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CONTENTS

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BAD LAND SCENERY — JAIL ROCK, CHEYENNE COUNTY, NEBRASKA

THE
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THE COMMERCIAL DEVELOPMENT OF JAPAN

By O. P. AUSTIN,

Chief of the Bureau of Statistics, Treasury Department

With new currency, a new tariff, new relations to her foreign population, and new treaty relations with the commercial world, Japan's commercial future is a subject which naturally arrests attention and also arouses much conjecture; and when it is considered that the trade relations of that country with the United States are growing more rapidly than those with any other nation, the subject becomes one of especial interest to the people of the United States. Our exports of merchandise to Japan, which 20 years ago were but a couple of millions of dollars annually, had reached five millions by 1890, nearly eight millions in 1896, over 13 millions in 1897, 20 millions in 1898, and between 17 and 18 millions in 1899. Our purchases from Japan of articles which we must have, such as raw silk and fibers for our manufacturers, tea, rice, and other articles which we cannot produce at home, have constantly grown, even while our purchases from other parts of the world were being reduced, and are now from 25 to 26 millions a year, against one-half that sum fifteen years ago. Over a thousand citizens of the United States are now residing in Japan, many of them actively participating in her foreign commerce, two-thirds of which is still conducted by foreigners, while over seven thousand citizens of Japan are residing in the United States, many of them as students, and over twenty-seven thousand of her people are residents of the Hawaiian islands, which are now under the United States flag. No European nation except Great Britain has so many citizens residing

in Japan as has the United States and no country has as many Japanese citizens under her flag as has our own, while no nation is so closely associated with the growth of her commerce or has greater reason to expect an active participation in it.

Japan has during the past few years assumed an important rank in the list of commercial nations, and in doing so has vastly increased her commerce with the United States, the nation instrumental in first opening the doors of that country to commerce with the world. Within the last two years new treaties have been made with the principal countries of the world, by which their citizens are given equal privileges with the citizens of Japan in all parts of the empire and made subject to its laws, which have been recently revised. Also new commercial codes have been established, new currency adopted, new tariffs created, and new ports opened for commercial intercourse with the world. Lastly, Japan and the United States have become near neighbors physically, Japan's northern territory, the Kurile islands, lying within 500 miles of the Aleutian islands, while her southern extreme, Formosa, is within 200 miles of the Philippines, thus making a complete chain along the Pacific front of Asia. From Yokohama, her most important port of entry, the distance to Manila as a trade center is practically the same as that to Hongkong, which has proved so important a distributing point for British trade. From Yokohama to Honolulu, a distance of 3,400 miles, Japanese steamships now regularly ply, and from Yokohama to the Pacific coast ports of the United States the distance is far less than to the ports of any other great commercial nation, while the opening of an isthmian canal would greatly lessen the water route between Japan and the Gulf and Atlantic ports of the United States, from which she draws so large and constantly increasing a proportion of her supplies.

To the readers of THE NATIONAL GEOGRAPHIC MAGAZINE the earlier commercial relations of Japan to the world and the part which the United States has had in developing them are so well known that they need not be recounted in detail. Portuguese adventurers, who were the first to establish commercial relations in China, soon extended their trade to Japan, where sailors landed in 1542, and within a few years established an active commerce. Encouraged by that success, the Dutch East India Company in 1598 dispatched five merchant vessels to Japan. In 1609 other Dutch ships arrived and were well received by the Japanese, who conceded them a port on the island of Hirado

and the privilege of establishing a "factory" or trading post and settlement. The hostilities between the Portuguese and Dutch, however, and the extreme demands of the Portuguese, who considered themselves already established in the commerce of Japan, coupled with dissatisfaction with the attitude of foreign missionaries toward the popular religion of Japan, led to the exclusion of all traders except the Dutch, who were permitted to take up their residence on a small island, Deshima. Here they remained for more than two centuries in undisturbed monopoly of the entire European trade of Japan. In 1852 serious complaints of mistreatment of American sailors wrecked on the coast of Japan having been made, Commodore M. C. Perry, with a fleet of American vessels, was sent by the United States government to demand from Japan a treaty by which American vessels should be allowed to enter one or more of its ports to obtain supplies, and, if practicable, that Americans should also be given general trading privileges in these ports. This undertaking was peacefully carried to a successful termination, a treaty being signed March 31, 1854, by which the ports of Shimoda and Hakodate were opened as harbors of refuge, supply, trade, and consular residence to the United States. This action was quickly followed by a successful demand for similar privileges by the British, Russian, and Dutch governments, and by 1860 the ports of Hakodate, Kanagawa, Nagasaki, and Niigata were opened to the commerce of the leading nations of the world.

From this time forward the commercial relations of Japan with the world made rapid progress. In 1860 and 1861 a Japanese embassy visited the United States and Europe. The decade 1860–70, while largely occupied by dissensions, and in some cases hostilities, between the elements favoring commercial relations with the world and those preferring former methods, saw marked developments within Japan, the beginning of the adoption of the customs and methods of western nations, and laid the foundation of the progress which has since been made. In 1871 another embassy, consisting of the ambassador and junior prime minister, Iwakura, the vice-ambassador, Kido, Count Ito Hirobumi, the three ministers of the cabinet, and several officers, sailed from Japan to visit all the nations having treaties with that country.

The development of Japan which followed these tours of observation and intercourse with other nations of the world was very rapid. Schools were increased, students were sent abroad to obtain a higher education and study foreign methods, internal

highways made, steamships built and communication with foreign countries increased, manufacturing industries encouraged and multiplied, and business men from other countries welcomed to participate in the commercial and business development of the country. As a consequence, the foreign commerce of Japan, which in 1878 amounted to less than $90,000,000, in 1898 was over $218,000,000, while the development of railroads, manufactures, and internal industries had been equally great.

The United States, which has been constantly and actively associated with the development of Japan, has participated largely in the growth of her commerce. Thousands of young men from Japan have visited the United States as students, and thousands of merchants and business men from the United States have gone to Japan as instructors both in educational and commercial lines. As teachers and professors in schools and colleges, as editors and publishers, as merchants who engage in both importing and exporting, as manufacturers, as constructors of railways and telegraphs and in establishing modern electrical aids to commerce, citizens of the United States have been active in Japan. As a consequence, the trade relations between the two countries have grown with greater rapidity than between Japan and any other nation. In 1881 the imports from the United States formed less than 6 per cent of the total importations into Japan, while in 1898 they formed 15 per cent of the total importations. Meantime Great Britain's share in the imports of Japan fell from 52 per cent in 1881 to 23 per cent in 1898. The United States is also Japan's largest customer by reason of the fact that the chief export products of Japan are articles required by the manufacturers of the United States and cannot be produced in this country.

Of the $23,560,000 total exportations to the United States in 1898, the value of $12,620,000 consisted of raw silk, $3,286,000 of tea, $1,847,000 of mats for floors, $347,000 of rice, $336,000 of chemicals, drugs, etc., and $3,109,000 of manufactures of silk, while Japanese foot-mats, manufactures of bamboo, lacquered ware, and other products peculiar to the Japanese are prominent in the list. Exports from Japan to the United States have steadily grown, especially since the development of the silk manufacturing industry in this country. The United States is the largest purchaser of raw silk from Japan, whose total exportations of raw silk exceed $28,000,000. France is the next largest customer in this line, her purchases of raw silk from Japan in 1897

amounting to $10,000,000 in value against $16,000,000 by the United States. The exports from Japan to the United States in 1881 were $5,500,000 in value, being 36.5 per cent of the total exports of that year, and in 1898 were $25,600,000, or 20.06 per cent of the total exports of that year.

Japan's imports from the United States have grown with even greater rapidity than her exports to the United States. In 1881 they amounted to but $890,000, and in 1898 had reached $20,000,000 in value. They have increased even more rapidly than the total importations of Japan, our share of her import trade having risen from 5.72 per cent in 1881 to 14.57 per cent in 1898, while the United Kingdon, our principal competitor in that market, which furnished in 1881 52.51 per cent of the total imports of Japan, supplied in 1898 22.84 per cent. In the fiscal year 1892 our total exports of domestic merchandise to Japan amounted to $3,288,282, and in 1899 to $17,158,970. Of this total of $17,158,970 exported to Japan in the fiscal year just ended, the largest item was raw cotton, which amounted to $5,775,784 in value; the next largest was tobacco and manufactures thereof, amounting to $2,927,700; then followed iron and steel and manufactures thereof, $2,578,616; illuminating oil, $2,341,922; breadstuffs, $744,562; wood and manufactures thereof, $530,693; distilled spirits, $414,404; paper and manufactures of, $350,118; instruments for scientific purposes, $232,000; provisions, $212,408; leather and manufactures of, $209,611; clocks and watches, $183,397; paraffine wax, $132,273; lubricating oil, $119,553; chemicals, drugs, and dyes, $80,498; condensed milk, $76,701; and india-rubber manufactures, $57,579.

Taking up the great class of iron and steel and examining it in detail, we find that the exports of locomotive engines in 1899 amounted to $529,514; builders' hardware, $20,498; sewing machines, $5,270; car wheels, $3,624; firearms, $38,306; machinery not separately specified, $563,641, and iron and steel not separately specified, $1,405,715.

A detailed study of the exports from the United States to Japan with the purpose of determining the articles mostly in demand in that country during the decade, and in which the export trade has most rapidly grown, shows that the largest item is raw cotton, the value of which exported in 1890 amounted to but $85,211, had grown to $7,435,526 by 1898, and was $5,775,784 in 1899, the imports of 1898 having been somewhat excessive. Leaf tobacco,

which was exported in such small quantities prior to 1894 that it found no separate statement in the official accounts, amounted in 1894 to $820, in 1897 to $55,124, and in 1899 to $2,414,482. Cigarettes amounted in 1890 to $76,556, in 1894 to $137,895, and in 1899 to $445,263. Illuminating oil, which in 1890 amounted to $3,559,395 in value, was in 1899 $2,341,922. This reduction is due in part to the active competition by Russian and Sumatran petroleum and in a small degree to the fact that Japan is now producing some petroleum from her own wells, though a recently published statement indicates that the product is small and the cost of producing practically as great as importing from other countries. It is proper to add, however, that the reduction indicated by the figures quoted is more apparent than real, and is partially due to a reduction in price per gallon, the total exports of illuminating oil to Japan in the fiscal year 1899 being 32,705,180 gallons, against 37,892,930 gallons in 1890. Flour has increased from $127,120 in 1890 to $722,710 in 1899. This increase is evidently due to a growing disposition among the Japanese to consume more of this class of food rather than rely as largely upon rice as in former years, since the number of foreigners in Japan, other than Chinese and Coreans, amounts to but about 5,000, and has not materially increased during the period in which our exports of flour to that country have more than quadrupled.

