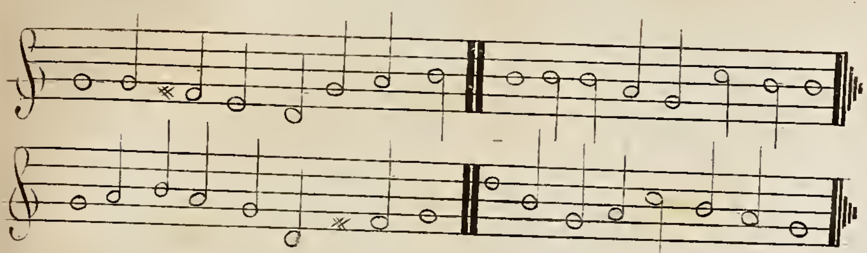
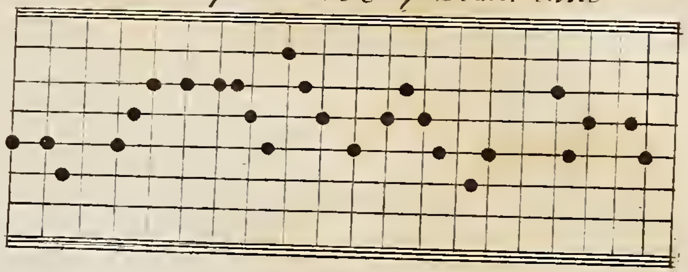


Fig. 2.
A Table for dividing the Chime barrel of the 100 Psalm tune



CIPHER.

Fig. 3.

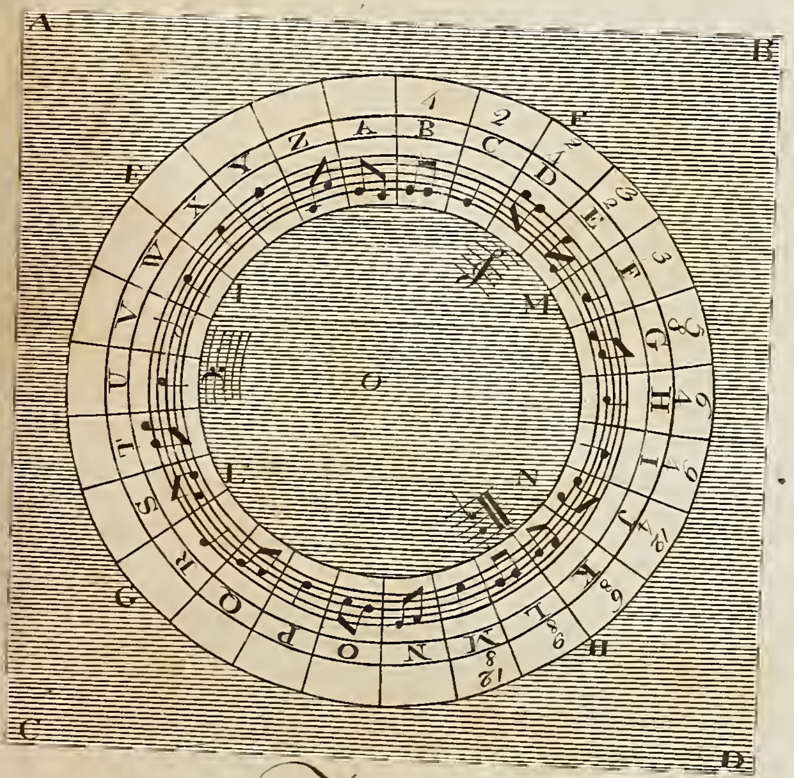


Fig. 4.

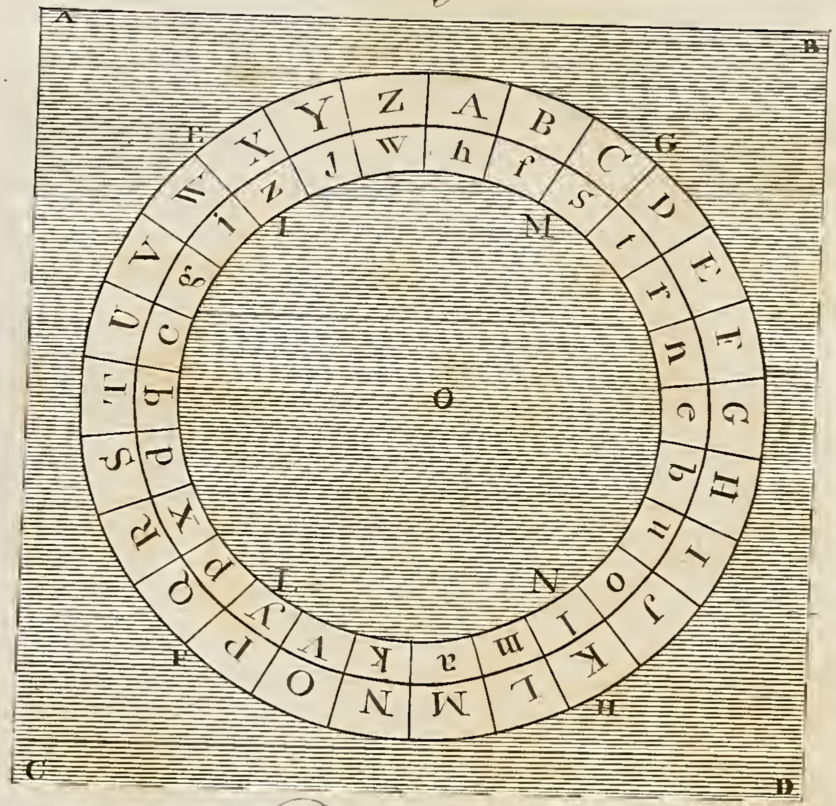


Fig. 5.

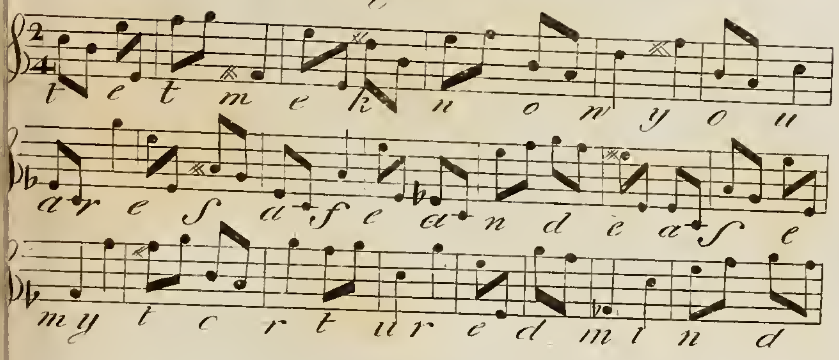


Fig. 6.

Ma un jvc inmm svar
vgrxc qv cd jvc dbhmm
bhgr h yrkduvk hkt-
jvc ahj dqumm ahlr.
h dbha vyyvduquvk-

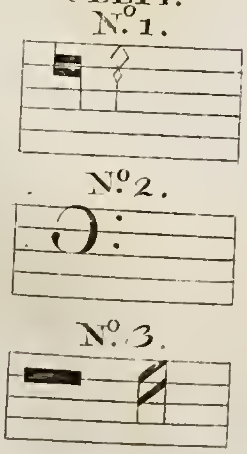
Fig. 7.

⊏ʌXOO∈ʌ+LO λ+Γ⊏ʌ Δ
SΓ⊃.Γ+⊏ +ΓO I⊂ΓO +
LX∈OI SΓ⊃.θOX⊔⊂⊃C+∈Δ
∇+∈ ∈CII.⊏SI⊓ +⊔
θX∈⊃OΓLO ◇. LS∈⊏C+Γ
Γ+ ⊏XSC⊏+X C⊏ CΔ
CΓ⊃C⊔ ⊔ OX OΓLO ◇
ΓOTIOL⊏ OC⊏ʌOX ⊔CΓ⊃.
Δ+λO λOSΓΔ Γ+ ΔO Γ⊃.
λO S IO⊏⊏OX Δʌ+X⊏I∇
◇ IO⊏ λO ΔOO ⊏ʌS⊏ C⊏
L+λOΔ⊔X+λ ⊏ʌO ʌOSX⊏
+X ΓONOX OSXO ⊏+ΔO O
λ∇ ⊔SLO λ+XO.

Fig. 8.

⊔∈NO◇N⊏∈⊔Γ⊔⊔∈X·∈ST
⊃SΔ⊔CX∇ʌXΓ∇∇ST⊃Δ⊃
NX◇□OCN∇∇ΓOOXE+∇X
+XΔS⊃X⊔∈X⊏Γ⊔X SΔ⊔∈
XθN⊔Γ□X∇.+X⊥T◇θ⊔TΓ
∇⊔S⊔∈X∈ST⊃Γ◇□θS EX
CX∇∇⊥⊃X⊥Γ⊃X□⊔S⊃X⊏
ΓN◇⊓ST⊃∇N+X⊃⊔⊓S⊃□
NX+⊃ΓXX∇⊓⊔∈NONO⊔∈
X◇N⊏∈⊔⊔∈Γ⊔XN⊔∈X⊃E
Γ⊕XOTOS⊃T◇□SXOTOL
TN⊔X.

Fig. 9.
CLEFF.



1780 Jan. 14th, 6 h. A. M. the thermometer ſuſpended in the open air at Glaſgow, ſtood at 46° below 0.
The Spaniſh fleet defeated by Admiral Rodney Jan. 16th.
Charleſton ſurrendered to the Britiſh May 12th.
A dreadful inſurrection in London, and riots in many other places of the kingdom.
A great number of Britiſh ſhips taken by the combined fleets of France and Spain.
Lord Cornwallis defeats the Americans at Camden.
A dreadful hurricane in the Leeward Iſlands Oct. 9th.
An extraordinary ſtorm of wind in England.
War declared againſt the Dutch Dec. 20th.

1781 A terrible engagement between the Dutch and Britiſh fleets near the Dogger Bank Aug. 5.
Lord Cornwallis with his army ſurrender to the united forces of France and America Oct. 18th.

1782 Minorca ſurrendered to the Spaniards February 4th.
The French fleet under De Graſſe defeated and almoſt deſtroyed by Admiral Rodney April 12th.
The Spaniſh floating batteries before Gibraltar entirely deſtroyed Sept. 12th.

1783 Preliminaries of a general peace ſigned. America declared independent Jan. 20th.
A dreadful earthquake, attended with many extraordinary circumſtances, in Italy and Sicily.
The ſun obſcured by a kind of fog during the whole ſummer.
A volcanic eruption in Iceland ſurpaſſing any thing recorded in hiſtory. The lava ſpouted up in three places to the height of two miles perpendicular, and continued thus for two months; during which time it covered at tract of 3600 ſquare miles of ground, in ſome places more than 100 feet deep.
A large meteor appears to the northward of Shetland, and takes its direction ſouthward, with a velocity little inferior to that of the earth in its annual courſe round the ſun. Its tract obſerved for more than 1000 miles.

1787 General Convention meet at Philadelphia for the purpoſe of forming a new conſtitution, which was afterwards adopted by all the ſtates.

1789 Firſt Congreſs meet under the federal conſtitution March 4th.
States General opened at Paris April 25th.
Baſtile demoliſhed by the people July 14th.
Conſtitution of France framed Auguſt 6th.

CHRONOMETER, in general, denotes any inſtrument or machine uſed in meaſuring time; ſuch are dials, clocks, watches, *&c.* See Dial, *&c.*

The term *chronometer*, however, is generally uſed in a more limited ſenſe, for a kind of clock ſo contrived as to meaſure a ſmall portion of time with great exactneſs, even to the ſixteenth part of a ſecond: of ſuch a one there is a deſcription in Deſaguliers's experimental philoſophy, invented by the late ingenious Mr George Graham; which muſt be allowed to be of great uſe for meaſuring ſmall portions of time in aſtronomical obſervations, the time of the fall of bodies, the velocity of running waters, *&c.* But long ſpaces of time cannot be meaſured by it with ſufficient exactneſs, unleſs its pendulum be made to vibrate in a cycloid; becauſe, otherwiſe it is liable to err conſiderably, as all clocks are which have ſhort pendulums that ſwing in large arches of a circle.

There have been ſeveral machines contrived for meaſuring time, under the name of *chronometers*, upon principles very different from thoſe on which clocks and watches are conſtructed.

Plate CXXXVI. fig. 1. repreſents an air-chronometer, which is conſtructed in the following manner. Provide a glaſs tube of about an inch in diameter, and three or four feet long: the diameter of the inſide of this tube muſt be preciſely equal in every part: at the bottom muſt be a ſmall hole, cloſely covered with a valve. In the tube place a piſton E, fig. 2. which is made to fit it exactly, and muſt be oiled, that it may move in the tube with the greateſt freedom: in this piſton there is a cock that ſhuts quite cloſe; and from the top of it there goes a cord F, which paſſes through the handle G. The cock of the piſton being cloſed, it is to be let down to the bottom of the tube, and being then drawn up to the top, the air will then ruſh in by the valve at the bottom of the tube, and ſupport the piſton. You are then to turn the cock, ſo as to make a very ſmall vent; and the air paſſing ſlowly through that vent, the piſton will gradually deſcend, and ſhow the hour, either by lines cut in the tube with a diamond, or marked with paint, or by ſmall ſlips of paper painted on the glaſs. If this chronometer ſhould go too faſt or two ſlow, it may be eaſily regulated by altering the poſition of the cock in the piſton, as it is on that the whole depends.

If, inſtead of marking the tube, you would have the time ſhown by a dial, it may be eaſily effected by placing an axis to which the hand of the dial is fixed, directly over the tube, and winding the ſtring to which the piſton is joined round that axis; for then, as the piſton deſcends, the axis will gradually turn the hand, and ſhow the hour: but it muſt be obſerved, that as the deſcent of the piſton is not conſtantly regular, on account of the decreaſe of reſiſtence from the quantity of the ſubjacent air as the piſton deſcends, the axis therefore muſt not be a regular cylinder, but conical like the fuſee of a watch, as in fig. 3. by which means the motion of the hand of the dial will be conſtant and regular.

Fig. 4. repreſents a lamp-chronometer. It conſiſts of a chamber lamp A, which is a cylindrical veſſel about three inches high, and one inch diameter, placed in the ſtand B. The inſide of this veſſel muſt be every where exactly of the ſame diameter. To the ſtand B is fixed the handle C, which ſupports the frame DEFG, about 12 inches high, and four wide. This frame is to be covered with oiled paper, and divided into twelve equal parts by horizontal lines; at the end of which are wrote the numbers for the hours, from 1 to 12, and between the horizontal lines are diagonals that are divided into halves, quarters, *&c.* On the handle B, and cloſe to the glaſs, is fixed the ſtyle or gnomon H. Now, as the diſtance of the ſtyle from the flame of the lamp is only half an inch, if the diſtance of the frame from the ſtyle is only ſix inches, then, while the float that contains the light deſcends,

deſcends, by the decreaſe of the oil, one inch, the ſhadow of the ſtyle on the frame will aſcend twelve inches, that is, its whole length, and ſhow by its progreſſion the regular increaſe of the hours, with their ſeveral diviſions. It is abſolutely neceſſary, however, that the oil uſed in this lamp be always of the ſame ſort and quite pure, and that the wick alſo be conſtantly of the ſame ſize and ſubſtance, as it is on theſe circumſtances, and the uniform figure of the veſſel, that the regular, progreſs of the ſhadow depends.

CHRONOMETER, among muſicians, an inſtrument invented by *Loulie*, a French muſician, for the purpoſe of meaſuring time by means of a pendulum. The form of the inſtrument, as deſcribed by him, is that of an Ionic pilaſter, and is thus deſcribed by Malcolm in his Treatiſe of Muſic, p. 407.—" The chronometer conſiſts of a large ruler or board, ſix feet or 72 inches long, to be ſet on end; it is divided into its inches, and the numbers ſet ſo as to count upwards; and at every diviſion there is a ſmall round hole, through whoſe centre the line of diviſion runs. At the top of this ruler, about an inch above the diviſion 72, and perpendicular to the ruler, is inſerted a ſmall piece of wood, in the upper ſide of which there is a groove, hollowed along from the end that ſtands out to that which is fixed in the ruler, and near each end of it a hole is made: through theſe holes a pendulum cord is drawn, which runs in the groove: at that end of the cord which comes through the hole furtheſt from the ruler, the ball is hung; and at the other end there is a ſmall wooden pin, which can be put in any of the holes of the ruler: when the pin is in the upmoſt hole at 72, then the pendulum from the top to the centre of the ball muſt be exactly 72 inches; and therefore, whatever hole of the ruler it is put in, the pendulum will be juſt ſo many inches as that figure at the hole denotes. The manner of uſing the machine is this: The compoſer lengthens or ſhortens his pendulum, till one vibration be equal to the deſigned length of his bar, and then the pin ſtands at a certain diviſion, which marks the length of the pendulum; and this number being ſet with the cliff at the beginning of the ſong, is a direction for others how to uſe the chronometer, in meaſuring the time according to the compoſer's deſign: for with the number is ſet the note, crotchet, or minim, whoſe value he would have the vibration to be; which in briſk duple time is beſt a minim or half bar, or even a whole bar, when that is but a minim; and in ſlow time a crotchet. In triple time, it would do well to be the third part or half, or fourth part of a bar; and in the ſimple triples that are allegro, let it be a whole bar. And if, in every time that is allegro, the vibration is applied to a whole or half bar, practice will teach us to ſubdivide it juſtly and equally. Obſerve, that, to make this machine of univerſal uſe, ſome canonical meaſure of the diviſions muſt be agreed upon, that the figure may give a certain direction for the length of the pendulum.

CHROSTASIMA, in natural hiſtory, a genus of pellucid gems, comprehending all thoſe which appear of one ſimple and permanent colour in all lights; ſuch are the diamond, carbuncle, ruby, garnet, amethyſt, ſapphire, beryl, emerald, and the topaz. See DIAMOND, CARBUNCLE, *&c.*

CHRYSA, (anc. geog.), a town of Myſia, on the ſinus Adramyttenus; extinct in Pliny's time: it had a temple of Apollo Smintheus (Homer, Strabo). The country of the fair Chryſeis, who gave firſt riſe to the quarrel between Agamemnon and Achilles.

CHRYSALIS, or AURELIA, in natural hiſtory, a ſtate of reſt and ſeeming inſenſibility, which butterflies, moths, and ſeveral other kinds of inſects, muſt paſs through before they arrive at their winged or moſt perfect ſtate.

In this ſtate, no creatures afford ſo beautiful a variety as the butterfly kinds, and they all paſs through this middle ſtate without one exception. The figure of the aurelia or chryſalis generally approaches to that of a cone, or at leaſt the hinder part of it is in this ſhape; and the creature, while in this ſtate, ſeems to have neither legs nor wings, nor has any power of walking. It ſeems indeed to have hardly ſo much as life. It takes no nouriſhment in this ſtate, nor has it any organs for taking any; and indeed its poſterior part is all that ſeems animated, this having a power of giving itſelf ſome motions. The external covering of the chryſalis is cartilaginous, and conſiderably large, and is uſually ſmooth and gloſſy: but ſome few of them have a few hairs; ſome are alſo as hairy as the caterpillars from which they are produced; and others are rough, and, as it were, ſhagreened all over.

In all of theſe there may be diſtinguiſhed two ſides; the one of which is the back, the other the belly of the animal. On the anterior part of the latter, there may always be diſtinguiſhed certain little elevations running in ridges, and reſembling the fillets wound about mummies: the part whence theſe have their origin, is eſteemed the head of the animal. The other ſide, or back, is ſmooth, and of a rounded figure in moſt of the chryſaliſes; but ſome have ridges on the anterior part, and ſides of this part; and theſe uſually terminate in a point, and make an angular appearance on the chryſalis.

From this difference is drawn the firſt general diſtinction of theſe bodies. They are by this divided into two claſſes; the round and the angular kinds. The firſt are, by the French naturaliſts, called *feves*; from the common cuſtom of calling the chryſalis of the ſilkworm, which is round, by this name.

There is ſomething more regular in this diſtinction than might at firſt be conceived; for the diviſion is continued from the fly-ſtate: the rounded chryſaliſes being almoſt all produced by the *phalenæ*, or moths; and the angular ones by the *papilios*, or day-flies. There are ſeveral ſubordinate diſtinctions of theſe kinds; but, in general, they are leſs different from one another than the caterpillars from whence they are produced.

The head of thoſe of the firſt claſs uſually terminates itſelf by two angular parts, which ſtand ſeparate one from the other, and reſemble a pair of horns. On the back, eminences and marks are diſcovered, which imagination may form into eyes, noſe, chin, and other parts of the human face.

There is a great variety and a great deal of beauty in the figures and arrangement of the eminences and ſpots on the other part of the body of the chryſaliſes of different kinds. It is a general obſervation, that thoſe chryſaliſes which are terminated by a ſingle horn, afford day-butterflies of the kind of thoſe which have buttoned

buttoned antennæ, and whoſe wings, in a ſtate of reſt, cover the under part of their body, and which uſe all their ſix legs in walking, thoſe of many other kinds uſing only four of them. Thoſe chryſaliſes which are terminated by two angular bodies, and which are covered with a great number of ſpines, and have the figure of a human face on their back in the greateſt perfection, afford butterflies of the day-kind; and of that claſs the characters of which are, their walking on four legs, and uſing the other two, that is, the anterior part, in the manner of arms or hands. The chryſaliſes which have two angular bodies on their heads, but ſhorter than thoſe of the preceding, and whoſe back ſhows but a faint ſketch of the human face, and which have fewer ſpines, and thoſe leſs ſharp, always turn to that ſort of butterfly the upper wings of which are divided into ſegments, one of which is ſo long as to repreſent a tail, and whoſe under wings are folded over the upper part of the back. A careful obſervation will eſtabliſh many more rules of this kind, which are not ſo perfect as to be free from all exceptions; yet are of great uſe, as they teach us in general what ſort of fly we are to expect from the chryſalis, of which we know not the caterpillar, and therefore can only judge from appearances.

Theſe are the principal differences of the angular chryſaliſes; the round ones alſo have their different marks not leſs regular than thoſe.

The greater number of the round chryſaliſes have the hinder part of their body of the figure of a cone; but the upper end, which ought to be its circular plane baſe, is uſually bent and rounded into a ſort of knee: this is uſually called the head of the chryſalis; but there are alſo ſome of this kind, the head of which is terminated by a nearly plane ſurface: ſome of the creeping ten-legged caterpillars give chryſaliſes of this kind, which have each of them two eminences that ſeem to bring them towards the angular kind.

Among the angular chryſaliſes there are ſome whoſe colours ſeem as worthy our obſervation as the ſhapes of the others. Many of them appear ſuperbly clothed in gold. Theſe elegant ſpecies have obtained the name of *chryſalis* and *aurelia*, which are derived from Greek and Latin words, ſignifying gold; and from theſe all other bodies of the ſame kind have been called by the ſame names, though leſs, or not at all, intitled to them. As ſome kinds are thus gilded all over, ſo others are ornamented with this gay appearance in a ſparing manner, having only a few ſpots of it in different places on their back and belly. Theſe obvious marks, however, are not to be depended upon as certain characters of diſtinction: for accidents in the formation of the chryſalis may alter them; and thoſe which naturally would have been gilded all over, may be ſometimes only ſo in part; and either theſe or the others may, by accident, be ſo formed, as to ſhow nothing of this kind at all, but be only of a duſky brown. Thoſe, however, which have neither ſilver nor gold to recommend them to your eyes, do not want other colours, and thoſe beautifully variegated. Some of them are all over of an elegant green, as is the chryſalis of the fennel-caterpillar; others of an elegant yellow; and ſome of a bright greeniſh tinge, variegated with ſpots of a ſhining black: we have a very beautiful inſtance of this laſt kind in the chryſalis of the elegant cabbage-caterpillar. The general colour of the chryſalis of the common butterflies, however, is brown.

Some are alſo of a fine deep black; and of theſe many are ſo ſmooth and gloſſy, that they are equal to the fineſt Indian japan. The common caterpillar of the fig-tree gives an inſtance of one of theſe moſt beautiful gloſſy ones; the caterpillar of the vine affords another of theſe fine black chryſaliſes.

The rounded chryſaliſes do not afford any thing of that variety of colouring ſo remarkably beautiful in the angular ones; they are uſually of a duſky yellow, in different ſhades, and are often variouſly ſpotted with black: but theſe, as well as all other chryſaliſes, before they arrive at their fixed colour, paſs through ſeveral other temporary ones; ſome being of a different colour when firſt produced from the caterpillar, from what they are a few days afterwards; and ſome varying ſo greatly, though only in degree, as not to be diſtinguiſhable, even by the moſt converſant eye, from what they were when firſt produced. The green rough caterpillar of the cabbage has a chryſalis which is green at firſt; and from that gradually goes through all the ſhades of green to faint yellow, which is its laſting colour; and one of the oak caterpillars yields a chryſalis beautifully ſpotted with red at its firſt appearance; but theſe ſpots change to brown for their fixed colour: the third day from their formation uſually fixes their laſting colours; and if they are obſerved to turn black in any part after this time, it is a ſign that they are dead or dying.

The ſeveral ſpecies of inſects, as a fly, ſpider, and an ant, do not differ more evidently from one another in regard to appearance, than do a caterpillar, its chryſalis, and a butterfly produced from it; yet it is certain, that theſe are all the product of the ſame individual egg; and nothing is more certain, than that the creature which was for a while a caterpillar, is, after a certain time, a chryſalis, and then a butterfly. Theſe great changes produced in ſo ſudden a manner, ſeem like the *metamorphoſes* recorded in the fables of the ancients; and indeed it is not improbable that thoſe fables firſt took their origin from ſuch changes.

The parts being diſtinguiſhable in the chryſalis, we eaſily find the difference of the ſpecies of the fly that is to proceed from it. The naked eye ſhows whether it be one of thoſe that have, or of thoſe that have not, a trunk; and the aſſiſtance of a microſcope ſhows the antennæ ſo diſtinctly, that we are able to diſcern whether it belongs to the day or night claſs; and often to what genus, if not the very ſpecies: nay, in the plumoſe horned kinds, we may ſee, by the antennæ, whether a male or female phalæna is to be produced from the chryſalis; the horns of the female being in this ſtate evidently narrower, and appearing leſs elevated above the common ſurface of the body, than thoſe of the male.

All theſe parts of the chryſalis, however, though ſeen very diſtinctly, are laid cloſe to one another, and ſeem to form only one maſs; each of them is covered with its own peculiar membrane in this ſtate, and all are ſurrounded together by a common one; and it is only through theſe that we ſee them; or rather we ſee on theſe the figures of all the parts moulded within, and

and therefore it requires attention to diſtinguiſh them. The chryſalis is ſoft when firſt produced, and is wetted on the front with a viſcous liquor; its ſkin, though very tender at firſt, dries and hardens by degrees: but this viſcous liquor, which ſurrounds the wings, legs, *&c.* hardens almoſt immediately; and in conſequence faſtens all thoſe limbs, *&c.* into a maſs, which were before looſe from one another: this liquor, as it hardens, loſes its tranſparence, and becomes brown; ſo that it is only while it is yet moiſt that theſe parts are to be ſeen diſtinct.

It is evident from the whole, that the chryſalis is no other than a butterfly, the parts of which are hid under certain membranes which faſten them together; and, when the limbs are arrived at their due ſtrength, they become able to break through theſe membranes, and then expand and arrange themſelves in their proper order.

The firſt metamorphoſis, therefore, differs nothing from the ſecond, except that the butterfly comes from the body of the caterpillar in a weak ſtate, with limbs unable to perform their offices, whereas it comes from the chryſalis perfect.

Hiſtory of Inſects, vol. i. p. 2.—28.

M. Reaumur has given us many curious obſervations on the ſtructure and uſes of the ſeveral coverings that attend the varieties of the caterpillar-kind in this ſtate.

The creatures in general remain wholly immoveable in this ſtate, and ſeem to have no buſineſs in it but a patient attendance on the time when they are to become butterflies; and this is a change that can happen to them only as their parts, before extremely ſoft and weak, are capable of hardening and becoming firm by degrees, by the tranſpiration of that abundant humidity which before kept them ſoft: and this is proved by an experiment of M. Reaumur, who, incloſing ſome chryſaliſes in a glaſs tube, found, after ſome time, a ſmall quantity of water at the bottom of it; which could have come there no other way, but from the body of the incloſed animal. This tranſpiration depends greatly on the temperature of the air; it is increaſed by heat, and diminiſhed by cold; but it has alſo its peculiarities in regard to the ſeveral ſpecies of butterfly to which the chryſalis belongs.

According to theſe obſervations, the time of the duration of the animal in the chryſalis ſtate muſt be, in different ſpecies, very different; and there is indeed this wide difference in the extremes, that ſome ſpecies remain only eight days in this ſtate, and others eight months.