The growth of the importations of tobacco into Japan has been phenomenal. In 1892 the total importation of tobacco, leaf and cut, was valued at $40,000; in 1896 it was $74,000; in 1897, $212,000, and in 1898, $2,250,000, this extraordinary importation of 1898 being due in part to the increased rate of duty provided by the new tariff; but the fact that in 1897 it was three times as much as in the preceding year would indicate a rapid growth in the demand for tobacco. An examination of the table of exports of tobacco from the United States shows that the markets of this country benefit by practically all of this increase, the exportations of tobacco from the United States to Japan in the fiscal year 1899 being $2,927,700 in value, as against $671,272 in the preceding year, prior to which time there had been a steady growth in the exports of tobacco from the United States to Japan.

In paper and its manufactures the export trade to Japan has grown very rapidly, the total exports of this class being, in 1890, $1,606; in 1896, $10,126, and in 1899, $350,118. Instruments for scientific purposes increased from $9,441 in 1890 to $34,600

in 1894, $148,271 in 1897, and $232,892 in 1899. Paraffine wax, of which the exports only began to be separately stated in 1891, amounted in that year to $255, and in 1894 to $73,315, in 1896 to $127,001, and in 1899 to $132,273. Chemicals, drugs, and dyes increased from $23,030 in 1890 to $80,498 in 1899; manufactures of india-rubber increased from $22,871 in 1890 to $57,579 in 1899. In the same period canned beef increased from $11,212 in 1890 to $40,750 in 1899, and beef, salted or pickled, from $628 to $42,893. Leather and its manufactures find a steady demand in Japan, owing to the fact that the number of cattle and other animals whose skins are used for this purpose is comparatively few. The total number of cattle in Japan is given in the last census as 1,148,761, or 26.92 for each 1,000 inhabitants, while in the United States, according to the latest reports of the Department of Agriculture, the number of cattle is 44,000,000, or about 600 for each 1,000 inhabitants.

Exportations of cotton cloths to Japan have fallen by reason of the rapid increase in the manufacture of cotton cloth in that country, the total for 1899 being but $35,828, against $141,264 in 1897. Meantime, however, exportations of raw cotton to Japan have rapidly increased, being, as already indicated, $5,775,784 in 1899, against $85,211 in 1890. This is largely due to the increase in the manufacture of cotton goods in Japan, though American cotton has grown in popularity with the manufacturers there within the past few years. Experience has shown them that cotton from the United States is more satisfactory for use in manufacturing than that which they had been accustomed to obtain from India and China, the staple in American cotton being longer, thus giving better results. As a consequence, imports of American cotton now form a much larger percentage of the total importation into Japan than in earlier years, although the cottons of China and India have largely the advantage both in the matter of proximity and cheapness of labor utilized in their production. Japan also produces a considerable amount of cotton of her own, though it can scarcely be expected that the production will increase sufficiently to keep pace with the growth of her cotton manufacturing industry.

The entire area of Japan is but 169,140 square miles, or less than the State of California, while but about 10 per cent of her land is under cultivation and but a comparatively small proportion cultivable, since mountain ranges and rocky islets and shores

form a large proportion of her area. It must be remembered that Japan, with a small cultivable area, has a population of about 45,000,000, and must therefore devote most of her arable land to the production of foodstuffs, while her natural products of silk and tea are so much in demand the world over that they are not likely to be displaced for cotton, which can be so readily brought from other and comparatively adjacent countries. Cotton manufacturing in Japan has, however, grown very rapidly, the total number of spindles in 1899 being 4,358,702, against 5,468 in 1863 and 43,700 in 1883. It is thus apparent that Japan will continue to purchase from other parts of the world a large proportion of the raw cotton which her rapidly growing cotton mills will consume, and as the cotton from the United States has already made rapid headway against that from the nearer countries of China and India, it is reasonable to assume that the market for American cotton will continue to grow, especially if an isthmian canal gives opportunity for direct water shipments from the cotton-growing section of the United States.

In iron and steel there seems no reason to doubt that the demand upon the United States will continue. The importations of manufactures of iron and steel into Japan have grown very rapidly. It is apparent that the demand for manufactures of this class will continue to increase with perhaps greater rapidity. The various manufacturing and mechanical industries are being encouraged by the government and by Japanese capitalists, as are also the construction of railroads, the building of ships, and other enterprises of this kind, which will require great quantities of iron and steel and their manufactures. While considerable quantities of iron ore are known to exist in various parts of Japan, it is not believed that they will prove sufficient to seriously interfere with or take the place of the supplies now being furnished from other countries, especially since there are few places where iron and coal are found in conjunction. In addition to this, it may be said that while the coal supply is now such as to have become quite an article of export, rivaling that of Australia and other localities in that part of the world, I do not believe that it will be sufficient to meet the great demand upon it for all classes of manufactures for any considerable term. Besides, the large capital required for the construction of establishments for the manufacture of iron and steel, coupled with the extreme cheapness of production in the United States through proximity of coal and iron mines, makes it improbable

that the market in Japan for manufactures of this class will be seriously impaired by local production and manufacture.

One important factor entering into the question of local manufactures in Japan, making her a competitor with other countries which have formerly held this market, is that of labor. All recent writers agree that rates of wages in Japan have very much increased in the last few years and are likely to continue to increase, and that the fear formerly expressed that a combination of modern manufacturing developments with the cheap labor of the Orient would result in driving the manufacturers of other parts of the world out of the markets thus far does not seem to have been justified by the experiment. An interesting illustration of this statement is seen in the importations of clocks and watches. The opinion was expressed a few years ago that the cleverness of Japanese workmen in reproducing articles of delicate workmanship brought to their attention would soon reduce to a minimum the importation of clocks and watches and other articles of this character. Experience, however, has not justified this belief. The importation of clocks and watches into Japan, according to the official figures of the Japanese government, has increased from $320,000 in 1892 to $1,400,000 in 1898.

That the effect of the new treaties upon the business relations of foreigners in Japan will be extremely important, not alone to foreigners, but to Japanese commerce in general, is shown by the fact that in 1898 foreign merchants exported $53,650,000 in value of the total exports of $81,075,000, and imported $91,800,000 of the total imports, which amounted in that year to $136,720,000, or, in other words, of the total foreign commerce of Japan in 1898, which amounted to $217,800,000, $145,450,000, or about 67 per cent, was conducted by foreigners. While the foreign residents of Japan generally look with some anxiety upon the effect of the new relations, which will subject them to Japanese laws and customs, it is believed that their anxiety is more the dread of a change from a system to which they have always been accustomed than to any real hardships or disadvantages which the new order is likely to develop.

BIG BAD LANDS—SANDSTONE CAPS ON CLAY COLUMNS—LOOKING NORTHWEST FROM HEAD OF INDIAN DRAW, WASHINGTON COUNTY, SOUTH DAKOTA

THE BAD LANDS OF SOUTH DAKOTA

By N. H. Darton,

U. S. Geological Survey

There are Bad Lands of greater or less area in various portions of the arid and semi-arid districts of the west. The most extensive tract is in the southwestern part of South Dakota, on White river, a short distance east of the Black hills. They begin near the 101st meridian and extend for about 120 miles up the White River valley, nearly to the Nebraska line. Their width varies from 30 to 50 miles and their total area is about 4 000 square miles. They attain their finest development on the north side of the valley, along the divide between White river and the south fork of the Cheyenne river. This divide is high and narrow, and is composed of the light colored clays—of the White River formation—and is a region of slight rainfall.

The principal factors in bad-land development here are massive structure of the moderately hard clay and the steep declivities which, together, afford exceedingly favorable conditions for rapid erosion. Somewhat similar conditions prevail on the south side of the White River valley. The region was originally a relatively smooth plain. It was uplifted in a recent geologic time, and as the White river and the south fork of the Cheyenne river deepened their valleys during the progress of this uplift, they and their branch streams cut deeply into the surface of the plains. As erosion progressed, portions of this surface have been sculptured into narrow ridges, steep-sided buttes, rounded domes, pinnacles, and castellated forms in endless variety. Portions of the plains remain as grass-covered table-lands, usually bounded by high, rugged cliffs of clay, and deeply channeled by intricate winding cañons. As erosion is more rapid than soil formation, the slopes are bare and their prevailing tints are flesh, cream, ashy gray, pale green, and buff. The material is fairly homogeneous in its texture, but owing to slight differences in texture, it is carved and channeled into great variety of forms. Occasionally thin beds of sandstone and beds of slightly harder clays add to the complexity of erosion products. The lower beds of the formation are filled with thin vertical veins of chalcedony,

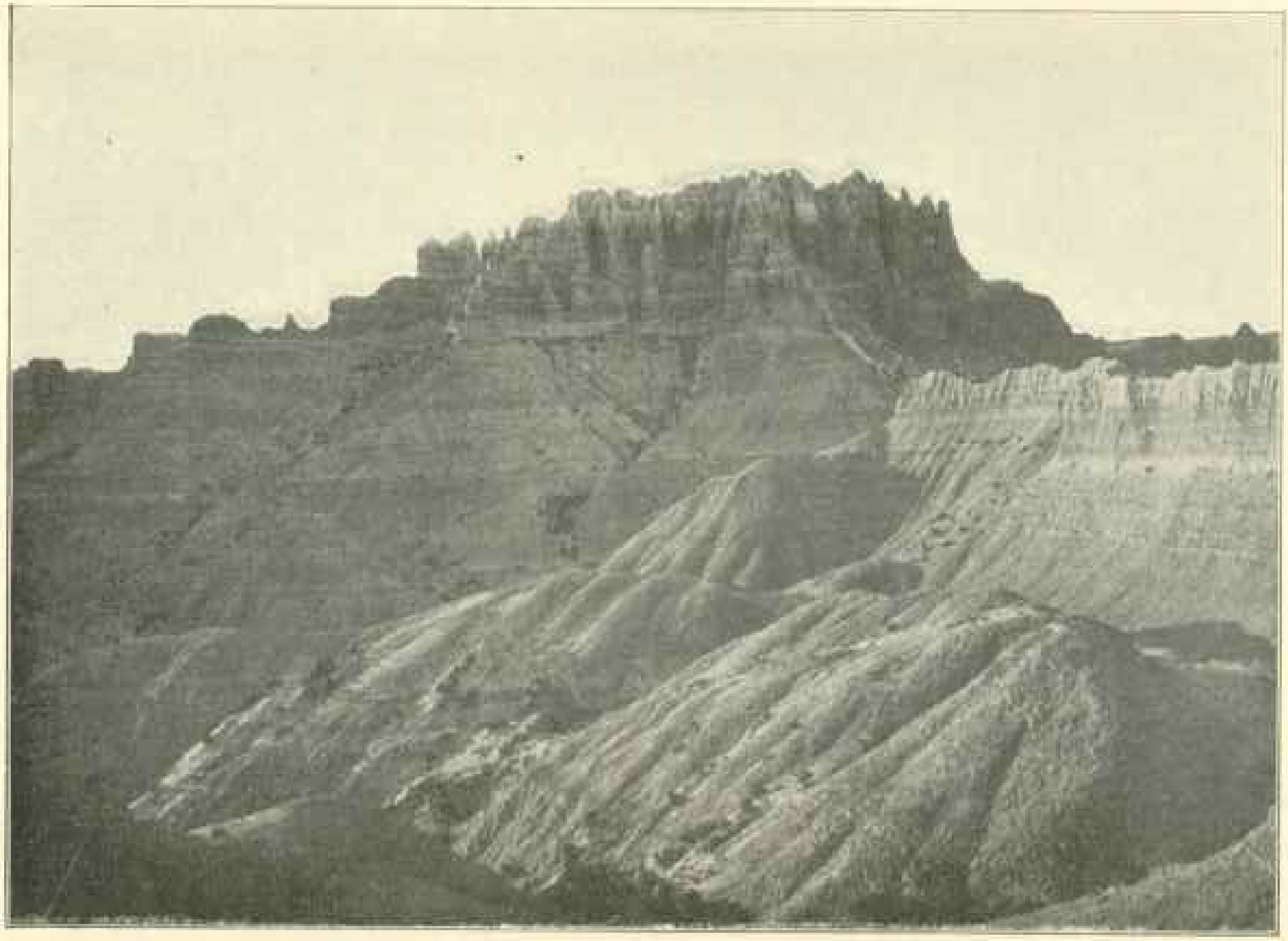
a very hard material, which stands out in innumerable minute ridges and accumulates on the surface in fragmentary condition as the clay is washed away.

To one standing on a high point in the midst of the Bad Lands, a unique view is presented. The bare surfaces are dazzlingly bright in the sunlight. Mesas and buttes, pinnacles and spires of every variety of form rise to varying heights in intricate confusion. Small areas of original plains surface stand as mesas presenting steep walls, deeply notched by cañons and with projecting ridges cut into spires and pinnacles, often of considerable altitude. Many of the pinnacles are capped by masses of sandstone which have protected the underlying clay and left a column standing. A typical general view in the Bad Lands is given on page 338, which also shows some representative pinnacles. The highest features in the region rise from 150 to 300 feet above the valleys. These valleys penetrate far into the Bad Lands, and often contain sufficient soil to sustain a sparse growth of grass. They contain water holes at long intervals, in which limited supplies of water are occasionally preserved far into the autumn, often covered by a thin pellicle of mud which diminishes evaporation. One of the most prominent features in the Bad Lands is the "Great Wall," which extends along the north side of the White River valley for many miles. It is a bare escarpment descending from a ridge of grass-covered table-land, deeply invaded from the northwest by wide bad-land valleys extending toward the Cheyenne river.

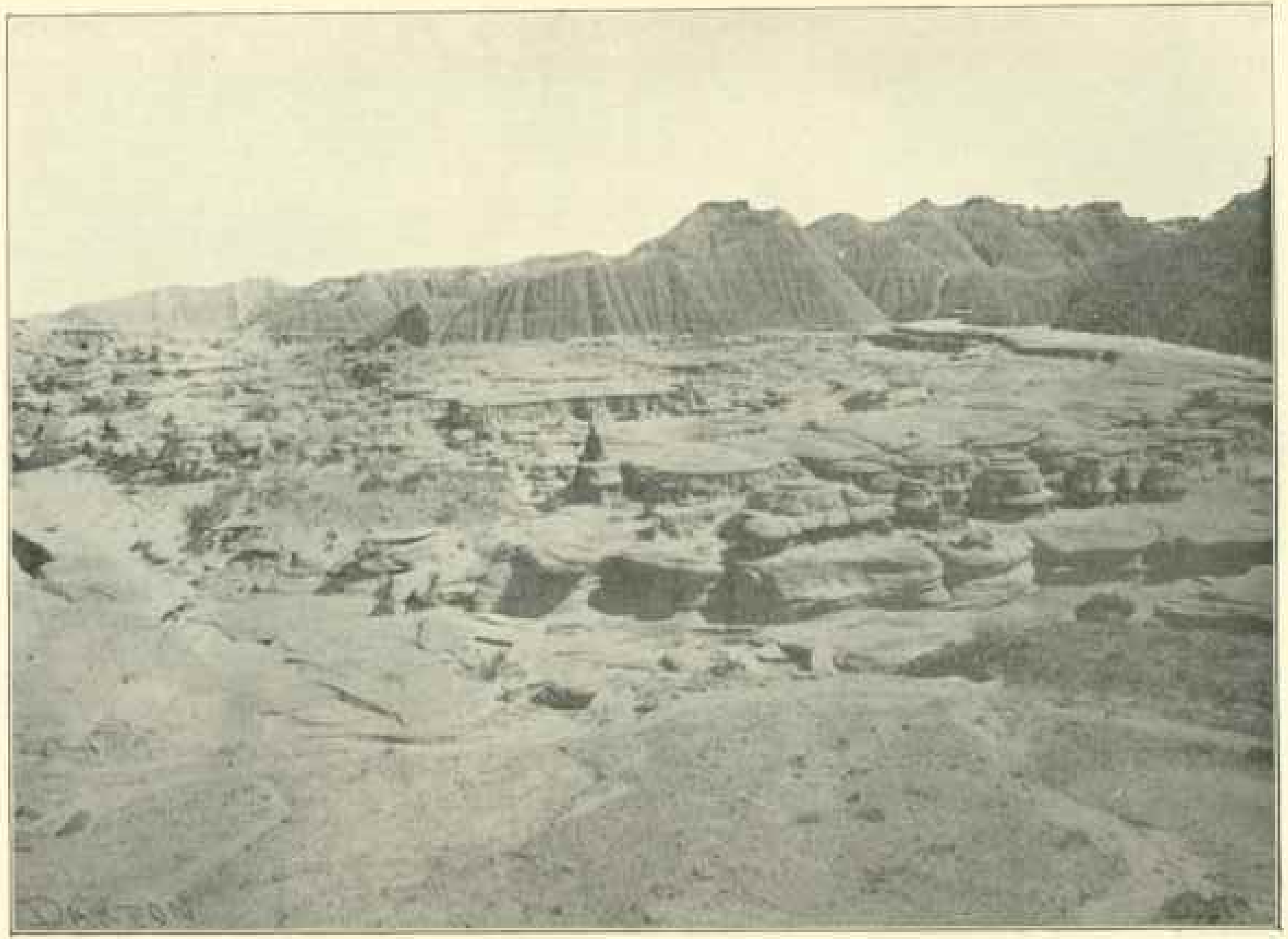
Near the center of the bad-land area rises a prominent remnant of the original plain, known as Sheep mountain, named from the mountain sheep, some of which still remain there. Its table-like surface is covered with grass, but its slopes are marked by a wide zone of bad lands, consisting of high, bare cliffs intricately cañoned and buttressed as shown on page 341.

Very few roads cross the Bad Lands, but there are a few lines of travel through them, which have served for communication. The greater part of the area lies within the Pine Ridge Indian Reservation.

The Bad Lands are famous for the large amount of fossil animal remains which they contain. They have produced hundreds of tons of fossils of Tertiary animals, and every season the region receives visits from one or more parties of "bone-hunters," as they are called, from some of the colleges. A trip to the Big Bad Lands is an interesting experience. They may be easily reached



NEAR SOUTHERN END OF SHEEP MOUNTAIN, WASHINGTON COUNTY, SOUTH DAKOTA



TOADSTOOL PARK, NEAR ARELIA, ROCK COUNTY, NEBRASKA

from several points along the line of the Chicago and North-Western railway, Black Hills division. Hot Springs, on both the North-Western and the Burlington railway lines, is within two days' drive from Sheep mountain, but Hermosa, on the North-Western railway, is somewhat nearer. At this station conveyance may be had, and a fairly large area of the Bad Lands may be seen in a three-days' trip, including a climb to the top of Sheep mountain and the top of the divide between the headwaters of Indian creek and Cottonwood draw.

The White River clay formation extends into Nebraska, and at a number of localities exhibits characteristic bad lands. Near Adelia, on the Burlington and Missouri River railroad, in the extreme northwestern corner of Nebraska, there is a small but exceedingly interesting area of these bad lands, presenting the usual characteristics. One particularly unique locality in this vicinity is shown on page 342. On the North Platte river the same formation presents many striking topographic features, notably Jail Rock, in Cheyenne county, an admirable illustration of which appears as the frontispiece.

THE WEST INDIAN HURRICANE OF AUGUST 7–14, 1899

By E. B. Garriott,

Professor of Meteorology, U. S. Weather Bureau

The American public has manifested a peculiar interest in the West Indian hurricane of August 7–14, 1899. This interest may be partially attributed to the fact that for the first time in her history the United States possessed territory in the tropics which was devastated and made temporarily dependent by a hurricane. And aside from this consideration the storm afforded an opportunity for demonstrating the utility of the newly organized West Indian branch of the United States Weather Bureau. The experience of Puerto Rico in this hurricane is of special interest and importance for the reason that she possessed the advantage of a full-reporting station of the Weather Bureau from which warnings of the approach of the hurricane were disseminated the day before its arrival and where accurate data near the path of the center of the disturbance were recorded.

Extending nearly four hundred miles east and southeast from Puerto Rico are the Leeward islands of the Lesser Antilles. To

the west of Puerto Rico is the island of Santo Domingo. North and distant about one hundred miles from the Santo Domingo coast are the easternmost islands of the Bahama group, which extend from the Turks islands on the east about six hundred and fifty miles in a northwesterly direction to the west end of Great Bahama island, which is seventy-five miles from the Florida coast. These islands border a line drawn northwest by west from Guadeloupe, one of the southernmost islands of the Leeward group, over the Bahamas, a distance of 1,400 to 1,500 miles, and this line represents the approximate path of the hurricane from August 7 to 12.

Puerto Rico records show that the usual path of hurricanes is somewhat to the south of that island, and that during the last four hundred years the island has been visited by eight hurricanes which were attended by a marked loss of life or property. The first of these occurred in July, 1515; the second in 1527, when the executive building in San Juan was destroyed, and the third on August 21, 1615, when the cathedral was demolished. The *San Juan News* of August 8, 1899, which contains this record, states that the most violent hurricane in the history of Puerto Rico occurred on the night of August 22, 1772. It continued from eleven at night until three in the morning, in alternating violent gusts and squalls. Trees were torn up by the roots, fields were inundated, plantations disappeared, and a large number of people were killed and buried under the ruins of their houses. On September 4, 1806, a hurricane caused great damage at Ponce. On September 21, 1819, crops were damaged to such an extent that a famine followed. A violent hurricane, which is remembered by many present residents of the island, occurred October 29, 1867. On August 14, 1886, a hurricane passed to the south of Puerto Rico, doing considerable damage along the south coast and destroying crops in the interior.