We know that the caterpillar changes its ſkin four or five times during its living in that ſtate; and that all theſe ſkins are at firſt produced with it from the egg, lying cloſely over one another. It parts with, or throws off all theſe one by one, as the butterfly, which is the real animal, all this time within, grows more and more perfect in the ſeveral firſt changes. When it throws off one, it appears in another ſkin exactly of the ſame form; but at its final change from this appearance, that is, when it throws off the laſt ſkin, as the creature within is now arrived at ſuch a degree of perfection as to need no farther taking of nouriſhment, there is no farther need of teeth, or any of the other parts of a caterpillar. The creature, in this laſt change, proceeds in the very ſame manner as in all the former, the ſkin opening at the back, and the animal making its way out in this ſhape. If a caterpillar, when about to throw off this laſt ſkin, be thrown into ſpirits of wine, and left there for a few days, the membranes within will harden, and the creature may be afterwards carefully opened, and the chryſalis taken out, in which the form of the tender butterfly may be traced in all its lineaments, and its eyes, legs, *&c.* evidently ſeen. It is not neceſſary, however, to ſeize upon this exact time for proving the exiſtence of the chryſalis or butterfly in the caterpillar: for if one of theſe animals be thrown into ſpirit of wine, or into vinegar, ſome days before that time, and left there for the fleſh to harden, it may afterwards be diſſected, and all the lineaments of the butterfly traced out in it, the wings, legs, antennæ, *&c.* being as evident here, and as large, as in the chryſalis.

It is very plain from this, that the change of the caterpillar into chryſalis, is not the work of a moment; but is carrying on for a long time before, even from the very hatching of the creature from the egg. The parts of the butterfly, however, are not diſpoſed exactly in the ſame manner while in the body of the caterpillar, as when left naked in the form of the chryſalis: for the wings are proportionally longer and narrower, being wound up into the form of a cord; and the antennæ are rolled up on the head; the trunk is alſo twiſted up and laid upon the head; but this in a very different manner from what it is in the perfect animal, and very different from that in which it lies within the chryſalis; ſo that the firſt formation of the butterfly in the caterpillar, by time arrives at a proper change of the diſpoſition of its parts, in order to its being a chryſalis. The very eggs, hereafter to be depoſited by the butterfly, are alſo to be found not only in the chryſalis, but in the caterpillar itſelf, arranged in their natural, regular order. They are indeed in this ſtate very ſmall and tranſparent; but after the change into the chryſalis, they have their proper colour.

As ſoon as the ſeveral parts of the butterfly, therefore, are arrived at a ſtate proper for being expoſed to the more open air, they are thrown out from the body of the caterpillar, ſurrounded only with their membranes; and as ſoon as they are arrived after this at a proper degree of ſtrength and ſolidity, they labour to break through theſe thinner coverings, and to appear in their proper and natural form. The time of their duration in this ſtate of chryſalis is very uncertain, ſome remaining in it only a few days, others ſeveral months, and ſome almoſt a year in appearance. But there is a fallacy in this that many are not aware of. It is natural to think, that as ſoon as the creature has incloſed itſelf in its ſhell, be that of what matter it will, it undergoes its change into the chryſalis ſtate. And this is the caſe with the generality: yet there are ſome which are eight or nine months in the ſhell before they become chryſaliſes; ſo that their duration in the real chryſalis ſtate is much ſhorter than it naturally appears to be. M. Reaumur carefully watched the auriculated caterpillar of the oak in its ſeveral changes, and particularly from its chryſalis, which is of this laſt kind, into the fly; and has given an account of the method of this as an inſtance of the general courſe of nature in theſe operations.

The membranes which envelope the creature in this chryſalis ſtate are at firſt tough and firm, and immediately touch the ſeveral parts of the incloſed animal; but by degrees, as theſe parts harden, they become covered, ſome with hairs, and others with ſcales. Theſe, as they continue to grow, by degrees fall off the ſeveral particular membranes which cover the parts on which they are placed, to a greater diſtance, and by degrees looſen them from the limbs. This is one reaſon of thoſe membranes drying and becoming brittle.

The middle of the upper part of the CORSELET is uſually marked with a line which runs in a longitudinal direction: and this part is always more elevated than the reſt, even in the conic kinds, which are no otherwiſe angular. This line is in ſome very bold and plain; in others it is ſo faint as not to be diſtinguiſhable without glaſſes; but it is always in the midſt of that line that the ſhell begins to open. The motion of the head of the butterfly backwards firſt occaſions this crack; and a few repetitions of the ſame motion open it the whole length of the line.

The clearing itſelf, however, entirely, is a work of more time in this caſe, than is the paſſing of the chryſalis out of the body of the caterpillar. In that caſe there is a crack ſufficiently large in the ſkin of the back, and the whole chryſalis being looſe comes out at once. But in this caſe, every particular limb, and part of the body, has its ſeparate caſe; and theſe are almoſt inconceivably thin and tender, yet it is neceſſary that every part be drawn out of them before it appear naked to the open air. As ſoon as all this is effected, and the animal is at full liberty, it either continues ſome time upon the remains of its covering, or creeps a little way diſtant from it, and there reſts. The wings are what we principally admire in this creature. Theſe are at this time ſo extremely folded up, and placed in ſo narrow a compaſs, that the creature ſeems to have none at all: but they by degrees expand and unfold themſelves; and finally, in a quarter of an hour, or half an hour at the utmoſt, they appear at their full ſize, and in all their beauty. The manner of this ſudden unfolding of the wings is this: the ſmall figure they make when the creature firſt comes out of its membranes, does not prevent the obſerving that they are at that time conſiderably thick. This is owing to its being a large wing folded up in the niceſt manner, and with folds ſo arranged as to be by no means ſenſible to the eye, for the wing is never ſeen to unfold; but, when obſerved in the moſt accurate manner ſeems to grow under the eye to this extent. When the creature is firſt produced from the ſhell, it is every where moiſt and tender; even its wings have no ſtrength or ſtiffneſs till they expand themſelves; but they then dry by degrees, and, with the other parts, become rigid and firm. But if any accident prevents the wings from expanding at their proper time, that is, as ſoon as the creature is out of its ſhell, they never afterwards are able to expand themſelves; but the creature continues to wear them in their contracted and wholly uſeleſs ſtate; and very often, when the wings are in part extended before ſuch an accident happens, it ſtops them in a partial extenſion, and the creature muſt be contented to paſs its whole life with them in that manner.

M. Reaumur has proved, that heat and cold make great differences in the time of hatching the butterfly from its chryſalis ſtate: and this he particularly tried with great accuracy and attention, by putting them in veſſels in warm rooms, and in ice-houſes; and it ſeemed wholly owing to the haſtening or retarding the evaporation of the abundant humidity of the animal in the chryſalis ſtate, that it ſooner or later appeared in the butter-fly form. He varniſhed over ſome chryſaliſes, in order to try what would be the effect of thus wholly preventing their tranſpiration; and the conſequence was, that the butterfly came forth from theſe two months later than their natural time. Thus was the duration of the animal in this ſtate lengthened; that is, its exiſtence was lengthened: but without any advantage to the creature, ſince it was in the time of its ſtate of inaction, and probably of inſenſibility.

Though this was of no conſequence, M. Reaumur deduces a hint from it that ſeems to be of ſome uſe. He obſerves, that hens eggs, of which we make ſo many uſes, and eat in ſo many forms, are properly a ſort of chryſalis of the animal; their germ, after they are impregnated by the cock, containing the young animal alive, and waiting only a due degree of warmth to be hatched, and appear in its proper form. Eggs tranſpire notwithſtanding the hardneſs of their ſhells; and when they have been long kept, there is a road found near one of their ends, between the ſhell and the internal membrane; this is a mark of their being ſtale, and is the effect of an evaporation of part of their humidity: and the ſame varniſh which had been uſed to the chryſalis, being tried on eggs, was found to preſerve them for two years, as freſh as if laid but the ſame day, and ſuch as the niceſt palate could not diſtinguiſh from thoſe that were ſo. See EGGS.

It is not yet known how much farther this uſeful ſpeculation might be carried, and whether it might not be of great uſe even to human life, to invent ſomething that ſhould act in the manner of this varniſh, by being rubbed over the body, as the *athletæ* did of old, and the ſavages of the Weſt Indies do at this time, without knowing why. But to return to the inſects which are the ſubjects of this article; their third ſtate, that in which they are winged, is always very ſhort, and ſeems deſtined for no other action but the propagation of the ſpecies. See PAPILIO.

CHRYSANTHEMUM, CORN-MARIGOLD: A genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked; the pappus marginated, or conſiſting only of a border: the calyx hemiſpherical and imbricated, with the marginal ſcales membranaceous. There are 19 ſpecies, of which the following are the moſt remarkable: 1. The ſerotinum is a native of North America. The roots of this plant creep far under the ſurface, and ſend up ſtrong ſtalks more than four feet high, garniſhed with long ſawed leaves ending in points. Theſe ſtalks divide upward into many ſmaller; each being terminated by a large, white, radiated flower, which appears in the end of Auguſt or September. 2. The coronarium hath been long cultivated in the gardens on account of the beauty of its flowers. It grows to the height of three feet, with a ſingle upright ſtalk divided into numerous branches, garniſhed with pinnated leaves, and crowned with elegant compound flowers of different colours and properties. The varieties are, ſingle and double flowers of a cream-colour; yellow; yellow and white: brimſtone-coloured: fiſtular, or quilled; or thoſe with finely jagged leaves, and flowers of all the above colours and properties. All the varieties begin flowering in July: the flowers are exceedingly numerous, and exhibit a conſtant ſucceſſion of full bloom till November; and both ſingle and double are ſucceeded by abundance of ſeed. 3. The puteſcens is a native of the Canary iſlands. It riſes with a ſhrubby ſtalk near two feet high, dividing into many branches, which are garniſhed with pretty thick ſucculent leaves, of a greyiſh colour, cut into many ſegments. The flowers come out from the wings of the leaves, growing upon naked footſtalks ſingly, which greatly reſemble thoſe of chamomile. There is a ſucceſſion of flowers on the ſame plant for the greateſt part of the year, for which it is chiefly eſteemed. This plant will perfect ſeeds in Britain when the ſeaſons are favourable.

Culture. The firſt kind multiplies very faſt by its creeping roots, and will thrive in any ſoil or ſituation. The ſecond may be raiſed in abundance from ſeed, either in a hot-bed or warm border, in the ſpring, for tranſplanting; alſo by cuttings and ſlips of their branches in autumn. The latter method is practiſed only for the propagation of the fine doubles, for an early bloom the following ſummer; and the beſt time to perform it is in September, or early in October. Cut off at that time a quantity of the robuſt ſide ſhoots, from three to ſix inches long, without flowers; diveſt them of the lower leaves, and plant many of them together in large pots, within an inch or two of their tops, and two or three inches apart, give ſome water, and place them in the ſhade during the hot weather: by the end of October they will be rooted, when the pots are to be removed either into a greenhouſe or garden-frame, for the winter; but the latter is the moſt eligible, where they may enjoy the full air in mild weather, and have occaſional ſhelter from froſt. In April they may be tranſplanted ſingly into borders and ſome in pots. The plants thus raiſed will flower a month or ſix weeks ſooner the ſucceeding ſummer than thoſe raiſed in the ſpring from ſeed; but as they ſoon become barren, it is proper to have always a quantity of plants raiſed from the ſeed. The third ſort may be raiſed either from ſeeds or cuttings, but requires to be ſheltered in the green-houſe in winter.

CHRYSES, the prieſt of Apollo, father of Aſtynome, called from him *Chryſeis.* When Lyrneſſus was taken, and the ſpoils divided among the conquerors, Chryſeis fell to the ſhare of Agamemnon. Chryſes upon this went to the Grecian camp to ſolicit his daughter's reſtoration; and when his prayers were fruitleſs, he implored the aid of Apollo, who viſited the Greeks with a plague, and obliged them to reſtore Chryſeis.

CHRYSIPPUS, a ſtoic philoſopher, born at Solos in Cilicia, was diſciple to Cleanthus, Zeno's ſucceſſor. He wrote many books, ſeveral of which related to logic. None of the philoſophers ſpoke in ſtronger terms of the fatal neceſſity of every thing, nor more pompouſly of the liberty of man, than the Stoics, Chryſippus in particular. He was ſo conſiderable among them, as to eſtabliſh it into a proverb, that if it had not been for Chryſippus, the porch had never been. Yet the Stoics complained, as Cicero relates, that he had collected ſo many arguments in favour of the ſceptical hypotheſis, that he could not anſwer them himſelf; and thus had furniſhed Carneades, their antagoniſt, with weapons againſt them. There is an apophthegm of this philoſopher preſerved, which does him honour. Being told that ſome perſons ſpoke ill of him, "It is no matter (ſaid he), I will live ſo that they ſhall not be believed."

CHRYSIS, or GOLDEN-FLY, in natural hiſtory: A genus of inſects belonging to the order of hymenoptera. The mouth is armed with jaws, but has no proboſcis; the antennæ are filiform, bent, and conſiſt of 12 articulations; the abdomen is arched, with a ſcale on each ſide; the anus is dentated, and armed with a ſting; the wings lie plain; and the body appears as if gilt. There are ſeveral ſpecies; but the ignita, or flaming chryſis, is beautified with the moſt reſplendent colours. The fore-part of its head is green and gold, and the hinder of a lovely azure. The thorax is likewiſe azured over, with a mixture of green, and terminates at its extremity with ſharp points on both ſides. The abdomen is green and gold before, and of a coppery-red behind, imitating molten copper highly poliſhed. The whole inſect is dotted on its upper part, which gives it a great reſplendency of colour. The antennæ are black, and legs green intermixed with gold. This ſpecies dwells in holes of walls between the ſtones, and in the mortar that cements them. It is often ſeen iſſuing from ſuch holes, where it neſtles and performs its work. The larvæ, which reſemble thoſe of the waſp, likewiſe inhabit the holes of decayed walls.

CHRYSITRIX, in botany: a genus of the dioecia order, belonging to the polygamia claſs of plants. In the hermaphrodite the glume is two-valved, the corollæ from chaff numerous and briſtly; many ſtamina, one within each chaff; one piſtillum. The male is the hermaphrodite; there is no piſtillum.

CHRYSOBALANUS, COCOA PLUM: A genus of the monogynia order, belonging to the icoſandria claſs of plants; and in the natural method ranking under the 36th order, *Pomaceæ.* The calyx is quinquefid, the petals five; plum-kernel five furrowed and five-valved. There is only one ſpecies, the icaco, which is a native of the Bahama iſlands and many other parts of America, but commonly grows near the ſea. It riſes with a ſhrubby ſtalk eight or nine feet high, ſending out ſeveral ſide-branches, which are covered with a dark brown bark. The flowers are white, and are ſucceeded by plums like damſons; ſome blue, ſome red, and others yellow. The ſtone is ſhaped like a pear, and has five longitudinal furrows. The plums have a ſweet luſcious taſte, and are brought to the tables of the inhabitants, by whom they are much eſteemed.