Incubated in the warm and exceedingly moist region of equatorial rains, the hurricane of August 7–14, 1899, advanced toward the outlying islands of the Leeward group during the night of August 6, its approach being first indicated by the 8 a. m. reports of August 7 from the Weather Bureau stations at Roseau, Dominica, and Basse Terre, St Christopher. Moving northwestward during the afternoon and night of the 7th, the hurricane center apparently passed almost directly over Guadeloupe and Montserrat and to the south of the Virgin islands, which are the extreme western islands of the Leeward group. The island of

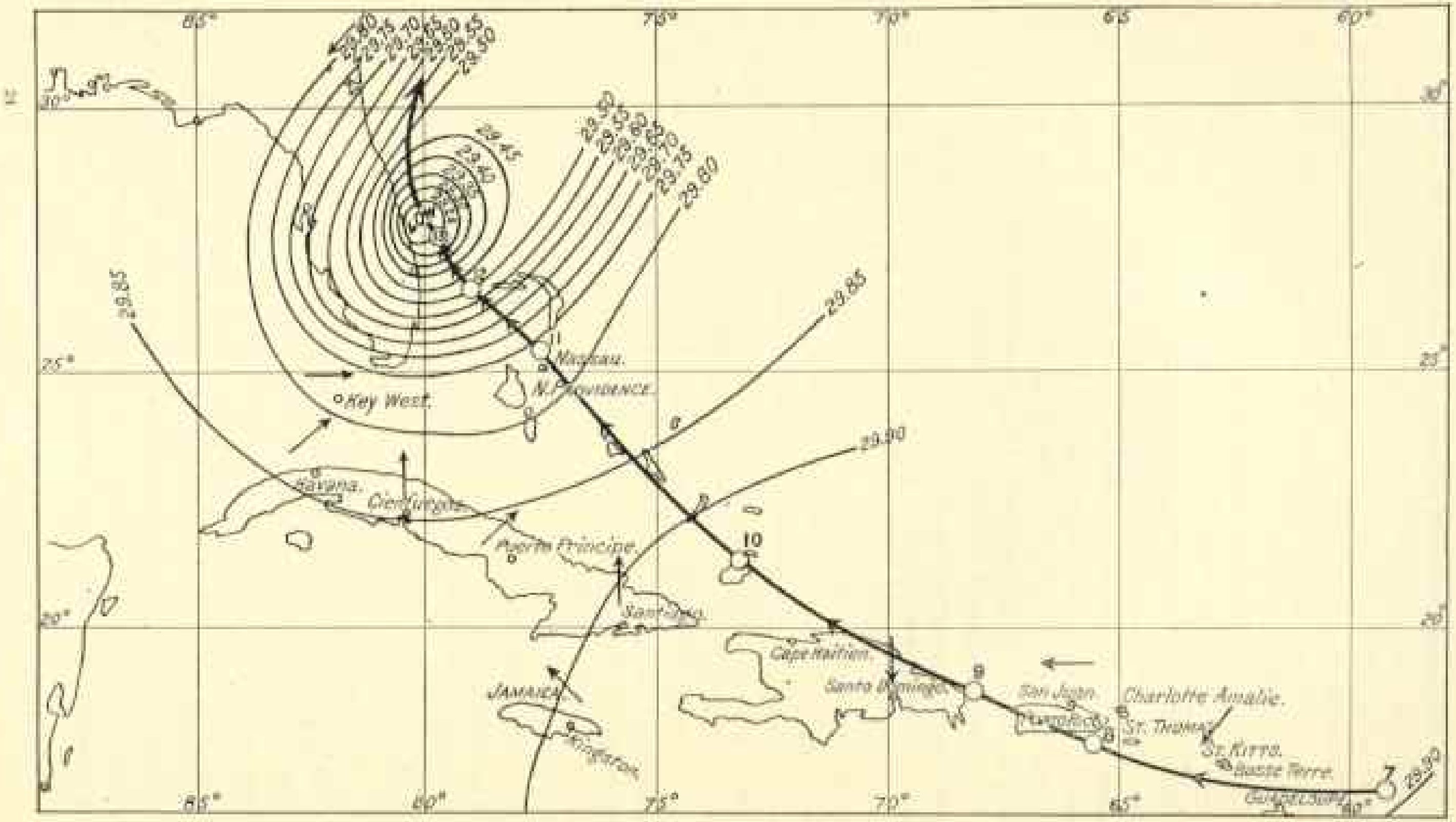


DIAGRAM SHOWING TRACK OF WEST INDIAN HURRICANE OF AUGUST 7-14, 1900

Guadeloupe suffered severely, and on the island of Montserrat nearly 100 persons were reported killed and villages and estates were destroyed. On the islands of Nevis, St Christopher, and Antigua the storm was less severe, while the Danish island of St Croix was the only one of the Virgin islands which suffered to any great extent.

Between 8 and 9 a. m. of August 8 the hurricane center passed over or very near the south coast of Puerto-Rico, attended by an appalling loss of life and property, and by the morning of the 9th had reached a position near the north coast of Santo Domingo. Following a west-northwest track, the hurricane center arrived at the eastern Bahamas and evidently passed near Grand Turk island during the night of the 9th. The position and course of the storm during the succeeding twenty-four hours were approximately determined by the distant Weather Bureau stations of observation at Santiago and Puerto Principe, Cuba, and by regular and special reports received through the coöperation of the colonial government at Nassau, Bahamas. By the morning of the 11th there was evidence at Nassau of the approach of the storm-center. During the day the barometer fell rapidly, with increasing northeast winds and heavy rain, and during the evening cable communication between Nassau and Jupiter, Fla., was lost. On the following day, August 12, the barometer fell rapidly at Jupiter, with wind increasing to a gale from the northeast, and by the morning of the 13th the barometer at that station had fallen to 29.22 inches and the wind had reached a velocity of 52 miles an hour. From the 14th to the 19th the storm-center drifted slowly northward and northeastward along the Atlantic coast, attended by severe gales and high seas from Florida to Virginia, after which it apparently passed eastward over the ocean beyond the region of land observation.

With data now available it is not possible to determine the intensity of this hurricane at various points along its course. During August 7 and 8 the character and extent of the destruction it caused will give it rank among the historical hurricanes of the Leeward islands, Puerto Rico, and Santo Domingo. During the period it occupied in advancing from Santo Domingo over the Bahama islands and thence northward off the Atlantic coast of the United States, no observations have been received which show the exact strength of the storm as measured by instrumental observations. Observations of this character, made

by shipmasters who encountered the hurricane, will furnish data for a later and more exhaustive report. In the meantime reports of disasters at sea are being multiplied, and when the history of this hurricane is completed the casualties it caused on land and sea will aggregate hundreds of human lives and millions of dollars' worth of property.

Owing to the special interest taken in Puerto Rico by the people of the United States, and to the fact that this island possessed the only fully equipped and regular reporting station of the Weather Bureau which occupied a position in the path of the hurricane, and near its center, an account in detail of the storm's characteristics will at this time be confined to data contained in instrumental records and reports rendered by the official in charge of the Weather Bureau office at San Juan. At San Juan the barometer began to fall at 10 p. m. of the 7th, and the lowest recorded reading, 29.23 inches, was reached at 8.30 a. m. of the 8th. The wind was variable, with occasional gusts during the night of the 7th–8th, and gradually settled into a gale from the northeast toward the morning of the 8th. The hurricane was at its height at San Juan between 7 and 9 a. m. of the 8th, when the wind velocity was calculated by the Weather Bureau observer at 85 to 90 miles an hour. The observer reports that practically no thunder and lightning attended the storm, only two flashes of lightning, and they were not severe, being observed by him. The rainfall was very heavy, a total of 6.37 inches falling, of which 4.18 inches fell from noon to 8 p. m. of the 8th. Ponce and the port of Ponce on the south coast were wrecked, with a loss of about two hundred lives and an aggregate property loss of at least $500,000. The estimated damage to property throughout the island is in the millions of dollars. Dwellings were destroyed and crops were ruined and the main body of the working population will be for a time dependent on the United States, their home government, for the necessities of life.

In conclusion, it seems proper to refer to the action taken by the United States Weather Bureau in giving warning along the line of its advance of the approach of the hurricane center. Immediately upon the receipt of the morning reports of August 7, when the storm was central east of Dominica, the central office of the Weather Bureau at Washington ordered, through Habana, Cuba, hurricane signals from Dominica to Puerto Rico, and the signals were carried to Santo Domingo the afternoon of the 7th. Messages containing information regarding the position and prob-

able course of the hurricane were sent to all Weather Bureau stations in the West Indies from Barbados to Cuba; and as the hurricane moved westward signals were ordered and advices were telegraphed to all Weather Bureau stations in the threatened districts and to Atlantic coast and Gulf ports and there given the widest possible dissemination. In fact, the warnings foreran the storm by a period which varied from a few hours at the easternmost Leeward islands to 36 and 48 hours at points along the South Atlantic coast and Gulf ports of the United States. That the warnings were prompt, accurate, and of almost incalculable value is universally acknowledged by owners and masters of vessels who by holding their vessels in port avoided a hurricane which, by the evidence of disasters and reports of disasters, was one of exceptional violence.