CHRYSOCOMA, GOLDY-LOCKS: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ.* The receptacle is na-

naked; the pappus ſimple; the calyx hemiſpherical and imbricated; the ſtyle hardly longer than the florets. There are nine ſpecies, the moſt remarkable of which are, the linoſyris, the coma aurea, and the cornua. Theſe are herbaceous flowering perennials, growing from one to two feet high, ornamented with narrow leaves, and compound floſcular flowers of a yellow colour. They are eaſily propagated by dividing the roots or by cuttings; but the two laſt require to be ſheltered in the green-houſe in winter.

CHRYSOGONUM, in botany: A genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is paleaceous; the pappus monophyllous, and tridented; the calyx pentaphyllous; the ſeeds wrapped up each in a tetraphyllous calyculus, or little cup.

CHRYSOLARUS (Emanuel), one of thoſe learned men in the 14th century who brought the Greek literature into the weſt. He was a man of rank; and deſcended from an ancient family, ſaid to have removed with Conſtantine from Rome to Byzantium. He was ſent into Europe by the emperor of the eaſt to implore the aſſiſtance of the Chriſtian princes. He afterwards taught at Florence, Venice, Pavia, and Rome; and died at Conſtantinople, in 1415, aged 47. He wrote a Greek grammar, and ſome other ſmall pieces.

CHRYSOLITE, or YELLOWISH-GREEN TOPAZ; a precious ſtone of a graſs green colour, found in the Eaſt Indies, Brazil, Bohemia, Saxony, Spain, in Auvergne and Bourbon in France, and in Derbyſhire in England. Some are likewiſe found with volcanic lavas, as in the Vevarais, where ſome large lumps have been ſeen of 20 or 30 pounds weight; but it is remarkable, that ſome of theſe chryſolites are partly decompoſed into an argillaceous ſubſtance. All chryſolites, however, are far from being of the ſame kind. The oriental is the ſame with the peridot, and differs only by its green hue from the ſapphires, topazes, and rubies of the ſame denomination. This becomes electric by being rubbed; has a priſmatic form of ſix, or ſometimes of five ſtriated faces; and does not loſe its colour or tranſparency in the fire, which the common chryſolite often does; becoming either opaque, or melting entirely in a ſtrong heat. The inſtant it melts, it emits a phoſphoric light like the baſis of alum and gypſeous ſpar: with borax it produces a thin colourleſs glaſs. Its ſpecific gravity is between 3.600 and 3.700; according to Briſſon it is 2.7821, or 2.6923; and that of the Spaniſh chryſolite 3.0989.

The ſubſtance of this precious ſtone is lamellated in the direction of the axis of its primitive form: but the chryſolite from Saxony is foliated in a perpendicular direction to the ſame axis. The chryſolite of the ancients was the ſame gem which is now called *topaz*, and the name of itſelf indicates that it ought to be ſo. Pliny ſays that the colour of the chryſolite is yellow like gold.

CHRYSOLITE-*Paſte*, a kind of glaſs made in imitation of natural chryſolite, by mixing two ounces of prepared cryſtal with ten ounces of red-lead, adding 12 grains of crocus martis made with vinegar; and then baking the whole for 24 hours, or longer in a well luted cucurbit.

CHRYSOMELA, in zoology, a genus of inſects belonging to the order of coleoptera. The antennæ are ſhaped like bracelets, and thicker on the outſide; and neither the breaſt nor the elytra are marginated. There are no leſs than 122 ſpecies enumerated by Linnæus, principally diſtinguiſhed by differences in their colour. They are to be found almoſt every where, in woods, gardens, &c. Their progreſſive motion is ſlow; and ſome when caught emit an oily liquor of a diſagreeable ſmell. The glittering colours with which ſeveral ſpecies of Chryſomelæ are adorned, and which ſeem to exhibit the brilliancy of gold and copper, have occaſioned their bearing that pompous name. The larvæ of theſe inſects have in general an oval body, rather oblong and ſoft; on the fore-part of which are ſituated ſix feet, which are ſcaly, as is alſo the head. They prey upon the ſubſtance of leaves, rejecting the fibrous part. Thoſe of the leaping chryſomelæ infeſt the cotyledons and tender leaves of plants. Of this genus is that very pernicious inſect called by the country people the *turnip fly*, which infeſts turnips and many crops in the garden, deſtroying often whole fields while in their ſeedling leaves. In very hot ſummers they abound to an amazing degree, and, as you walk in a field or in a garden, make a pattering like rain, by jumping on the leaves of the turnips or cabbages. See Plate CXLIX.

CHRYSOPHYLLUM, or BULLY-TREE: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 43d order, viz. *Dumoſæ*. The corolla is campanulated, decemfid, with the ſegments alternately a little patent. The fruit is a ten-ſeeded berry. There are two ſpecies, the cainito and glabrum, both natives of the Weſt Indies. The firſt riſes 30 or 40 feet high, with a large trunk covered with a brown bark, and divides into many flexible ſlender branches, which generally hang downward, garniſhed with ſpear-ſhaped leaves, whoſe under ſides are of a bright ruſſet colour. The flowers come out at the extremities of the branches diſpoſed in oblong bunches, which are ſucceeded by fruit of the ſize of a golden pippin, that are very rough to the palate, and aſtringent; but when kept ſome time mellow, as is practiſed here with medlars, they have an agreeable flavour. The ſecond ſort never riſes to the height of the firſt, nor do the trunks grow to half the ſize; but the branches are ſlender and garniſhed with leaves like thoſe of the firſt. The flowers come out in cluſters from the ſide of the branches, which are ſucceeded by oval ſmooth fruit about the ſize of a bergamot pear. This contains a white clammy juice when freſh; but after being kept a few days, it becomes ſweet, ſoft, and delicious. Incloſed are four or five black ſeeds about the ſize of thoſe of a pomkin. Both theſe plants are frequently preſerved in gardens where there are large ſtoves, and are propagated by ſeeds, but the plants can never bear the open air in Britan.

CHRYSOPLENIUM, in botany: a genus of the digynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 12th order, *Succulentæ*. The calyx is quadrifid or quinquefid, and coloured; no corolla; the capſule biroſtrated, unilocular and polyſpermous.

CHRYSOPRASUS, or CHRYSOPRASIUS, the 10th of the precious ſtones mentioned in the Revelations, as forming

forming the foundation of the heavenly Jeruſalem. The chryſopraſius is by mineralogiſts reckoned to be a variety of the chryſolite, and by Cronſtedt called the *yellowiſh green and cloudy topaz*. He conjectures that it may perhaps be the ſubſtance which ſerves as a matrix to the chryſolite; as thoſe that he had ſeen were like the clear veined quartz, called in Sweden *milk cryſtal*, which is the firſt degree of cryſtallization.

The chryſopraſus, according to M. Magellan, is of a green colour, deeper than the chryſolite, but with a yellowiſh tinge inclining to blue like the green leek. M. Achard ſays that it is never found chryſtallized, and that it is ſemitranſparent. By others it is reckoned among the quartz, and its colour is ſuppoſed to be owing to the mixture of cobalt, as it gives a fine blue glaſs when melted with borax, or with fixed alkali. Mr Achard, however, found the glaſs of a deep yellow when the fuſion was made with borax; and that it really contains ſome calx of copper inſtead of cobalt. Mr Dutens ſays, that ſome gold has been found in this kind of ſtone: but this laſt belongs in all probablity, ſays M. Magellan, to another claſs of ſubſtances, viz. the vitreous ſpars.

To the latter belongs moſt probably the aventurine, whoſe colour is generally a yellow-brown red; though ſometimes it inclines more to the yellow, or greeniſh, than to the red. Theſe ſtones are not quite tranſparent: ſome indeed ſhine with ſuch a brilliancy, as to render them of conſiderable value, but they are very rare. The common aventurine is but an artificial glaſs of various colours with which powder of gold has been mixed; and theſe imitated aventurines ſo frequently excel the native ones in ſplendor, that the eſteem of the latter is now much lowered. With regard to the chryſopraſus, its name from πρασον, ſhows it to be of a greeniſh-blue colour, like the leaves of a leek; it only differs from the chryſolite in its bluiſh hue.

CHRYSOSTOM (St John), a celebrated patriarch of Conſtantinople, and one of the moſt admired fathers of the Chriſtian church, was born of a noble family at Antioch about the year 347. He ſtudied rhetoric under Libavius, and philoſophy under Andragathus: after which he ſpent ſome time in ſolitude in the mountains near Antioch; but the auſterities he endured having impaired his health, he returned to Antioch, where he was ordained deacon by Meletius. Flavian, Meletius's ſucceſſor, raiſed him to the office of preſbyter five years after; when he diſtinguiſhed himſelf ſo greatly by his eloquence, that he obtained the ſurname of *Golden mouth*. Nectarius patriarch of Conſtantinople, dying in 397, St Chryſoſtom, whoſe fame was ſpread throughout the whole empire, was choſen in his room by the unanimous conſent of both the clergy and the people. The emperor Arcadius confirmed this election, and cauſed him to leave Antioch privately, where the people were very unwilling to part with him. He was ordained biſhop on the 26th of February 398; when he obtained an order from the emperor againſt the Eunomians and Montaniſts; reformed the abuſes which ſubſiſted amongſt his clergy: retrenched a great part of the expences in which his predeceſſors had lived, in order to enable him to feed the poor and build hoſpitals; and preached with the utmoſt zeal againſt the pride, luxury, and avarice of the great. But his pious liberty of ſpeech procured him many powerful enemies. He differed with Theophilus of Alexandria, who got him depoſed and baniſhed; but he was ſoon recalled. After this, declaiming againſt the dedication of a ſtatue erected to the empreſs, ſhe baniſhed him into Cucuſus in Armenia, a moſt barren unhoſpitable place; afterwards, as they were removing him from Petyus, the ſoldiers treated him ſo roughly, that he died by the way, A. D. 407. The beſt edition of his works is that publiſhed at Paris in 1718, by Mountfaucon.

CHRYSTAL. See CRYSTAL.

CHUB, or CHUBB, in ichthyology. See CYPRINUS.

The reſorts of this fiſh are eaſily found; for they are generally holes, overſhaded by trees, and this fiſh will be ſeen floating in ſuch almoſt on the ſurface of the water in a hot day in great numbers. They are but a poor fiſh for the table, and are very full of bones; but they entertain the angler very much, and are of the number of thoſe that are eaſily taken. The beſt manner of fiſhing for him is thus: prepare a very ſtrong rod of a ſufficient length; fix to the hook a graſshopper; place yourſelf ſo as to be perfectly out of ſight of the fiſh, and drop in the bait about two feet from the place where a large chub lies; if he does not ſee the angler he very ſeldom fails biting, and is immediately taken; but he is ſo ſtrong a fiſh that he ſhould be taken out carefully, after a great deal of playing, otherwiſe the tackle will be in danger; a beetle, or any large fly, will anſwer the purpoſe in the place of a graſshopper; and if none of them are to be had, the method of fiſhing muſt be altered, and the line be long enough for fiſhing at the bottom. In March and April this fiſh is to be caught with large red worms; in June and July with flies, ſnails, and cherries; but in Auguſt and September the proper bait is good cheeſe pounded in a mortar, with ſome ſaffron, and a little butter; ſome make a paſte of cheeſe and Venice turpentine for the chub in winter, at which ſeaſon this fiſh is better than at any other; the bones are leſs troubleſome in this ſeaſon, and the fleſh is more firm and better taſted; the row is alſo well flavoured in general. The angler muſt keep this bait for this fiſh at the bottom in cold weather, and near the top in hot, and the fiſh will bite eagerly.

CHUBB (Thomas), a noted polemical writer, born at Eaſt Harnham, a village near Saliſbury, England, in 1679. He was put apprentice to a glover at Saliſbury, and afterwards entered into partnerſhip with a tallow-chandler. Being a man of ſtrong natural parts, he employed all his leiſure in reading; and though a ſtranger to the learned languages, became tolerably verſed in geography, mathematics, and other branches of ſcience. His favourite ſtudy was divinity; and he formed a little ſociety for the purpoſe of debating upon religious ſubjects, about the time that the Trinitarian controverſy was ſo warmly agitated between Clarke and Waterland. This ſubject, therefore, falling under the cognizance of Chubb's theological aſſembly, he at their requeſt drew up and arranged his ſentiments on it, in a kind of diſſertation; which was afterward publiſhed under the title of *The Supremacy of the Father aſſerted*, &c. In this piece Mr Chubb ſhowed great talents in reaſoning; and acquired ſo

much

much reputation, that the late Sir Joſeph Jekyl, maſter of the rolls, took him into his family to enjoy his converſation: but though he is ſaid to have been tempted to remain with him by the offer of a genteel allowance, he did not continue with him many years; but choſe to return to his friends at Saliſbury. He publiſhed afterwards a 4to volume of tracts, which Mr Pope informs his friend Gay, he "read through with admiration of the writer, though not always with approbation of his doctrine." He died a ſingle man in the 68th year of his age, and left behind him 2 vols. of poſthumous tracts, in which he appears to have had little or no belief in revelation. But however licentious his way of thinking may be deemed, nothing irregular or immoral has been fairly imputed to him in his life and actions.

CHUDLEIGH (Lady Mary), was born in 1656, and married to Sir George Chudleigh, baronet, by whom ſhe had ſeveral children: her poems and eſſays have been much admired for delicacy of ſtyle. She died in 1710; and is ſaid to have written ſeveral dramatic pieces, which, though not printed, are preſerved in the family.

CHUPMESSAHITES, a ſect among the Mahometans, who believe that Jeſus Chriſt is God, and the true Meſſiah, the Redeemer of the world; but without rendering him any public or declared worſhip. The word in the Turkiſh language ſignifies *protector of the Chriſtians.* Ricaut ſays, there are abundance of theſe Chupmeſſahites among the people of faſhion in Turkey, and ſome even in the ſeraglio.

CHURCH, has different ſignifications, according to the different ſubjects to which it is applied.

1. It is underſtood of the collective body of Chriſtians, or all thoſe over the face of the whole earth who profeſs to believe in Chriſt, and acknowledge him to be the Saviour of mankind. This is what the ancient writers call the *catholic* or *univerſal church.* Sometimes the word church is conſidered in a more extenſive ſenſe, and divided into ſeveral branches; as the church militant is the aſſembly of the faithful upon earth; the church triumphant, that of the faithful already in glory; to which the Papiſts add the church patient; which, according to their doctrines, is that of the faithful in purgatory.