THE RETURN OF WELLMAN

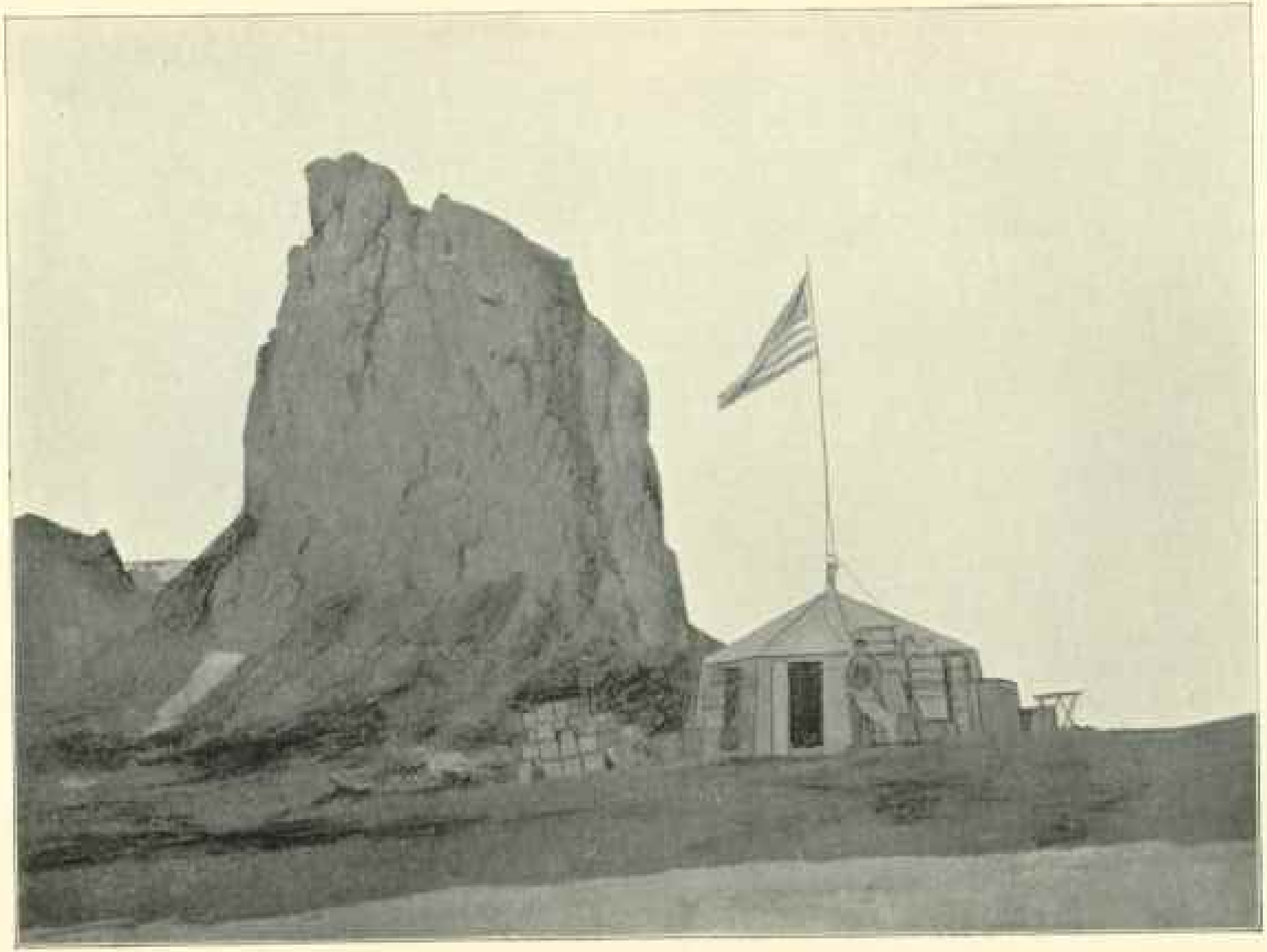
By J. Howard Gore,

Professor of Mathematics and Geodesy in the Columbian University

In the short article that appeared in The National Geographic Magazine for July, I mentioned three obstacles that might stand in the way of Mr Wellman's success in his attempt to reach the ultimate north. From the meager accounts that have reached us it appears that all three of these hindrances were encountered: a high latitude was not reached last year, the greater part of the expedition spending the winter at or near the point of debarkation and only two members of the party advancing northward; death carried away one of the best and strongest men and the leader himself was incapacitated by a serious accident; and, finally, a breaking up of the ice on which they were encamped caused a loss of a considerable part of the equipment.

Fortunately we are assured that some important discoveries were made in the neighborhood of Freedom island; possibly this means that the four or five islands already known were more accurately located and perhaps better delineated. It is to be hoped that magnetic observations were made during their winter sojourn, and that aurora displays were carefully noted. Such a series of observations might yield an adequate return for the outlay of capital, labor, and suffering.

WALTER WELLMAN



CAPE TROUTTOOFF — THE HEADQUARTERS OF THE WELLMAN EXPEDITION

The most pathetic incident that has reached us is the account of the lonely vigil of Bjoervig. We are told that he and Bentzen were spending the winter night alone in the outpost camp, nearly a hundred miles north of the main camp. Here Bentzen died—surely not from the scurvy, as anti-scorbutic food in abundance had been taken from Norway—and, with the inherent dread the Norwegians have of having bears feed upon their bodies, he evidently exacted from his companion a promise to preserve his corpse until the summer sun could loosen enough stones to form at least the semblance of a grave. Such a promise was made to be kept, and for two months the little tent-like hut sheltered the living and the dead. These two men during the days of preparation were always together. Both knew much of the dangers and labor that would soon confront them, and they worked with the common purpose to prepare to meet them. In the discussions and conjectures as to who would form the advance guard, all wished to be included, but all knew that these two would surely go; their fitness picked them out. And now Bentzen, the jolly, robust, energetic, noble-hearted man, has taken another and still longer step into the unknown, and Bjoervig has returned with the last messages of his companion and the memories of that long night of waiting. Such an example of fidelity almost merits the hardships of the Arctic for its procuring.

Now that Mr Wellman will soon be with us, it is better to await his story of what was accomplished, and content ourselves at this point with saying that if it speaks of failure in any form it will give positive proof that, under the circumstances, herculean efforts could not have yielded better results.

THE INTERNATIONAL CLOUD WORK OF THE WEATHER BUREAU

By Frank H. Bigelow,

Professor of Meteorology, U. S. Weather Bureau

In the month of May, 1896, several national meteorological services began in coöperation to take a series of simultaneous observations on the height and the motion of the ten standard types of clouds which have been defined by the International Committee. The object of this survey of the movements of the atmosphere, continued for at least one year, was to gather ma-

terial that could be used to determine the action of the higher strata with reference to the formation and the progressive motion of storms. Our observations are generally so exclusively made in the lowest level of the ocean of air that comparatively imperfect information exists regarding the higher currents upon which to found intelligent theories, and it is with the purpose of supplying this deficiency that the series of international observations was undertaken. By the liberal policy of the United States government the Weather Bureau was able to do its part of this work. The discussion of the data is now nearly finished for the report which it is expected to issue before the end of the present year. While it is not practicable to give any detailed account of the results, it may be interesting to have presented in THE NATIONAL GEOGRAPHIC MAGAZINE a brief synopsis of the scope of the report now being prepared by the writer.

The observations are divided into two classes: (1) The *primary*, which are made by means of two theodolites placed at the end of a long base line adapted to triangulations in the vertical direction. These give the *absolute* heights, velocities, and direction of motion of individual clouds; between 6,000 and 7,000 of such observations were made at Washington, D. C. (2) The *secondary*, executed with nephoscopes at fourteen stations distributed at nearly equal distances from each other over the districts east of the Rocky mountains, give the *relative* velocities and direction of motion, and with the help of the results obtained by the primary system can be translated into absolute values; there were 25,000 to 30,000 of these observations made in the United States.

The discussion of these data has been divided into a number of parts, of which the following may be mentioned in this connection: (1) The distribution of the cirrus, cirro-stratus, cirro-cumulus, alto-cumulus, alto-stratus, strato-cumulus, cumulo-nimbus, nimbus, cumulus, stratus, was so determined that we now know the average height of each type for every month in the year and the depth of the zone or horizontal belt in which they may severally occur. Thus the upper types are found in layers as much as six miles thick, though they form most frequently near the middle of their respective belts; the lower are thinner, and have some peculiar characteristics besides. When we consider that the height and shape of these belts, changing from month to month, indicates some very delicate physical process going on in the aqueous vapor of the atmosphere, it is easy to see that they become the best means for studying the

state of the pressure, temperature, and vapor tension—that is, the physics of the air itself. (2) A very important subject has been the determination of the direction and velocities of the horizontal motions of the air in each of the eight principal levels, on all sides of the anti-cyclones and cyclones, high and low areas of pressure, as they move over this country. These movements have been separated into two components, the first belonging to the general or undisturbed motion of the atmosphere-which is about eastward in this latitude, and the second to the local motions, which are gyratory and especially concerned with descending and ascending vortices or storms. These data give us for the first time definite information regarding storm components, and these enable us to look into the theories much more closely than heretofore. (3) This analysis has been supplemented by a compilation of cloud motions taking place in the cumulus or the cirrus levels, as derived from the Weather Bureau cloud charts collected during the past twenty years, the object of which is to show how the average anti-cyclone and cyclone are affected by the circulation of the air over different parts of the United States—that is, by the Rocky mountains, the Lake region, the Gulf of Mexico, and the Atlantic States—the results being exhibited on a series of colored charts.

These practical facts lead to the necessity of definite theoretical studies in order to account for them, and this again to several other lines of research: (1) The first thing was to prepare a system of standard constants and formulæ by a comparative study of the papers of several authors, and by the addition of such new demonstrations as seemed desirable, so that the work of many men in their several branches may be read as one consistent meteorological scheme. This standard system represents the outcome of several years' study of the subject. These formulæ include most of the thermodynamic or hydrodynamic conditions likely to arise on a rotating body surrounded by an atmosphere, like the earth. (2) Next, a completely new set of working tables, based upon these formulæ, has been prepared for the barometric reductions from one level to another; for studying with the greatest accuracy the exact conditions of pressure, temperature, and vapor tension at the level where a cumulus cloud base forms by the vertical convection, at the place where the hail forms, and at the level where the snow is produced, and finally for computing the dynamic forces and the gradients of motion according to the observed velocities. These tables are perma-

neatly useful to meteorology, and that they are needed is seen from the following considerations: The Smithsonian tables and the International tables are adapted for the reduction from elevations 2,000 meters or less to the sea-level; but in cloud-work it is necessary to reduce at will throughout a region up to 15,000 meters in height and with ranges of temperature from $+30°$ to $-60°$ centigrade, which is far beyond the limits of any existing tables. The Hertz diagram for adiabatic expansion leaves out the vapor contents of the air in parts of the formulæ, introducing errors as much as 0.30 inch in pressure. Besides, it is desirable to be able to start with surface conditions and compute upward in exact figures all the elements existing in the cloud, and also the gradients connecting one level with another.

Since the atmosphere differs very widely from the adiabatic laws, one of our problems is to discuss how much this departure is for all seasons of the year, and from these data we expect to study carefully the laws of solar insolation and terrestrial radiation—that is, the actinometry of the atmosphere—by means of this new and improved material. Finally, there are no tables published which are available for computing the dynamic forces indicated by the equations, and this is necessary if meteorology is to be made an exact science. (3) The possession of all this new matter enables us to analyze closely the Ferrel theory of the local cyclone and the German theory of the same, which differ from each other, and to show that they are both only ideal solutions of vortices and do not conform to the stream lines given by the observations. An attempt has been made to interpret the analytical equations of motion, so that they shall match the observed facts, and this leads to a different idea of the circulation in storms from that commonly taught by meteorologists. The application of the theory to tornadoes is certainly satisfactory, and in the case of hurricanes and cyclones it is on the whole very promising.