2. Church is applied to any particular congregation of Chriſtians, who aſſociate together and concur in the participation of all the inſtitutions of Jeſus Chriſt, with their proper paſtors and miniſters. Thus we read of the church of Antioch, the church of Alexandria, the church of Theſſalonica, and the like.

3. Church denotes a particular ſect of Chriſtians diſtinguiſhed by particular doctrines and ceremonies. In this ſenſe we ſpeak of the Romiſh church, the Greek church, the Reformed church, the church of England, &c.

The Latin or Weſtern church, comprehends all the churches of Italy, France, Spain, Africa, the north, and all other countries whither the Romans carried their language. Great Britain, part of the Netherlands, of Germany, and of the North, have been ſeparated from hence ever ſince the time of Henry VIII.; and conſtitute what we call the Reformed church, and what the Romaniſts call the weſtern ſchiſm.

The Greek or Eaſtern church, comprehends the churches of all the countries anciently ſubject to the Greek or eaſtern empire, and through which their language was carried; that is, all the ſpace extended from Greece to Meſopotamia and Perſia, and thence into Egypt. This church has been divided from the Roman, ever ſince the time of the emperor Phocas.

The Gallican church, denotes the church of France, under the government and direction of their reſpective biſhops and paſtors. This church has always enjoyed certain franchiſes and immunities; not as grants from popes, but as derived to her from her firſt original, and which ſhe has taken care never to relinquiſh. Theſe liberties depend upon two maxims; the firſt, that the pope has no authority or right to command or order any thing either in general or in particular, in which the temporalities and civil rights of the kingdom are concerned; the ſecond, that notwithſtanding the pope's ſupremacy is owned in caſes purely ſpiritual, yet in France his power is limited and regulated by the decrees and canons of ancient councils received in that realm.

4. The word church is uſed to ſignify the body of eccleſiaſtics, or the clergy, in contradiſtinction to the laity. See CLERGY.

5. Church is uſed for the place where a particular congregation or ſociety of Chriſtians aſſemble for the celebration of divine ſervice. In this ſenſe churches are variouſly denominated, according to the rank, degree, diſcipline, &c. as Metropolitan church, Patriarchal church, Cathedral church, Parochial church, Collegiate church, &c. See METROPOLIS, PATRIARCH, &c.

In eccleſiaſtical writers, we meet with *grand church,* for the chief church of a place; particularly in the Greek lithurgy, for the church of St Sophia at Conſtantinople, the ſee of the patriarch, founded by Conſtantine, and conſecrated under Juſtinian. It was at that time ſo magnificent, that Juſtinian is ſaid to have cried out in the conſecration thereof, Ενικησα σε, Σολομον; *I have outdone thee, Solomon.* The dome, which is ſaid to have been the firſt that was built, is 330 feet diameter.

The firſt church publicly built by the Chriſtians, ſome authors maintain to be that of St Saviour at Rome, founded by Conſtantine; others contend, that ſeveral churches abroad, called by the name of *St Peter Vivus,* were built in honour of that apoſtle during his life-time.

CHURCH, with regard to architecture, Daviler defines a large oblong edifice, in form of a ſhip, with nave, choir, iſles, chapel, belfry, &c. See each part under its proper head.

CHURCH, ſimple, is that which has only a nave and a choir.

CHURCH with Iſles, that which has a row of porticos, in form of vaulted galleries, with chapels in its circumference.

CHURCH in a Greek croſs, that where the length of the traverſe part is equal to that of the nave; ſo called becauſe moſt of the Greek churches are built in this form.

CHURCH in a Latin croſs, that whoſe nave is longer than the croſs part, as in moſt of the Gothic churches.

CHURCH in Rotundo, that whoſe plan is a perfect circle, in imitation of the Pantheon.

For the form of the ancient Greek churches, when they had all their parts, it was as follows: firſt was a porch, or portico, called the *vaunt-nave*, ϖροναος: this was adorned with columns on the outſide, and on the inſide ſurrounded with a wall; in the middle whereof was a door, through which they paſſed into a ſecond portico. The firſt of theſe porticos was deſtined for *the energumeni*, and penitents in the firſt ſtage of their repentance; the ſecond was much longer, deſtined for penitents of the ſecond claſs, and the catechumens, and hence called ναρθης, *ferula*, becauſe thoſe placed in it began to be ſubject to the diſcipline of the church. Theſe two porticos took up about one-third of the ſpace of the church. From the ſecond portico, they paſſed into the nave, ναος, which took up near another third of the church. In the middle, or at one ſide of the nave, was the ambo, where the deacons and prieſts read the goſpel, and preached. The nave was deſtined for the reception of the people, who here aſſiſted at prayers.

Near the entrance of this was the baptiſtery or font. Beyond the nave was the choir, χορος, ſet with ſeats, and round: the firſt ſeat on the right, next the ſanctuary, being for the chantor, or *choragus*.

From the choir they aſcended by ſteps to the ſanctuary, which was entered at three doors. The ſanctuary had three apſides in its length; a great one in the middle under which was the altar, crowned with a baldachin, ſupported by four columns. Under each of the ſmall apſides, was a kind of table or cupboard, in manner of a beaufet.

Though, of the Greek churches now remaining, few have all the parts above deſcribed, moſt of them having been reduced to ruins or converted into moſques.

*High-*CHURCH was a denomination originally given to thoſe otherwiſe called *Non-jurors*, who refuſed to acknowledge the title of William III. to the crown of Great Britain, under a notion that James II. though excluded, was ſtill their rightful ſovereign. This appellation was given them, becauſe they entertained high notions of the dignity and power of the church, and the extent of its prerogative and juriſdiction. And thoſe, on the contrary, were called *low-church men*, who diſapproved of the ſeceſſion and obſtinacy of the non-jurors, diſtinguiſhed themſelves by their moderation toward diſſenters, and were leſs ardent in extending the limits of church authority. The denomination of *high-church men* is now more generally applied to all who form pompous and ambitious conceptions of the authority and juriſdiction of the church, and who would raiſe it to an abſolute independence on all human power.

CHURCH-*Ale*. See WHITSUN-*Ale*.

CHURCH-*Reeves*, the ſame with CHURCH-*Wardens*.

CHURCH-*Scot*, or *Churcheſſet*, a payment or contribution, by the Latin writers frequently called *primitiæ ſeminum*; being, at firſt, a certain meaſure of wheat, paid to the prieſt on St Martin's day, as the firſt fruits of harveſt. This was enjoined by the laws of king Malcom IV. and Canute, c. 10. But after this, *Church-ſcot* came to ſignify a reſerve of corn-rent paid to the ſecular prieſts, or to the religious; and ſometimes was taken in ſo general a ſenſe as to include poultry, or any other proviſion that was paid in kind to the religious. See TITHE.

CHURCH-*Wardens* (*eccleſiæ guardiani*), in the Engliſh eccleſiaſtical polity, are the guardians or keepers of the church, and repreſentatives of the body of the pariſh. They are ſometimes appointed by the miniſter, ſometimes by the pariſh, ſometimes by both together, as cuſtom directs. They are taken, in favour of the church, to be, for ſome purpoſes, a kind of corporation at the common law; that is, they are enabled, by that name, to have a property in goods and chattels, and to bring actions for them, for the uſe and profit of the pariſh. Yet they may not waſte the church goods, but may be removed by the pariſh, and then called to account by actions at common law: but there is no method of calling them to account but by firſt removing them; for none can legally do it but thoſe who are put in their place. As to lands or other real property, as the church, church-yard, &c. they have no ſort of intereſt therein; but if any damage is done thereto, the perſon only or vicar ſhall have the action. Their office alſo is to repair the church, and make rates and levies for that purpoſe: but theſe are recoverable only in the eccleſiaſtical courts. They are alſo joined with the overſeers in the care and maintenance of the poor. They are to levy a ſhilling forfeiture on all ſuch as do not repair to church on Sundays and holidays; and are empowered to keep all perſons orderly while there; to which end it has been held that a church-warden may juſtify the pulling off a man's hat, without being guilty of either an aſſault or a treſpaſs. There are alſo a multitude of other petty parochial powers committed to their charge by divers acts of parliament.

CHURCHILL (Sir Winſton), the father of the great duke of Marlborough, was deſcended from an ancient and honourable family in Dorſetſhire. He was born at Wotton Glanvile in that county in 1610; and educated at St John's college at Oxford. He engaged in the cauſe of his unfortunate ſovereign Cha. I. for which he ſuffered ſeverely in his fortune; and having married while young, Elizabeth, the daughter of Sir John Drake of Aſhe in Devonſhire, ſhe was forced to ſeek a refuge in her father's houſe, when Mr Churchill's misfortunes left him none that he could call his own; and there moſt of his children were born. After the reſtoration, he was elected a burgeſs to ſerve in parliament for the borough of Weymouth; and, in 1669, his majeſty was pleaſed to confer on him the honour of knighthood. The next year he was made one of the commiſſioners of claims in Ireland; and upon his return from thence, was conſtituted one of the clerks comptrollers of the green-cloth: but writing a kind of political eſſay upon the Hiſtory of England, which gave great offence to the parliament, he was, in 1678, diſmiſſed from his poſt. He was, however, ſoon reſtored to it again; and lived to ſee his eldeſt ſurviving ſon raiſed to the peerage, and the reſt of his children in a fair way to promotion. He died in 1688.

CHURCHILL (John) Duke of Marlborough, and prince of the holy Roman empire, a moſt renowned general and ſtateſman, was born at Aſhe in Devonſhire in 1650. He was eldeſt ſon of Sir Winſton Churchill, who carried him to court while very young, and where he was particularly favoured by James duke of York, afterwards king James II. when only twelve years of age. In 1666, he was made an enſign of the guards during the firſt Dutch war; and afterwards improved himſelf greatly in the military art at Tangier. In 1672, Mr Churchill attended the duke of Monmouth who commanded a body of auxiliaries in the French ſervice, and was ſoon after made a captain in the duke's own regiment. At the ſiege of Nimeguen, which happened in that campaign, he diſtinguiſhed himſelf ſo much that he was taken notice of by the celebrated marſhal Turenne, who beſtowed on him the name of the *handſome Engliſhman*.—In 1673 he was at the ſiege of Maeſtricht, where he gained ſuch applauſe, that the king of France made him a public acknowledgment of his ſervice; and the duke of Monmouth, who had the direction of the attack, told king Charles II. that he owed his life to Mr Churchill's bravery. In 1681, he married Sarah daughter and co-heireſs (with her ſiſter the counteſs of Tyrconnel) of Richard Jenning , Eſq; of Sandrich, in Hertfordſhire. The duke of York recommended him in a very particular manner to the king: who, in 1682, created him baron of Eymouth in the county of Berwick in Scotland, and made him colonel of the third troop of guards. A little after king James's acceſſion, he was created baron Churchill of Sandrich in the county of Hertford, and made brigadier-general of his majeſty's army in the weſt; where, when the duke of Monmouth came to ſurpriſe the king's army, while the earl of Feverſham and the majority of the officers were in their beds, he kept the enemy in play till the king's forces had formed themſelves, and thereby ſaved the whole army. When James ſhowed an intention of eſtabliſhing the catholic religion in Britain, lord Churchill, notwithſtanding the great obligations he owed him, thought it his duty to abandon the royal cauſe; but even then did not leave him without acquainting him by letter with the reaſon of his ſo doing. Lord Churchill was graciouſly received by the prince of Orange; and was by him employed firſt to re-aſſemble the troop of guards at London, and afterwards to reduce ſome lately raiſed regiments, and to new-model the army; for which purpoſe he was inveſted with the rank and title of lieutenant-general. In 1689, he was ſworn one of the privy council, and one of the gentlemen of the king's bed-chamber; and on the 9th of April following, was raiſed to the dignity of earl of Marlborough in the county of Wilts. He aſſiſted at the coronation of their majeſties; and was ſoon after made commander in chief of the Engliſh forces ſent over to Holland; and here he firſt laid the foundation of that fame which was afterwards ſpread over all Europe. In 1690, he was made general of the forces ſent to Ireland: where he made the ſtrong garriſons of Cork and Kinſale priſoners of war. The year following, king William ſhowed the good opinion he had of his conduct, by ſending him to Flanders to put all things in readineſs, and to draw the army together againſt his arrival. In 1692, he was diſmiſſed from all his employments: and, not long after, was with ſome other peers committed to the tower on an accuſation of high treaſon; which, however, was afterwards found to be a falſe and malicious report, the authors of which were puniſhed. Marlborough was ſoon reſtored to favour, and in 1698 was appointed governor to the earl of Glouceſter; with this extraordinary compliment from king William, "My lord, make him but what you are, and my nephew will be all I wiſh to ſee him." The ſame day he was again ſworn one of the privy council; and in July following was declared one of the lord juſtices of England, for the adminiſtration of the government, in which great truſt he was three times ſucceſſively in the king's abſence. In 1701 he was appointed general of the foot, commander in chief of the Engliſh forces, and ambaſſador extraordinary and plenipotentiary at the Hague. Upon the acceſſion of queen Anne to the throne, he was elected into the order of the garter, declared captain-general of all her majeſty's forces, and ſent ambaſſador extraordinary and plenipotentiary to Holland. After ſeveral conferences about a war, he put himſelf at the head of the army, where all the other generals had orders to obey him. His exploits in the field have been taken notice of under the article BRITAIN, n° 349—370: we ſhall therefore only take notice in this place, of the rewards and honours conferred upon him for theſe exploits. After this firſt campaign he was created marquis of Blandford and duke of Marlborough, with a penſion of L. 5000 out of the poſt-office, to devolve for ever upon thoſe enjoying the title of Duke of Marlborough. In 1703, he met Charles III. late emperor, going to Spain, who preſented him with a ſword ſet with diamonds. In 1704, having forced the enemy's lines at Schellenberg, he received a letter of thanks from the emperor Leopold, written with his own hand; an honour ſeldom done to any but ſovereign princes. After the battle of Blenheim, he received congratulatory letters from moſt of the potentates in Europe, particularly from the States General, and from the emperor, who deſired him to accept of the dignity of a prince of the empire, which with the queen's leave was conferred upon him by the title of *Prince of Mildenheim in the province of Swabia*. After the campaign was ended, he viſited the court of Pruſſia, where he laid ſuch ſchemes as ſuſpended the diſputes with the Dutch about king William's eſtate; which wiſe conduct cauſed the whole confederacy to acknowledge that he had done the greateſt ſervice poſſible to the common cauſe. Upon his return to England, the queen, to perpetuate his memory, granted the intereſt of the crown in the honour and manor of Woodſtock and hundred of Wotton to him and his heirs for ever. In 1705 he made a tour to Vienna, upon an invitation of the emperor Joſeph; who highly careſſed him, and made him a grant of the lordſhip of Mildenheim. After the campaign of 1708, the ſpeaker of the houſe of commons was ſent to Bruſſels on purpoſe to compliment him; and on his return to England he was again complimented in the houſe of lords by lord chancellor Cowper. All his ſervices, however, and all the honours conferred upon him, were not ſufficient to preſerve him from being diſgraced. After the change of the miniſtry in 1710, his intereſt daily declined; and in 1712, on the firſt day of the new year, he was removed from all his places. Finding all arts uſed to render him obnoxious in his native country, he viſited his principality of Mildenheim, and ſeveral towns in Germany; after which he returned to England, and arrived there on the day of the queen's death. After being welcomed by the nobility and foreign miniſters, he attended on king George I. in his public entry through London, who appointed him captain-general, colonel of the firſt regiment of foot-guards, one of the commiſſioners for the government of Chelſea hoſpital, and maſter-general of the ordnance. Some years before his death, he retired from public buſineſs. He died at Windſor-lodge in 1722, aged 73; leaving behind him a very numerous poſterity, allied to the nobleſt and greateſt families in the three kingdoms. Upon his demiſe all parties united in doing honour or rather juſtice to his merit, and his corpſe was interred the 9th of Auguſt following, with all the ſolemnity due to a perſon who had deſerved ſo highly of his country, in Weſtminſter-abbey. The noble pile near Woodſtock, which bears the name of Blenheim-houſe, may be juſtly ſtyled his monument; but without pretending to the gift of prophecy, one may venture to foretel, that his glory will long ſurvive that ſtructure; and that ſo long as Britiſh hiſtories remain, or indeed the hiſtories of Europe, his memory will live and be the boaſt of Britain, which by his labours was raiſed to be the firſt of nations, as during the age in which he lived he was deſervedly eſteemed the firſt of men. If he had foibles, as theſe are inſeparable from human nature, they were ſo hidden by the glare of his virtues as to be ſcarcely perceived or were willingly forgotten. A certain paraſite, who thought to pleaſe Lord Bolingbroke by ridiculing the avarice of the Duke, was ſtopt ſhort by his Lordſhip; who ſaid, "He was ſo very great a man, that I forget he had that vice."