The new treaty between the United States and Japan went into effect on July 17. The main feature of the treaty is the abolition of the jurisdiction of the United States consular courts in Japan. Henceforth all the exceptional privileges, exemptions, and immunities formerly enjoyed by citizens of the United States, as a part of or appurtenant to such jurisdiction, will absolutely cease and all such jurisdiction will be assumed and exercised by Japanese courts.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The forty-eighth annual meeting of the American Association for the Advancement of Science was held in Columbus, August 19–26. While naturally not attended by as large numbers as was the jubilee meeting in Boston the preceding year, the work accomplished yielded even better results, as the more effectual organization and the limited number of papers read permitted the free discussion of nearly every subject presented. The purpose and work of the Association, and at the same time the achievements of modern science, are admirably reviewed in the following paragraphs from the opening address of the distinguished President, Dr Edward Orton:

"Alfred R. Wallace has recently made a careful inventory of the discoveries and inventions to which the progress of the race is mainly due, and he divides them into two groups, the first embracing all the epoch-making advances achieved by man previous to the present century, and the second taking in the discoveries and advances of equal value that have had their origin in the nineteenth century. In the first list he finds but fifteen items of the highest rank, and the claims of some even of this number to a separate place are not beyond question. They may not really be of epoch-making character. But he puts into the list the following, *viz.*: Alphabetical writing and Arabic notation, which have always been the two great engines of knowledge and discovery. Their inventors are unknown, lost in the dim twilight of prehistoric times.

"Coming, after a vast interval, to the fourteenth century, A. D., we find the mariners' compass, and in the fifteenth century the printing-press, both of which, beyond question, are of the same character and rank as alphabetic writing. From the sixteenth century we get no physical invention or discovery, but it witnessed an amazing movement of the human mind, which in good time gave rise to the great catalogue of advances of the seventeenth century, the most prolific of all the centuries antecedent to our own. To it we credit the invention of the telescope and, though not of equal rank, the barometer and thermometer, and in still another field the invention of differential calculus, the

all-important discovery of the attraction of gravitation, of the laws of planetary motion, of the circulation of the blood, of the measurement of the velocity of light. To the eighteenth century we refer the more important of the early steps in the evolution of the steam-engine and the foundation of both modern chemistry and electrical science. This completes the list. Counting all these inventions and discoveries as separate, we get sixteen. Wallace places the barometer and thermometer under one number, and makes a total of fifteen.

"In making such a list it is evident that the personal equation of the author undoubtedly needs to be recognized, and different orders of arrangement, even if the elements were the same, would be assigned by different students. At any rate, something like this is the list of what the race has gained in science since it first came to itself up to the year 1800. The greatest steps have certainly all been counted.

"And now what has the record been since 1800? How does the nineteenth century compare with its predecessors? A brief examination will show us that in scientific discovery and progress it is not to be compared with any single century, but rather with all past time. In fact, it far outweighs the entire progress of the race from the beginning up to 1800. Counting on the same basis as that which he had previously adopted, Wallace finds twenty-four discoveries and inventions of the first class that have had their origin in the nineteenth century against the fifteen or sixteen already enumerated of all the past. This is not the proper occasion to review, compare, and set in order the several elements of this glorious list, but let me simply recall to your minds a few of them.

"Of the same rank with Newton's theory of gravitation, which comes from the seventeenth century, stands out the doctrine of the correlation and conservation of forces of our own century, certainly one of the widest and most far-reaching generalizations that the mind of man has yet reached. Against Kepler's laws from the seventeenth century we can set the nebular theory of the nineteenth. The telescope of the seventeenth is overbalanced by the spectroscope of the nineteenth. If the first reveals to us myriads of suns, scattered through the illimitable fields of space, the second tells what substances compose these suns and maintain their distant fires, and, most wonderful of all, the direction and the rate in which each is moving. Harvey's immortal discovery of the seventeenth century finds a full equivalent in the

germ theory of diseases of the nineteenth. The mariners' compass of the fourteenth century easily yields first place to the electric telegraph of the nineteenth, while the barometer and thermometer of the seventeenth century are certainly less wonderful, though perhaps not less serviceable, than the telephone and phonograph of our own day.

"I need not pursue the comparison exhaustively, but in addition to the advances now enumerated the great doctrine of organic evolution, supported especially by the recapitulation theory in embryology, finds nothing to match with it in broadening and inspiring power in all the past history of the race. The same can be said of the periodic law of Mendeléeff in chemistry, of the molecular theory of gases, of Lord Kelvin's vortex theory of matter, of the glacial period in geology, and of the establishment of the origin and antiquity of man—all of our own century. Nothing can be brought from all the past to compare for one moment in direct application to 'the relief of man's estate' with the discovery of anæsthetics, while by his discovery of antiseptic surgery the name and fame of Sir Joseph Lister will grow to the last syllable of recorded time. In the mobilization of man and the giving to him of the freedom of the globe, the railways and steamships of our century are absolutely without any element for comparison in all that the past has left us.

"There are, however, three inventions and discoveries that we have inherited from the past, and that have been already named, two of them from some distant but unrecorded century and one from the darkness of the middle ages, which have proved so indispensable to all subsequent advances that it is impossible for even the nineteenth century to present anything that can be properly compared with them. I refer to the alphabet, Arabic numerals, and the printing-press. To this list might be added, perhaps, language and the use of fire. The factors I have named are presupposed in all modern progress. By the very necessities of the case they must have preceded the progress at which we have glanced.

"As I have before said, the nineteenth century is the century of science, and it is science, mainly physical science, that constitutes the proper object of this association. Our geographical name is wide, but the scope of our association is wider still. It deals with and is devoted to science, which is the best product of the best powers of the human mind—the human mind, created in the image of God and divinely inspired to interpret this

wonderful universe. This association marks the stage already reached in this interpretation, but in its very title it indicates that the work is incomplete; that it is still in progress.

"Its founders, fifty years ago, clearly saw that they were in the early morning of a growing day. The most unexpected and marvelous progress has been made since that date, but as yet there is no occasion and no prospect of an occasion to modify the title. We are still laboring for the advancement of science, for the discovery of new truth. The field, which is the universe, was never so white to the harvest as now, but it is still early morning on the dial of science. It is possible that we could make ourselves more interesting to the general public if we occasionally foreswore our loyalty to our name and spent a portion of our time in restating established truths. Our contributions to the advancement of science are often fragmentary and devoid of special interest to the outside world; but every one of them has a place in the temple of knowledge, and the wise master builders, some of whom appear in every generation, will find them all and use them all at last, and then only will their true value come to light."

The papers of geographic interest were principally read before the sections of Geology and Geography, Social and Economic Science, and Anthropology. Among such a large number of important and original contributions it is impossible to more than indicate the titles of the following:

Before the section of Geology and Geography: "The Pre-Lafayette (Tennessean) Baselevel," by W J McGee; "The Geology of Columbus and Vicinity," by Edward Orton; "The Cape Fear Section in the Coastal Plain" and "Some Geological Conditions Favoring Water-power Developments in the South Atlantic Region," by J. A. Holmes; "A Consideration of the Interpretation of Unusual Events in Geological Records," by Frederick W. Simonds. Before the section of Social and Economic Science: "Corn as a Factor in the Wheat Problem," by John Hyde; "The Increase in the Median Age of the Population of the United States since 1850," by Mansfield Merriman; "Trusts: A Study in Industrial Evolution," by H. T. Newcomb; "Moral Tendencies of Existing Social Conditions," by Dr Washington Gladden. Before the section of Anthropology: "A Comparative Study of the Physical Structure of the Labrador Eskimos and the New England Indians," by Frank Russell;

"Regarding the Evidences of Ancient Prehistoric Man in the Maumee River Basin," by Charles E. Slocum; "The Latest Discoveries of Traces of Glacial Man at Trenton, N. J., and the Light Thrown upon Them by a Comparative Study of the Gravels of the Delaware and Susquehanna Valleys," by G. Frederick Wright; "Report of Committee on White Race in America," by J. McKeen Cattell; "The Beginnings of Mathematics," by W J McGee. Among other papers of especial note may be mentioned: "Some Experimental Illustrations of the Electrolytic Dissociation Theory," by A. A. Noyes; "Some New Products of Maize Stalks," by H. W. Wiley and W. H. Krug; "On Some Piratine Bugs, which may be Responsible for So-called 'Spider-bite' Cases," by L. O. Howard.

A gratifying feature of the meeting was the generous gift of $1,000 by Mr Emerson McMillin, of New York City, who thus becomes a patron of the Association. The Association was extremely fortunate in its entertainment, for the local committee that had the arrangements in charge did everything in their power to contribute to the success and pleasure of the delegates.

G. H. G.

THE REDISCOVERY OF PUERTO RICO

The acquisition of the island of Puerto Rico as one of the consequences of the recent war with Spain threw at once upon the government the duty of providing for the safe navigation of the waters which wash its shores by supplying to the seafaring community reliable charts of its almost unknown coast. It was a reproach to the Spanish administration that this plain duty was so long neglected, although it is only fair to say that a resurvey of the islands was in progress at the outbreak of hostilities, which of course put an end to the work. Whether the new survey would have been entirely satisfactory may be doubted, but it would probably have been an improvement on the previously available information. The war, however, made the results of this work unavailable, as the records were carried to Spain. Since the task of furnishing at an early date trustworthy information in regard to the approaches to this one of our possessions devolved upon the U. S. Coast and Geodetic Survey, the superintendent of that service, Dr Henry S. Pritchett, took immediate steps to meet these new demands upon the resources of the organization.

The south coast of Puerto Rico, being the least known and having a larger number of ports than any other part of the island, was selected for the beginning of the work. The steamer *George S. Blake*, so well known to the scientific world from association with the researches of Professor Agassiz and from results achieved by Captain Sigsbee and others, was

fitted out for this duty and sailed from Baltimore December 27, Mr Hodgekins commanding. She arrived off Ponce early in January, and began work in that vicinity by the measurement of a base line and the development of a scheme of triangulation along the south coast, to serve as a basis for the topographic and hydrographic surveys which were simultaneously in progress. An astronomical azimuth was also measured near Ponce, to insure the correct orientation of the work. In the beginning of the survey, the western point of the bay, which forms the port of Ponce, was taken as the western limit of the detailed work, which was thence carried to the eastward toward Jobos and Arroyo. At the end of March the work on the south coast was temporarily suspended in order to comply with a request from the Navy Department for a detailed survey of the important harbor of San Juan. The survey of the entrance and the principal part of the harbor was completed before the end of April, and the results are shown on a large-scale chart which is about to be issued to the public, blue-print copies having been furnished to the naval authorities at San Juan. This survey verified the important fact that the depth of water on San Juan bar is thirty-five feet, instead of twenty-four, as previously reported. Returning to the south coast, the *Blake's* company spent the month of May in completing the survey of Port Jobos and approaches of Arroyo bay. Point Viento was the most eastern point reached by the triangulation and topography, and here the season's work was closed.