Out of a variety of anecdotes and teſtimonies concerning this illuſtrious perſonage, collected in the new edition of the *Biographia Britannica*, the following ſelection may ſerve to illuſtrate more particularly his diſpoſition and manners.

One of the firſt things which he did, when very young, was to purchaſe a box to put his money in; an indication this of the economical, not to ſay avaricious, temper that accompanied him through life. Dr Joſeph Warton relates, that, on the evening of an important battle, the duke was heard to chide his ſervant for having been ſo extravagant as to light four candles in his tent when Prince Eugene came to confer with him. Mr Tyers, on the other hand, mentioned a circumſtance which, if well founded, redounds to his grace's generoſity, though in a different reſpect it is much to his diſcredit: It is, that during the rebellion 1715 he ſent L 10,000 to the earl of Mar. We conſider the ſtory as only a traditional report, which has not in itſelf any great degree of probability; and therefore we are by no means convinced of its truth. The late Mr Richardſon junior, the painter, hath recorded a pleaſing inſtance of the duke's calmneſs of diſpoſition; for which, indeed, he was always remarkable. "The duke of Marlborough (ſays the writer), riding out once with Commiſſary Marriot, near the commiſſary's houſe in the country, it began to rain, and the duke called for his cloak; Marriot having his put on by his ſervant immediately. The duke's ſervant not bringing the cloak, he called for it again; but the man was ſtill puzzling about the ſtraps and buckles. At laſt, it raining now very hard, the duke called again, and aſked him, 'what he was about that he did not bring his cloak?' 'You muſt ſtay (grumbles the fellow), if it rains cats and dogs, till I can get at it.' The duke only turned to Marriot, and ſaid, 'I would not be of that fellow's temper." The duke of Marlborough (adds Mr Richardſon) did by nature and conſtitution, what Seneca judged by philoſophy ought to be done. *Quid eſt quare ego ſervi mei hilarius reſponſum, et contumaciorem vultum, flagellis et compedibus expiem?*

Dr Swift, in one of his letters to Stella, relates the following particulars concerning the duke of Marlborough. "I was early this morning with ſecretary St John, and gave him a memorial to get the queen's letter for the firſt-fruits, who has promiſed to do it in a very few days. He told me 'he had been with the duke of Marlborough, who was lamenting his former wrong ſteps in joining with the Whigs, and ſaid he was worn out with age, fatigue, and misfortunes.' I ſwear it pitied me; and I really think they will not do well in too much mortifying that man, although indeed it is his own fault. He is covetous as hell, and ambitious as the prince of it: he would fain have been general for life, and has broken all endeavours for peace, to keep his greatneſs, and get money. He told the queen 'he was neither covetous nor ambitious.' She ſaid, 'if ſhe could have conveniently turned about, ſhe ſhould have laughed, and could hardly forbear it in his face.' He fell in with all the abominable meaſures of the late miniſtry, becauſe they gratified him for their own deſigns. Yet he has been a ſucceſsful general, and I hope he will continue his command."

Various characters have been drawn of the duke of Marlborough; moſt of which we ſhall omit, as either already ſufficiently known, or as not meriting particular notice. That which is given of him by Dr Swift, in his "Hiſtory of the four laſt years of the queen," has all the malignity and meanneſs of a party pamphlet. It is even ſo fooliſh as to inſinuate, that the duke's military accompliſhments were problematical, and that he was deſtitute of perſonal courage. Mr Macpherſon's character of his grace is very elaborately compoſed, and diſplays no ſmall degree of ability and penetration; though it is not, perhaps, entirely free from prejudice. The hiſtorian conſiders it as a fact, that lord Churchill, at the time of the Revolution, had a deſign of placing his unfortunate maſter king James II. a priſoner in the hands of his rival the prince of Orange. But this ſtory muſt be regarded as wholly unworthy of credit. It is founded upon ſuggeſtions and informations ſo groundleſs, and even ridiculous, that it cannot deſerve a formal refutation. On the other hand, Mr Macpherſon has done juſtice to the duke of Marlborough's proſecution of the war in Flanders, and hath ſhown that he conducted it upon the principles of ſound wiſdom and good policy.

There are two teſtimonies to the honour of the duke's memory, by two celebrated noble writers, which cannot be paſſed over. One is by lord Bolingbroke, in his letters on the Study and Uſe of Hiſtory. Speaking of the conſternation raiſed among the allies of the grand confederacy by the death of king William, and of the joy which that event gave to the French, his lordſhip obſerves, that "a ſhort time ſhowed how vain the fears of ſome and the hopes of others were. By his death, the duke of Marlborough was raiſed to the head of the army, and indeed of the con-

confederacy: where he, a new, a private man, a ſubject, acquired, by merit and by management, a more decided influence than high birth, confirmed authority, and even the crown of Great Britain, had given to king William. Not only all the parts of that vaſt machine, the grand alliance, were kept more compact and entire, but a more rapid and vigorous motion was given to the whole: and, inſtead of languiſhing out diſaſtrous campaigns, we ſaw every ſcene of the war full of action. All thoſe wherein he appeared, and many of thoſe wherein he was not then an actor, but abbettor however of their action, were crowned with the moſt triumphant ſucceſs. I take, with pleaſure, this opportunity in doing juſtice to that great man, whoſe faults I knew, whoſe virtues I admired; and whoſe memory, as the greateſt general, and as the greateſt miniſter, that our country, or perhaps any other, has produced, I honour."

The other teſtimony to the duke's accompliſhments is by the earl of Cheſterfield, in his Letters to his Son, "Of all the men (ſays his lordſhip) that ever I knew in my life (and I knew him extremely well), the late duke of Marlborough poſſeſſed the graces in the higheſt degree, not to ſay engroſſed them: and indeed he got the moſt by them; for I will venture (contrary to the cuſtom of profound hiſtorians, who always aſſign deep cauſes for great events) to aſcribe the better half of the duke of Marlborough's greatneſs and riches to thoſe graces. He was eminently illiterate: wrote bad Engliſh, and ſpelled it ſtill worſe. He had no ſhare of what is commonly called *parts*; that is, he had no brightneſs, nothing ſhining in his genius. He had, moſt undoubtedly, an excellent good plain underſtanding, with ſound judgment. But theſe alone would probably have raiſed him but ſomething higher than they found him; which was page to king James II.'s queen. There the graces protected and promoted him: for while he was an enſign of the guards, the ducheſs of Cleveland, then favourite miſtreſs to king Charles II. ſtruck by thoſe very graces, gave him L.5000; with which he immediately bought an annuity for his life of L.500 a-year, of my grandfather Halifax; which was the foundation of his ſubſequent fortune. His figure was beautiful; but his manner was irreſiſtable, by either man or woman. It was by this engaging graceful manner that he was enabled, during all his war, to connect the various jarring powers of the grand alliance, and to carry them on to the main object of the war, notwithſtanding their private and ſeparate views, jealouſies, and wrongheadedneſſes. Whatever court he went to (and he was often obliged to go himſelf to ſome teſty and refractory ones), he as conſtantly prevailed, and brought them into his meaſures. The penſionary Heinſius, a venerable old miniſter, grown grey in buſineſs, and who had governed the republic of the United Provinces for more than 40 years, was abſolutely governed by the duke of Marlborough, as that republic feels to this day. He was always cool, and nobody ever obſerved the leaſt variation in his countenance: he could refuſe more gracefully than other people could grant; and thoſe who went away from him the moſt diſſatiſfied as to the ſubſtance of their buſineſs, were yet perſonally charmed with him, and in ſome degree comforted by his manner. With all his gentleneſs and gracefulneſs, no man living was more conſcious of his ſituation, nor maintained his dignity better."

A peruſal of the above paſſage will convince us of the frivolous turn of the earl of Cheſterfield's mind. His lordſhip, in his zeal to exalt the duke of Marlborough's external accompliſhments, either forgets or depreciates the far greater talents of which he was poſſeſſed. There is an obſervation upon the ſubject in the Britiſh Biography, with which we entirely concur. "That the duke of Marlborough (ſays the writer) was eminently diſtinguiſhed by the gracefulneſs of his manners, cannot be queſtioned: but the earl of Cheſterfield appears to have attributed too much to their influence, when he aſcribes—the better half of the duke of Marlborough's greatneſs and riches to thoſe graces. That the uncommon gracefulneſs of his manners facilitated his advancement, and contributed to the ſucceſs of his negociations, may readily be admitted; but ſurely it muſt have been to much higher qualities that he owed the eſteem of king William and of prince Eugene, his reputation throughout all Europe, and his many victories and conqueſts. It was not by a polite exterior that he obtained his laurels at Schellenberg, at Oudenarde, at Ramillies, and at Blenheim."

How much the duke of Marlborough has been celebrated by our poets, is well known by Addiſon's "Campaign," and Philips "Blenheim." Mr Addiſon, in his Roſamond, has properly aſſumed another and voluntary occaſion of paying a fine compliment to his grace's military expoits, and the glory by which they would be followed. Upon the duke's removal from his places, an ode was inſcribed to him by Mr Somerville, animated with all the zeal of whiggiſh enthuſiaſm, and containing ſome paſſages that are truly poetical. Another ode, not much inferior in ſpirit, was addreſſed to his grace, on occaſion of his embarking for Oſtend in the year 1712.

The duke of Marlborough's Scots title of Baron Eymouth, being to heirs-male, died with himſelf; but his Engliſh title going to his daughters and their heirs-male went into the Spencer family, who retain their own ſurname of Spencer.

Churchill (Charles), a celebrated ſatiriſt, the ſon of Mr Charles Churchill curate and lecturer of St John's, Weſtminſter, was educated at Weſtminſter ſchool, and received ſome applauſe for his abilities from his tutors in that famous ſeminary. His capacity, however, was greater than his application, ſo that he acquired the character of a boy that could do good if he would. As the ſlighteſt accounts of perſons ſo noted are agreeable, it may not be amiſs to obſerve, that having one day got an exerciſe to make, and from idleneſs or inattention having failed to bring it at the time appointed, his maſter thought proper to chaſtiſe him with ſome ſeverity, and even reproached his ſtupidity; what the fear of ſtripes could not effect, the fear of ſhame ſoon produced, and he brought his exerciſe the next day, finiſhed in ſuch a manner, that he received the public thanks of all the maſters. Still, however, his progreſs in the learned languages was but ſlow; nor is it to be wondered at, if we conſider how difficult it was for a ſtrong imagination, ſuch as he was poſſeſſed of, to conform and walk tamely forward in the trammels of a ſchool education: minds like his are ever ſtarting aſide after new purſuits; deſirous of embracing a multiplicity of amuſing objects; eager to come at the end, without the painful inveſtigation of the means. In ſhort, for want of proper ſkill in theſe languages, he was rejected from Oxford, whither his father had ſent him; and probably this might have given occaſion to the frequent invectives we find in his works againſt that moſt reſpectable univerſity. Upon his return from thence, he again applied to his ſtudies in Weſtminſter ſchool, where, at 17 years of age, he contracted an intimacy with a lady, to whom he was married, and their mutual regard for each other continued for ſeveral years. At the uſual age of going into orders, Mr Churchill was ordained by the late biſhop of London, and obtained a ſmall curacy in Wales of L.30 a-year. Thither he carried his wife: they took a ſmall houſe; and he paſſed through the duties of his ſtation with aſſiduity and cheerfulneſs. Happy had it been for him had he continued there to enjoy the fruits of piety, peace, and ſimplicity of manners. He was beloved and eſteemed by his pariſhioners; and though his ſermons were rather above the level of his audience, they were commended and followed. But endeavouring to advance his fortune, by keeping a cyder cellar, it involved him in difficulties which obliged him to leave Wales and come to London. His father dying ſoon after, he ſtepped into the church in which he had officiated; and, in order to improve his income, which ſcarcely produced L.100 a year, he taught young ladies to read and write Engliſh at a boarding ſchool, kept by Mrs Dennis, where he behaved with that decency and decorum which became his profeſſion. His method of living, however, bearing no proportion to his income, he contracted ſeveral debts in the city; which being unable to pay, a jail, the terror of indigent genius, ſeemed ready to complete his misfortunes: but from this ſtate of wretchedneſs he was relieved by the benevolence of Mr Lloyd, father to the poet of that name. Mean while, Mr Lloyd, the ſon, wrote a poetical epiſtle called the *Actor*; which being read and approved by the public, gave the author a diſtinguiſhed place among the writers of his age. This induced Mr Churchill to write the *Roſciad*. It firſt came out without the author's name; but the juſtneſs of the remarks, and the ſeverity of the ſatire, ſoon excited public curioſity. Though he never diſowned his having written this piece, and even openly gloried in it; yet the public, unwilling to give ſo much merit to one alone, aſcribed it to a combination of wits: nor were Meſſrs Lloyd, Thornton, or Colman, left unnamed upon this occaſion. This miſplaced praiſe ſoon induced Mr Churchill to throw off the maſk, and the ſecond edition appeared with his name at full length. As the Roſciad was the firſt of this poet's performances, ſo many are of opinion that it is the beſt. In it we find a very cloſe and minute diſcuſſion of the particular merit of each performer; their defects pointed out with candour, and their merits praiſed without adulation. This poem, however, ſeems to be one of thoſe few works which are injured by ſucceeding editions: when he became popular, his judgment, began to grow drunk with applauſe; and we find, in the latter editions, men blamed whoſe merit is inconteſtable, and others praiſed that were at that time in no degree of eſteem with the judicious. His next performance was his *Apology to the Critical Reviewers*. This work is not without its peculiar merit; and as it was written againſt a ſet of critics whom the world was willing enough to blame, the public read it with their uſual indulgence. In this performance he ſhowed a particular happineſs of throwing his thoughts, if we may ſo expreſs it, into poetical paragraphs; ſo that the ſentence ſwells to the break or concluſion, as we find in proſe.

But while his writings amuſed the town, his actions diſguſted it. He now quitted his wife, with whom he had cohabited many years; and reſigning his gown and all clerical functions, commenced a complete *man of the town*, got drunk, frequented ſtews; and, giddy with falſe praiſe, thought his talents a ſufficient atonement for all his follies. In ſome meaſure to palliate the abſurdities of his conduct, he now undertook a poem called *Night*, written upon a general ſubject indeed, but upon falſe principles; namely, that whatever our follies are, we ſhould never attempt to conceal them. This, and Mr Churchill's other poems, being ſhown to Dr Johnſon, and his opinion being aſked, he allowed them but little merit; which being told to the author, he reſolved to requite this private opinion with a public one. In his next poem, therefore, of the *Ghoſt*, he has drawn this gentleman under the character of Pompoſo; and thoſe who diſliked Mr Johnſon allowed it to have merit. Mr Johnſon's only reply to Churchill's abuſe was, "that he thought him a ſhallow fellow in the beginning, and could ſay nothing worſe of him ſtill." The poems of Night and the Ghoſt had not the rapid ſale the author expected; but his *Prophecy of Famine* ſoon made ample amends for the late paroxyſm in his fame. In this piece, written in the ſpirit of the famous North Briton, he exerted his virulent pen againſt the whole Scotch nation; adopting the prejudices of the mob, and dignifying ſcurrility by the aid of a poetic imagination. It had a rapid and extenſive ſale, as propheſied by Mr Wilkes; who ſaid, before its publication, that he was ſure it muſt take, as it was at once perſonal, poetical, and political. After its appearance, it was even aſſerted by his admirers, that Mr Churchill was a better Poet than Pope. This exaggerated adulation, as it had before corrupted his morals, began now to impair his mind: ſeveral ſucceeding pieces were publiſhed, which, being written without effort, are read without pleaſure. His *Gotham*, *Independence*, *The Times*, ſeem merely to have been written by a man who deſired to avail himſelf of the avidity of the public curioſity in his favour, and are rather aimed at the pockets than the hearts of his readers.—Mr Churchill died in 1764, of a miliary fever, with which he was ſeized at Boulogne in France, whither he had gone on a viſit to Mr Wilkes. After his death his poems were collected and printed together in two volumes 8vo.

CHURCHING OF WOMEN AFTER CHILD-BIRTH, took its riſe from the Jewiſh rite of purification. In the Greek church it was limited to the fortieth day after delivery; but in the weſtern parts of Europe no certain time is obſerved. There is an office in the liturgy for this purpoſe.

CHURCHYARD, a piece of ground adjoining to a church, ſet apart for interment or burial of the dead.—In the church of Rome they are bleſſed or conſecrated with great ſolemnity. If a churchyard, which has been thus conſecrated, ſhall afterwards be polluted by any indecent action, or profaned by the burial of an infidel, an heretic, an excommunicated or unbaptized perſon, it muſt be *reconciled;* and the ceremony of the reconciliation is performed with the ſame ſolemnity as that of the bleſſing or conſecration.

Churchyard (Thomas), a poet who flouriſhed in the reigns of Henry VIII. Edward VI. queen Mary and queen Elizabeth, was born at Shrewſbury; and inherited a fortune, which he ſoon exhauſted in a fruitleſs attendance on the court, by which he only gained the favour of being retained a domeſtic, in the family of lord Surrey; when, by his lordſhip's encouragement, he commenced poet. Upon his patron's death, he betook himſelf to arms; was in many engagements; was frequently wounded, and was twice made priſoner. He publiſhed 12 pieces, which he afterwards printed together in one volume, under the title of *Churchyard's Chips;* and alſo the tragedy of Thomas Moubray duke of Norfolk. He died in 1570.

CHURLE, Ceorle, or Carl, in the Saxon times, ſignified a tenant at will, who held of the thanes on condition of rent and ſervice. They were of two ſorts: one rented the eſtate like our farmers; the other tilled and manured the demeſnes, and were called ploughmen. See Ceorle.

CHURNING, in country affairs, the operation of making butter by agitating milk in a well known veſſel called a churn. For accelerating this operation, a correſpondent in the Bath Society Papers recommends a little diſtilled vinegar to be poured into the churn; and the butter will be produced in an hour afterwards. He acknowledges, however, that his experiments have not as yet aſcertained the exact quantity of the acid which is neceſſary to the proper effect, nor the preciſe time of its being mixed with the cream. But he apprehends a table ſpoonful or two to a gallon of cream will be ſufficient; nor would he recommend it to be applied till the cream has undergone ſome conſiderable agitation. His firſt trial was after the churning had been going forward half a day: whether he obſerved the ſame rule afterwards, he does not ſay; but all his trials proved ſucceſsful, the butter being uniformly obtained in about an hour after the mixture.

CHUS, or *Chuſch,* (Bible.) It is a tradition of an ancient ſtanding, that the *Chus* of the Scriptures denotes *Ethiopia,* and *Chuſchi* an *Ethiopian:* the Septuagint and Vulgate conſtantly tranſlate it ſo; and in this they are followed by moſt interpreters, and by Joſephus and Jerome. And yet what Bochart urges to the contrary is of no inconſiderable weight; from Ezekiel xxix. 10. in which the two oppoſite extremes of Egypt are deſigned; and therefore *Chus,* which is oppoſite to Syene, muſt be Arabia: but this is more ſtrongly pointed out by Xenophon, by whom Ethiopia is ſaid to be the ſouth boundary of Cyrus's empire; and Herodotus diſtinguiſhes between the Ethiopians of Aſia and Africa, conjoining the former with the Arabians.

CHYLE, in the animal economy, a milky fluid ſecreted from the aliments by means of digeſtion. See Anatomy, p. 734, 735.

CHYLIFICATION, the formation of the chyle, or the act whereby the food is changed into chyle.

The chyle has by ſome authors been thought to have a great reſemblance in its nature and chemical analyſis to milk. The ſubject, however, hath as yet been but little inquired into. See the article Milk.

CHYME, or chymus, in the common ſignification of the word, denotes every kind of humour which is incraſſated by concoction; under which notion it comprehends all the humours fit or unfit for preſerving and nouriſhing the body, whether good or bad. It frequently imports the fineſt part of the chyle, when ſeparated from the fæces, and contained in the lacteal and thoracic duct.

CHYMISTRY. See Chemistry.

CHYMOLOGI, an appellation given to ſuch naturaliſts as have employed their time in inveſtigating the properties of plants from their taſte and ſmell.

CHYMOSIS, in medicine, the act of making or preparing chyme. The word comes from χυμος, *ſuccus,* of χεω, *fundo,* "I melt." Chymoſis, according to ſome, is the ſecond of the concoctions made in the body; being a repeated preparation of the moſt impure and groſs parts of the chyle, which being rejected by the lacteals, is imbibed by the meſeraics, and thence carried to the liver, to be there elaborated, purified, and ſubtilized afreſh. It is of this, according to Rogers, that the animal ſpirits are formed.

Chymosis is alſo a diſtortion of the eye-lids, ariſing from an inflammation; alſo an inflammation of the tunica cornea in the eye.

CHYTLA, in antiquity, a liquor made of wine and oil, and ſometimes uſed in divination.

CHYTRI, among the Athenians, a feſtival in honour of Bacchus and Mercury, kept on the 13th of the month Antheſterion.

CHYTRIUM (anc. geog.) a place in Ionia, in which formerly ſtood Clazomene; the Clazomenians through fear of the Perſians, removing from the continent to an adjacent iſland (Pauſanias). Alexander reduced the iſland, by a mole or cauſeway, to a peninſula.

CHYTRUS (anc. geog.), an inland town of Cyprus, to the north of Citium: famous for its excellent honey.

CIANUS Sinus, (anc. geog.), a bay of Bithynia, named from the town and river Cius.

CIBALÆ, or Cibalis, (anc. geog.), a town of Pannonia Inferior, on an eminence, near the lake Hiulka, to the north-weſt of Sirmium; the country of the emperor Gratian, where he was brought up to rope-making: a place rendered famous for the ſurpriſal and defeat of Licinius by Conſtantine.

CIBBER (Colley), a celebrated comedian, dramatic writer, and poet laureat to the king, was born at London in 1671. His father Caius Gabriel Cibber, was a native of Holſtein, and a ſkilful ſtatuary, who executed the baſſo relievo on the pedeſtal of the monument, and the two admired figures of lunatics over the piers of the gate to Bethlem Hoſpital in Moorfields. Colley, who derived his Chriſtian name from the ſurname of his mother's family, was intended for the church, but betook himſelf to the ſtage, for which he conceived an early inclination; and he was ſome time before he acquired any degree of notice, or even a competent ſalary. His firſt eſſay in writing, was the comedy of *Love's laſt Shift*, acted in 1695, which met with ſucceſs: as did his own performance of the character of the fop in it. From that time, as he ſays himſelf, "My muſe and my ſpouſe were ſo equally prolific, that the one was ſeldom the mother of a child, but in the ſame year the other made me the father of a play. I think we had a dozen of each ſort between us; of both which kinds ſome died in their infancy, and near an equal number of each were alive when we quitted the theatre." The *Careleſs Huſband*, acted in 1704, met with great applauſe, and is reckoned his beſt play; but none was of more importance to him than the *Non-juror*, acted in 1718, and levelled againſt the Jacobites. This laid the foundation of the miſunderſtanding between him and Mr Pope, raiſed him to be the hero of the Dunciad, and made him poet laureat in 1730. He then quitted the ſtage, except a few occaſional performances; and died in 1757. Cibber neither ſucceeded in acting nor in writing tragedy; and his odes were not thought to partake of the genius or ſpirit he ſhowed in his comedies.

His ſon *Theophilus*, alſo a comic actor after him, was born during a great ſtorm in 1703; and after paſſing a life of extravagance, diſtreſs, and perplexity, periſhed in another ſtorm in 1758, in the paſſage between Dublin and England. Theophilus married the ſiſter of Thomas Auguſtin Arne, the famous muſical compoſer; who became a celebrated tragic actreſs, and whoſe honour was ſacrificed to her huſband's extravagance.

CIBDELOPLACIA, in natural hiſtory; a genus of ſpars debaſed by a very large admixture of earth; they are opaque, formed of thin cruſts, covering vegetables and other bodies, by way of incruſtrations.

Of this genus we have the following ſpecies: 1. A greyiſh-white one, with a rough ſurface. 2. A whitiſh brown one: both theſe are friable. 3. A hard, pale-brown kind, which is the oſteocolla of the ſhops. 4. The whitiſh grey kind, with a ſmooth ſurface: this is the unicornu foſſile and ceratites of authors 5. The whitiſh brown corralloide kind.

CIBDELOSTRACIA, in natural hiſtory, terrene ſpars, deſtitute of all brightneſs and tranſparence, formed into thin plates, and uſually found coating over the ſides of fiſſures, and other cavities of ſtones, with congeries of them of great extent, and of plain or botroyide ſurfaces.

Of theſe there are uſually reckoned ſeven kinds: the firſt is the hard, browniſh-white cibdeloſtracium, found in Germany: the ſecond is the hard, whitiſh cibdeloſtracium, with thin cruſts, and a ſmother ſurface, found alſo in the Harts-foreſts in Germany: the third is the hard, pale-brown cibdeloſtracium, with numerous very thin cruſts, found in ſubterranean caverns in many parts of England as well as Germany: the fourth is the white, light, and friable cibdeloſtracium, found alſo in Germany, but very rarely in any part of England: the fifth is the light, hard, pale-brown cibdeloſtracium, with a ſmooth ſurface, found in almoſt all parts of the world: the ſixth is the whitiſh, friable cruſtaceous cibdeloſtracium, with a rougher ſurface, frequent in Germany and England; and the ſeventh is the browniſh-white friable cibdeloſtracium, with a duſty ſurface, found in ſeveral parts of Ireland, as well as Germany.

CIBORIA, in antiquity, the large huſk of Egyptian beans, which are ſaid to have been ſo large as to ſerve for drinking cups; whence they had their name *ciborium*, ſignifying a cup, in the Egyptian language.

CIBORIUM, in eccleſiaſtical writers, the covering for the altar. This covering is ſupported by four high columns, and forms a kind of tent for the euchariſt, in the Romiſh churches. Some authors call it *turris geſtatoria* and others *pyxis*; but the pyxis is properly the box in which the euchariſt is preſerved.

CIBUS FERIALIS, in antiquity, an entertainment peculiar to a funeral; for which purpoſe, beans, parſley, lettuce, bread, eggs, lentils, and ſalts were in uſe.

Plate CXLIX.

CICADA, the FROG-HOPPHER or FLEA-LOCUST, in zoology, a genus of inſects belonging to the order of hemiptera. The beak is inflected; the antennæ are ſetaceous; the four wings are membranaceous and deflected: and the feet, in moſt of the ſpecies, are of the jumping kind. The ſpecies are fifty-one. The larvæ of ſeveral of this genus evacuate great quantities of a frothy matter upon the branches and leaves of plants, in the midſt of which they conſtantly reſide, probably for ſhelter againſt the ſearch of other animals, to which it would become a prey. Nature has afforded this kind of defence to inſects whoſe naked and ſoft bodies might otherwiſe very eaſily be injured; perhaps alſo the moiſture of this foam may ſerve to ſcreen it from the ſultry beams of the ſun. On removing the foam, you diſcover the larva concealed underneath; but it does not long remain uncovered. It ſoon emits freſh foam, that hides it from the eye of obſervation. It is in the midſt of this foamy ſubſtance the larva goes through its metamorphoſis into a chryſalis and perfect inſect. Other larvæ, whoſe bodies are not ſo ſoft, run over plants without any manner of defence, and eſcape from inſects that might hurt them, by the nimbleneſs of their running, but eſpecially of their leaping.