Perhaps the most interesting feature of the information obtained during the season is the careful development of the haven known variously as Port Aguirre, Port Jobos, or Boca del Infierno, previously described by Mr O. H. Tittmann in THE NATIONAL GEOGRAPHIC MAGAZINE (vol. X, p. 293). The *Blake* found here a good harbor of refuge with a wide and deep entrance and anchorage of sufficient depth for any vessel. The upper portion is somewhat difficult of access and not so deep as the lower anchorage, but is still of considerable value and may in time, under the stimulus of American energy and capital, develop into an important port. Of the south coast of Puerto Rico in general it may be said that though there are real dangers to be avoided, they are less to be dreaded than the uncertainty engendered by the old and inaccurate maps. Knowing the true location of the shore line and of the few outlying reefs, navigation along this coast becomes very easy and perfectly safe.

A curious circumstance developed by this survey is the fact that the island seems to be considerably smaller than has been supposed, at least if one can safely generalize from the experience of one season. According to previous information, Point Viento is about fifty miles east of Ponce, but the actual distance was found to be about seven miles less. If this "shrinkage" should be found to extend to other portions of the island, it would make a considerable decrease in the area of the island from the figures usually stated.

THE Harriman Alaska expedition returned to Seattle July 31, after having traveled 1,000 miles in 78 days. The expedition proved most successful, discovering a new bay, several new glaciers, and bringing back an immense treasure of specimens of birds, plants, animals, etc.

THE WELLMAN POLAR EXPEDITION

Mr Walter Wellman on his arrival in England has issued a brief statement of the experiences of his party in Franz Josef Land during the past twelve months. The expedition, it will be remembered, left Tromsö June 26, 1898, but, owing to the large amount of ice barring the way, was unable to gain Cape Tegetthoff, its headquarters, before July 30. Mr Wellman is reported to have said:

"Desiring to push further north with the greatest speed, I dispatched Mr Baldwin August 5 with the Norwegians, sledges, dogs and boats, myself and others intending to follow in a few days. Shortly after Baldwin's departure I discovered that, owing to a sudden break-up of the ice, I was unable to proceed, but I sent two Norwegians to inform Baldwin to build his outpost, leave two men in charge of it, and return to my headquarters." Meanwhile Mr Baldwin had pushed on to latitude 81, where he built the outpost, and, leaving the two Norwegians, Bentzen and Bjoervig, in charge, rejoined Mr Wellman at Cape Tegetthoff late in October. Here they all passed the winter in the Harmsworth House, which was completely buried with snow. On February 18, 1899, Wellman, with the Norwegians, started north, but on reaching the outpost found Bentzen dead. Mr Wellman continues:

"After a delay of ten days the party, including Bjoervig, pressed north in sledges, and by March 20 reached 82 degrees, east of Rudolf island. The prospects were most reassuring. We had three months of the best season before us and we were confident of reaching 87 degrees. Though, of course, we had suffered from cold, we were all in fine form.

"Then a seemingly trivial accident turned the satisfactory advance into a precipitate retreat. While struggling with the sledges in rough ice, my right leg was bruised and sprained by my falling into a snow-hidden crevice. For two days I went on and, had other circumstances not occurred, I should have pressed onward so far that I should never have been able to return alive. At midnight on March 22 we were awakened by the crashing of the ice under our feet. It swayed and deep crevices yawned about us. Several dogs and sledges were crushed. In the darkness and storm it was impossible to see a path of safety. Expecting to be overwhelmed at any moment by the ice, we scrambled over the field of ice and saved most of our equipment except the dog food, reaching a place of safety in half an hour. Our brave Norwegian comrades did not express the slightest fear. While it was possible to go on for a time, my leg now demanded a retreat. For two or three days I stumbled along until I fell. There was nothing to do then but get on a sledge and be dragged back to headquarters by the men and dogs. Forced marches by my devoted comrades saved my life.

"The point at which we turned back was twenty-five miles northwest of the Freedom islands, where Dr Nansen landed in 1895. North of these

islands we photographed three islands and some large land, unseen either by Payer or Nansen. We also found that Payer's so-called Dove Glacier does not exist. I still believe it is possible to reach the Pole by Franz Josef Land, but I cannot say if I shall make another effort."

After Mr Wellman's return to the Harmsworth House, on April 9, Lieutenant Baldwin and four Norwegians went out to Wilczek Land, charting the unexplored east coast and discovering a new ice-covered island, extending to 64 degrees east, almost as large as Wilczek Land. They named it Graham-Bell Land in honor of the President of the National Geographic Society.

THROUGH FRANZ JOSEF LAND

The Duke of the Abruzzi, whose departure from Christiania on the *Stella Polare* has been announced, reached Archangel in July, where he was accorded a magnificent reception by the Russian garrison. Unlike Nansen, who sought to approach the Pole as near as possible upon his ship, either by sailing through an open sea or by drifting when bound in the ice, the Duke of the Abruzzi will watch for a favorable moment to gain a creek or port suitable for wintering and for serving as a base. The intention of the prince is to advance across Franz Josef Land and from his base, at intervals of two or three days' march, to establish a series of depots or caches of provisions extending toward the Pole. *Le Tour du Monde* contains the following interesting account of his plans and equipment: "The baggage of the expedition has been distributed among 1,500 boxes, each weighing about 55 pounds, and thus in case of need easily portable upon a man's back. The boxes are divided into four classes: provisions; clothing and equipment; tools and scientific instruments; and, lastly, articles that are useful but not indispensable. Each class has its own special color and each box is numbered according to the class and the nature of its contents. The provisions—rice, sea biscuit, preserved or salted beef, etc.—have been so divided that each box contains five different kinds of food, in order that the fare may in no extremity be reduced to one article of food. Each chest is lined on the inside with tin and soldered to keep out water and dampness. The boxes containing the clothes are of a bright green, those containing the scientific apparatus red, while the boxes containing the useful but not indispensable articles are yellow. Among the latter are playing-cards, dominoes, a guitar, a graphophone, a phonograph, and an æolian with a generous and varied repertory, including *Cavalleria Rusticana*, *Lohengrin*, *Tannhäuser*, *Don Juan*, and dance music. The party expect to return in eighteen months. Of the total expenses, estimated at about $575,000, the King of Italy has contributed one-fourth." The main purpose of the Duke of the Abruzzi is the thorough exploration of Franz Josef Land. If the conditions are favorable, however, he hopes to reach a point farther north than any previous explorer, and perhaps gain the Pole itself. The *Capella* reports meeting the *Stella Polare* August 9, headed for northwestern Franz Josef Land.

THE ISTHMIAN CANAL PROBLEM

A careful reading of Mr Nimmo's article on "The Proposed Interoceanic Canal in its Commercial Aspects," in the August number of THE NATIONAL GEOGRAPHIC MAGAZINE, brings to light various errors in statement which seem to require early attention. Two of these seemed to me of such importance as to warrant careful inquiry with a view to early correction:

1. On page 299 the distances from Manila to New York and London are tabulated as follows:

	Nautical miles.
From Manila to New York:	
Via Suez Canal	11,565
Via Nicaragua Canal	11,746
From Manila to London:	
Via Suez Canal	9,600
Via Nicaragua Canal	14,680

In reply to specific inquiry, the Acting Superintendent of the U. S. Coast and Geodetic Survey writes, under date of August 15, 1899, that these figures were given Mr Nimmo on June 10, 1898, but adds:

> "The distances then furnished . . . . are in error, the measurements having simply been taken from charts.
>
> The true distances are:

Manila to New York:	Nautical miles.
Via Suez Canal	11,566
Via Nicaragua Canal	11,678
Manila to London:	
Via Suez Canal	9,587
Via Nicaragua Canal	13,708

> I regret that the error was not discovered before the publication of the article by Mr Nimmo."

2. Still more seriously misleading is the tabulation on page 303 designed to prove that "Sailing tonnage is fairly holding its own in the ports of the globe," despite the fact that the figures are ostensibly correct. This is indicated by the paragraph in the "Report of the Commissioner of Navigation" for 1898, page 11, in which the figures quoted by Mr Nimmo are published; this paragraph is as follows:

> "The increase in steam tonnage is both real and apparent. In the last annual report of the Bureau the statement was ventured that on June 30, 1898, "steam tonnage, for the first time in our history, will exceed the combined tonnage of sailing vessels, barges, and canal-boats." The actual figures are: Steam vessels, 2,371,923 tons; all others, 2,377,815 tons. The removal of 62,000 tons of steam vessels from the merchant list by purchase for the government could not have been foreseen."

Moreover, although the figures are ostensibly correct, they are really incorrect, in that Mr Nimmo's "tonnage of sailing vessels" corresponds

to Commissioner Chamberlain's "all others," which includes a tonnage of 541,988 in canal-boats and barges; so that the figures should read, steam tonnage 2,371,923, sailing tonnage 1,855,857.

It is especially deplorable that the several errors should lie in a single direction—a direction supporting argument against the Nicaragua Canal.

W J McGee.

GEOGRAPHIC LITERATURE

The Tides and Kindred Phenomena in the Solar System. By George Howard Darwin. Boston and New York: Houghton, Mifflin & Co. 1898. Pp. xviii + 378.

Professor Darwin is the son of the great naturalist and himself a distinguished mathematician. In the present volume he appears as the mathematician explaining in every-day speech a subject that has elsewhere no such treatment in our language. In this rôle he is as successful as he seems to be diffident. Despite the disadvantage of the lecture form, the book is extremely readable and interesting. Any one who has looked through the non-mathematical literature of tides is familiar with the crude explanations found in encyclopedias and hand-books of astronomy and geography, where the moon is made to lift the ocean on the side of the earth next her away from the earth, while also lifting the earth away from the ocean on the further side—a statement true in a way, but quite unintelligible until amplified. To such the present volume will prove most welcome.

Professor Darwin gives admirably lucid accounts of the equilibrium and dynamic theories, besides pointing out clearly the failure of mathematics to grasp the whole problem of the actual tides. The book contains certain general tidal information, an exposition of the mathematical theory, analysis and prediction of oceanic tides, and an excellent account of tidal friction as an element in cosmogony. Forel's unique unmathematical work on the seiches of Lake Geneva receives a merited tribute and its first presentation in English.