The chryſalids, and all the larvæ that produce them, differ little from each other, only that the former have the rudiments of wings, a kind of knob at the place where the wings will afterwards be in the perfect inſect. As to other reſpects, the chryſalids walk, leap, and run over plants and trees; as do the larva and the frog hopper, which they are to produce. At length they through off their teguments of chryſalids, ſlip their laſt ſlough, and then the inſect appears in its utmoſt ſtate of perfection. The male alone is then endowed with the faculty of ſinging, which it exerciſes not with its throat, but with an organ ſituated under the abdomen. Behind the legs of the male are obſerved two valvulæ, which, raiſed up, diſcover ſeveral cavities, ſeparated by various membranes. The middle contains a ſcaly triangle. Two vigorous muſcles give motion to another membrane, which alternately becomes concave and convex. The air agitated by this membrane, is modified within the other cavities; and by the help of this ſonorous inſtrument, he amorouſly ſolicits his female. By pulling the muſcles of a frog-hopper lately dead, it may be made to ſing. This inſect begins its ſong early in the morning, and continues it during the heat of the noontide ſun. Its lively and animated muſic is, to the country people, a preſage of a fine ſummer, a plentiful harveſt, and the ſure return of ſpring. The cicadæ have a head almoſt triangular, an oblong body, their wings faſtigiated or in form of a roof, and ſix legs with which they walk and leap pretty briſkly. In the females at the extremity of the abdomen are ſeen two large laminæ, between which is incloſed, as in a ſheath, a ſpine, or lamina, ſomewhat ſerrated, which ſerves them for the purpoſe of depoſiting their eggs, and probably to ſink them into the ſubſtance of thoſe plants which the young larvæ are to feed upon.

Cicada *ſeptemdecim*, or Locuſt of North America, ranks with the cricket and graſs-hopper, as one genus of inſects belonging to the order of hemiptera, and has moſt of the diſtinguiſhing characteriſtics of the graſshopper, though its legs do not appear formed for leaping, as it is obſerved the inſect ſeldom removes without uſing its wings.—The characters of the Cicada, or American locuſt, are theſe: The beak is inflected; the antennæ are ſetaceous; the four wings are membranaceous, and deflected, and have much the appearance of the wings of ſome of the fly kind; the thorax is compreſſed and angulated, and the feet, in moſt of the ſpecies, are of the jumping kind.—A gentleman who obſerved it in Pennſylvania in 1782, gives the following account.

“ This remarkable inſect, though but trivial attention has been given to its hiſtory, appears as an extraordinary phenomenon in the works of creation. Its periodical viſits—its long abſence—the numbers which riſe from the earth, where they have, perhaps, undergone various transformations, whilſt they have lain, entombed, for the ſpace of 15, 16, or even 17 years, (for they are not always regular in their viſits) certainly deſerve ſome enquiry.

“ We know not the progreſs of the American locuſt, through its ſeveral changes during its long confinement in the earth. I have no doubt but it often alters its appearance, and though theſe changes remain, as yet, amongſt the arcana of nature, yet ſome intereſting obſervations may reſult from a purſuit of the enquiry, as far as their laſt appearance, which was in the year 1782, will admit of.

“ Towards the latter end of May, under ſuch trees as had been planted, previous to their former viſit, the ground was perforated; ſo as, in ſome degree to reſemble a honey-comb; and from theſe perforations, iſſued an army of theſe inſects; which, if they had been endued with the voraciouſneſs of the locuſts of the eaſt, muſt have ſpread devaſtation and terror throughout the country they fixed upon for a viſit.—But happily the cicada or locuſt, in this ſtate, is not more injurious than the ſportive ſummer graſs-hopper.

“ The appearance of the locuſt, when firſt eſcaping from its earthy manſion, is a large amber-coloured grub-worm, about one inch and an half in length, and about an inch and half in circumference; the feet are more ſtrongly formed than thoſe of the graſshopper, and conſiderably ſhorter;—the inſect ſeldom leaping, as has been before obſerved;—in the outer covering, *or grub-caſe, if the term may be admitted*, near the back of the neck, begins an opening, which continues down the body, nearly half the length of the inſect: through this opening the locuſt protrudes itſelf, and appears, at firſt a white coloured moth, nearly reſembling a ſilkworm, in its moth ſtate, though much larger. The wings in this tender ſtate of the inſect are wonderfully folded in cloſe rolls near their baſis, ſo exquiſitely compact, that it required ſeveral careful obſervations, to comprehend the poſſibility of the wings being formed with the inſect, as it really appeared an almoſt inſtantaneous creation, when they were expanded, which was performed by the locuſt ſhaking itſelf with a conſiderable force.

“ When the inſect relieves itſelf from the outer covering or grub-worm caſe, the wings are of the hue of rich milk. In this ſtate, the filaments, which add ſtrength to them, are of the ſame white colour, and inſtead of the tranſparency which they afterwards obtain, they are now remarkably opaque; but as ſoon as the moiſture dries from off the wings of the inſect, theſe filaments become more firm, and have a dark brown colour which approaches a black as the locuſt becomes ſtronger.

“ The time when they iſſue from the ground, is about an hour or two after ſun-ſet; ſoon after which they begin their exertions to free themſelves from the grub caſe, which the ſtronger ones effect in an hour or two.—They remain on the branches of the trees, which they have attained, (before this laſt metamorphoſis) until morning, when they are of an high amber colour—have acquired their ſtrength, and are able to contend with ſome of their enemies. The weaker ones, and thoſe who do not leave the earth till morning, do not ſo eaſily effect their transformation, and often prove a delicious prey to the larger and even the ſmaller birds.

“ While in the grub-worm ſtate, there is a fiſſure in the back of the ſkin, ſufficiently large to admit the locuſt to paſs therefrom, which, notwithſtanding, is not done without great exertions. At the time of their leaving the grub-caſe, for it cannot be, with propriety, termed a chryſalis, life and motion is ſtrong in the inſect, even when it is about aſſuming its new form. And when we conſider that every particular limb, every part of the body however delicately and tenderly formed,—and really ſome of them, at this time, are almoſt inconceivably thin and tender—is incloſed in a ſeparate caſe, and that theſe tender parts muſt be neceſſarily extricated from their ſheaths, before the inſect can enjoy uninterrupted freedom, we certainly feel our aſtoniſhment increaſe, in obſerving, that thoſe ſo elegantly formed members eſcape uninjured from even the extremities of their covering.—When this eſcape is effected, the inſect leaves the place where its covering is, and reſts at a very ſhort diſtance from it, where it remains until the moiſture is evaporated from its body. The wings, as well as the inſects, when firſt protruded from the grubcaſe, are very moiſt and tender; though by degrees they dry, and become more firm and rigid. But ſhould any accident prevent the cicada from a free expanſion of its wings, for a conſiderable time after the grub-caſe is forſaken, the poor inſect is doomed to remain either in a ſtate of total or partial debility;—for ſhould it be ſo weak as to be unable to expand its wings thoroughly, while the moiſture and pliancy remain, as ſoon as they become dry and rigid, they are fixed in that particular or total want of expanſion; and in this helpleſs ſtate, the cicada is a certain prey even to the long-applauded induſtrious emmet.

"The locuſt-grub, riſing from the ground, is nearly the colour of the locuſt when it has attained its full perfection, though not altogether as dark; its ſtrength is very great, nearly equalling that of the ſcarabæus carnifex (or the beetle which forms the balls from ordure): But as it is about to leave the caſe, it becomes weaker.

"At the time of their laſt appearance, an apple-tree was approved of for the theatre of my enquiry; and though it muſt have been very ſmall at the time of their former viſit, yet, having carefully collected the grubs which came up under its branches, the firſt evening I numbered 500, which I removed; the ſecond evening 600 more had made their appearance, and the third evening upwards of 400. Several ſtragglers remained, who were neglected, as the numbers were already ſufficiently great to claim my whole attention.

"Two or three days after their aſſuming the moth ſtate, the air reſounded with their notes, which were re-echoed either on the wing, or on the branches of the trees indiſcriminately. Theſe notes, expreſſive as thoſe of the feathered ſongſters, proved a call to courtſhip. The power of ſong, which ſomewhat reſembled the noiſe of a ſtocking-loom, was confined to the male—which it was eaſy to diſcover was produced by inflating air into his body, and expreſſing it through two ſmall apertures, placed a little below the baſe of his wings;—theſe holes lead from a muſical table, on each ſide of which are five or ſix thin bars, connected by exquiſitely fine membranes; which, during the time of ſong, maintain a continual vibration. Like the graſshopper, the locuſt very ſeldom ſports its ſocial call without a reſponſe from almoſt all the males within hearing; and frequently when the courtſhip has obtained his mate's approbation, an intruder allured by the concert, which is eaſily diſtinguiſhed, challenges the hero to combat, and the fight is often long and deſperate—as the victory always confers an intereſting reward.*

"When geſtation is fully accompliſhed, which is generally two or three days after they have aſſumed the flying ſtate, the female prepares to depoſit her burden; and although her body does not appear greatly diſtended, yet ſhe generally lays about 140 eggs.—The egg is of a white colour, and about a line in length, and one-third of a line in diameter. Nature has wonderfully provided her with an inſtrument in her tail, ſomewhat reſembling a two-edged ſword, which, like the graſshopper, ſhe can ſheath and unſheath at pleaſure: with this ſhe perforates the tender twigs of ſuch trees as will afford a convenient nidus for the eggs, and depoſits them by 14 or 15, under the bark, in the form of the letter V; and ſometimes ſhe pierces thro' a twig one-fourth of an inch thick.—After ſhe has carefully depoſited her eggs in the ſmaller branches, a ſudden blaſt of wind frequently lops the branch ſhe has choſen for their reſidence.

"It is thus that the parent provides for a ſucceſſion of the ſpecies, in which employment ſhe is generally buſied until about the tenth day of her moth ſtate, ſeldom if ever feeding on any thing but the early dew: For, as they fly in ſuch numbers, (and always careleſsly, without a leader, as is uſual with the eaſtern locuſts) were they to feed on plants the damage muſt certainly be obſervable: and as they live in the moth ſtate twelve or thirteen days, it is probable they have a portion of the dew of heaven for their ſuſtenance. Then they dry up as the ſilk-worm moth,—the male becoming ſuperannuated two or three days before the female.

"Having purſued the locuſt thro' its ſeveral moth ſtages, the numerous offspring it has depoſited in the ſlender twigs of trees, have ſtill ſome claim to an inveſtigation.—The eggs are of a cylindrical form, rounded at the ends, and are of ſuch a conſiſtence, that they require a hard preſſure between the fingers to cruſh them. The ſubſtance within, as in moſt other ſmall eggs, is a white, tranſparent, and viſcous fluid. In about the ſpace of fourteen days, from the time of their firſt being left by the parent, the egg produces a whitiſh inſect, ſomewhat larger than the ſilk-worm, when freſh hatched, which leaves the branch where the neſt was, and, dropping on the ground, either enters into the hole through which the old locuſt iſſued, or turns the earth aſide afreſh, and entombs itſelf there, to undergo the metamorphoſis of its anceſtors.

"In digging wells, cellars, &c. in America, inſects of very different appearances have been diſcovered, ſome twenty feet deep, which have been ſuppoſed to be of this ſpecies—others have been diſcovered nearer the ſurface, of which no doubt remains but that they are the grub of the locuſt—and early in the ſpring, previous to their aſſuming the moth ſtate, the ploughſhare often furniſhes the blackbird, which follows the ploughman, with a rich repaſt of them; for which, by his clamours and flutterings, he endeavours to expreſs his obligations. Varieties of this genus appear annually, they are in general much larger than the cicada ſeptemdecim, and of a greyiſh caſt; the dark brown or amber colour which the others have, appearing in theſe mottled with a dirty white."

CICATRICULA, among natural hiſtorians, denotes a ſmall whitiſh ſpeck in the yolk of an egg, ſuppoſed to be the firſt rudiments of the future chick.

CICATRIX, in ſurgery, a little ſeam or elevation of callous fleſh riſing on the ſkin, and remaining there after the healing of a wound or ulcer. It is commonly called a *ſcar*.

CICATRIZANTS, in pharmacy, medicines which aſſiſt nature to form a cicatrix. Such are Armenian bole, powder of tutty, &c.

Cicatrizants are otherwiſe called *eſcharotics*, *epulotics*, *incarnatives*, *agglutinants*, &c.

CICCA, in botany; a genus of the tetrandria order, belonging to the monœcia claſs of plants. The male calyx is tetraphyllous; there is no corolla: the female calyx tryphyllous; no corolla; four ſtyles; the capſule quadricoccous, or four berried.

CICELY,

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* Mas et feminina Cicada in coitu [æquè ac Grylli ſpecies] adeo firmiter uniti, ut ſine corporum mutilatione ſeparari nullo modo poſſint; et in hoc ſtatu per horas multas remanent, donec foecundationis opus perfectum ſit. Per lucos firmiter ſic uniti ſæpe volitant, et complures ſimul in conſpectu apparent.

Cicely, Cicer.

CICELY, in botany, the Engliſh name of a ſpecies of chærophyllum. See CHÆROPHYLLUM.

CICER, or CHICK-PEA, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the *Papilionaceæ*, or 32d order. The calyx is quinquepartite, as long as the corolla, with its four uppermoſt ſegments incumbent on the vexillum: the legumen is rhomboidal, turgid, and diſpermous. There is but one ſpecies, which produces peaſe ſhaped like the common ones, but much ſmaller. They are much cultivated in Spain, where they are natives, being one of the ingredients in their olios: as alſo in France; but are rarely known in Britain.

Cicer.

END OF THE FOURTH VOLUME.

DIRECTIONS FOR PLACING THE PLATES OF VOL. IV.

Plate	Page	Plate	Page
CXII. to face	40	CXXV.	168
CXIII.	56	CXXVI.	172
CXIV.	80	CXXVII.	236
CXV.	84	CXXVIII.	264
CXVI.	96	CXXIX.	300
CXVII.	100	CXXX.	304
CXVIII.	104	CXXXI.	304
CXIX.	108	CXXXII.	436
CXX.	112	CXXXIII.	440
CXXI.	144	CXXXIV.	456
CXXII.	144	CXXXV.	740
CXXIII.	148	CXXXVI.	774
CXXIV.	148	CXXXVII.	
The whole-ſheet Chemical Table			598

[In all, 26 Plates.]