Tides in rivers is the somewhat broad title to the account of bores. A gem of simple comprehensive statement is one of the several views of tide-raising forces: "If every particle of the earth and of the ocean were acted on by equal and parallel forces, the whole system would move together and the ocean would not be displaced relatively to the earth; we should say that the ocean was at rest. If the forces were not quite equal and not quite parallel, there would be a slight residual effect tending to make the ocean move relatively to the solid earth. In other words, any defect from equality and parallelism in the forces would cause the ocean to move on the earth's surface" (p. 104). The whole treatment of the tide-raising forces in both theories is very successful. Use is made of W. M. Davis' suggestion of absolute equality of centrifugal forces in every part of the earth. As gravitation varies with the square of the distance, residuals of excess and defect appear which are the tide-raising forces. This presentation Professor Darwin illustrates

with an arrow diagram, which is surely the simplest possible method of showing the equality of the centrifugal forces. The diagram and explanation of horizontal components of the tide-raising forces is equally simple and lucid. For the dynamic theory motion in the masses subjected to periodic impulses is the feature of actuality not contemplated in the equilibrium theory.

In a continuous equatorial canal of some 13 miles' depth we should have free oscillations that would pass around the earth with the moon. In less depths, and our oceans are much shallower, the wave would go slower. Thus the moon's periodic impulse is quicker than the free oscillation, and the resultant oscillation is inverted with low water always under the moon. About such a state of affairs occurs in the Pacific, and it is completely opposed to the equilibrium view. The fact that the Pacific is not an equatorial canal, however, forbids us to account this theorem as more than a suggestion. For regions where the tide follows the moon by irregular intervals Professor Darwin seems to fall back on Whewell's abandoned cotidals. Here we are beyond the grasp of mathematical treatment. Tides in canals or on a uniform ocean-covered globe admit of analysis, but the actual geographic problem has not been solved; even a large lake is of doubtful solution (p. 185). Ferrel declares his conviction that an equatorial dike across the Atlantic, though barring out all waves from the southern ocean, would not alter the actual tides of the North Atlantic. Darwin seems to consider the wave from the south as more significant than the local tide. "It may be conjectured that on the coast of Europe the latter is of less importance than the former" (p. 188). The whole subject is full of conjectures at this point. "The problem is one of insuperable complexity" (p. 188). Dr Whewell was obliged to abandon his famous chart of cotidals in 1836 on two grounds: (1) the excessive contouring of well-determined cotidals, and (2) the great difference of epoch of the diurnal wave in Europe and America, together with the identical epoch in Spain and at the Cape of Good Hope, supposed to be separated by a long journey up the Atlantic. No answer has ever been made to this objection, yet Professor Darwin again appeals to this cotidal chart abandoned by its author in the second year of its age, since copied in innumerable hand-books, and made responsible for the mythic birth of the tide in the Pacific.

One fancies that the author found the closing chapters, dealing with the rôle of tidal friction in the universe, most pleasant to write. Here Professor Darwin is peculiarly in his own domain, and his exposition is of the happiest. Looking back to days when the earth was still a glowing, fluid mass, we are made to see its molten tides rising toward the moon and struggling against the friction of particle on particle. In this way somewhat delayed, flood height is only reached when the earth's rotation has carried it somewhat forward past the moon. This high-tide protuberance pulls the moon forward in its orbit, which is thus enlarged and the month lengthened. At the same time the moon, striving to keep the tide crest under her, resists the earth's rotation and prolongs our day. Longer and longer grow both day and month, though at unequal rates, and must do so, even under the slighter impulse of the present

purely oceanic tides; until in the distant future both shall come to an equality, with a length of 55 of our present days. An important point in the proof that oceanic tides would affect the day and month in the same sense as the tide in the plastic mass is given us as a "fact" (p. 269). The author's success in putting mathematical argument into plain English compels one to regret that he did not attempt this point also. To look back is to see that day and month must once have been shorter than now. Indeed, an early date sees them again equal and but four or five of our hours long. The moon then swung in so small an orbit as almost to graze the earth, suggesting its origin by rupture of a parent body under the indefinitely growing amplitude imposed on the solar tide wave by that rotation period. Confirmation is found in the present elements of the lunar orbit.

If such a history is not inferred for the satellites of other planets, we at least see the influence of solar tides in checking or delaying birth of satellites for the nearer planets and in their coincidence of month and day. Saturn's stony meteor rings lie just within the distance where the planet's tide-raising force would shatter a small satellite to fragments. Nebulæ and binary stars are scanned and illuminated with the light of this tide-raising force, which is seen to produce far-reaching results throughout the universe.

M. S. W. J.

From Sea to Sea. Letters of Travel. By Rudyard Kipling. Two volumes. New York: Doubleday & McClure Company. 1899. Pp. 380. $2.00.

These two volumes, containing the letters of travel in India, Burma, Japan, and the United States, together with sketches of Calcutta and Lahore life, are published under the author's private seal of the sacred *Swastika* as a defense and protest against unauthorized editions which had appeared in this country. Mr Kipling has edited and revised the matter, and, as he has revisited Japan and resided for several years in the United States since the letters of travel from those countries were written, it may be presumed that there have been modifications.

Although written from the Anglo-Indian standpoint for Anglo-Indian readers, nothing could be more enjoyed by the globe-trotter, whom he so openly despises and ridicules, than Mr Kipling's accounts of his visits to out-of-the-way places in the native states of India. These letters are plainly the note and sketch book from which came many scenes of "*the Naulahka*." The *dak bungla* at Joohpur, with its trusting commercial travelers, is easily recognized; also the deserted ruins of Chitor and the dreadful "dull, blue tank sunk between walls of timeless masonry," and yet Boondi's intricate, rock-wrought palace, with the hanging gardens, its courts and gates, and everywhere the unseen eye of the zenana women. "The howling globe-trotters," who infest India in the cold weather to Mr Kipling's discomfort, will not be inclined to follow him to these places of strong local color and acute discomfort; surely not that globe-trotter who pronounced "Jeypore" with an "accent on the first syllable, if you please," to the derision of Mr Kipling.

Yet, when turned an "insolent globe-trotter himself," Mr Kipling glibly

drops whole syllables from Japanese geographic names, and refers to Kobé—accent on the last syllable, if you please—which puts him worse than level with the poor couple, who may have since revisited Jeypore, and put the accent where it does not offend the Anglo-Indian ear. But this, and even the moving of Stampede tunnel a few hundred miles across country, from the Cascade range to the Rocky mountains, we could forgive him ten times over if he would not employ the low and offensive sailors'-boarding-house term "Jap" for Japanese. There are people, "masses," in fact, who habitually use the abbreviations Brit and Yank and Jap, gent and pants and bike, but surely Mr Kipling, certainly in his serious, his editing and revising moods, is not of these. That pigeon-English abomination of "Chinaman" for Chinese is lapse enough. His guardian, Ganesh, whom he freely invokes, should prevent him from ever writing "Jap" again.

All trifles aside, nothing could be more brilliant, more clearly, cleverly photographic than these letters of travel, and no one has ever in such brief chapters gone to the spirit and the genius of the new countries and new people he found in his travels. His description of dank, chilly, fog-pressed Hongkong in April is the perfect thing, and also that inevitable amazement, that hesitating confession of chagrin of the Anglo Indian when he discovers and admits the superiority of the Chinese to the Hindu, when the Anglo-Indian has always considered that India, mere middle Asia, was all Asia, the real East, the Far East an unconsidered incident.

"They will overwhelm the world. . . . Neither at Penang, Singapur, nor this place have I seen a single Chinaman asleep while daylight lasted; nor have I seen twenty men who were obviously loafing. All were going to some definite end—if it were only like the Coolie on the wharf, to steal wood from the scaffolding of a half-built house. . . . Where he hides his love of art the heaven that made him out of the yellow earth that holds so much iron only knows. . . . It grieves me that I cannot account for the ideas of a few hundred million men in a few hours. This much, however, seems certain: If we had control over as many Chinamen as we have natives of India, and had given them one tithe of the cosseting, the painful pushing forward, and studious, even nervous regard of their interests and aspirations that we have given to India, we should long ago have been expelled from or have reaped the reward of the richest land on the face of the earth. . . . The great big lazy land that we nurse and wrap in cotton-wool and ask every morning whether it is strong enough to get out of bed seems like a heavy, soft cloud on the far-away horizon, and the babble that we were wont to raise about its precious future and its possibilities no more than the talk of children in the streets, who have made a horse out of a pea pod and match-sticks and wonder if it will ever walk. . . .

"And you think, as you go to office and orderly room, that you are helping forward England's mission in the East. 'Tis a pretty delusion, and I am sorry to destroy it, but you have conquered the wrong country. Let us annex China."

Never was there truer description of Canton than this: "Do you know those horrible sponges, full of worms, that grow in warm seas? You

break off a piece of it, and the worms break too. Canton was that sponge. . . . Hongkong showed me how the Chinaman could work. Canton explained why he set no value on life. The article was cheaper than in India. I hated the Chinaman before; I hated him doubly as I choked for breath in his seething streets, where nothing short of the pestilence could clear a way. . . . The Hindu is a sanitating saint compared to the Chinaman. . . .

"The march of the Mongol is a pretty thing to write about in magazines. Hear it once in the gloom of an ancient curio shop: hear the tramp of the feet on the granite blocks of the road, and the breaking wave of speech that is not human! Watch the yellow faces that glare at you between the bars, and you will be afraid, as I was afraid."

After five days' study Mr Kipling gave up that "oilskin mystery, the Chinaman," and sought the secrets of Hongkong's wealth and splendor, that magnificent city of truly palaces by the sea, to which "Calcutta is but a hamlet;" and then he took ship to Japan, where all of his finer and poetic susceptibilities were aroused, and everything—the landscapes, houses, men, women, little children, and works of art—is exquisitely transmuted into phrases by the magic of his mind. "I was satisfied. . . . Fujiyama was exactly as I had seen it. . . . I would not have sold my sight of it for the crest of Kinchinjunga, flushed with the morning. Fujiyama is the keynote of Japan. When you understand the one you are in a position to learn something about the other."

His praises fall justly and discriminatingly, and his description of old Hari Shin's remarkable conglomeration of a curio shop in Kobe and of that "blackwood cabinet" in Kioto, where Namamikawa creates his wonderful cloisonné enamels, are not better in their way than his summing up of Osaka castle: "Castles in India I know, and the forts of great emperors I had seen, but neither Akbar in the north nor Scindia in the south had built after this fashion—without ornament, without color, but with a single eye to savage strength and the utmost purity of line."

"The Chinaman's a native; that's the look on a native's face; but the Jap isn't a native, and he isn't a sahib, either." There Mr Kipling met the greatest puzzle of the Far East, and, like scores of the globe-trotting and all other kind, left before he had solved the racial enigma. "Japan is a great people," he finally says. "Her masons play with stone, her carpenters with wood, her smiths with iron, and her artists with life, death, and all the eye can take in. Mercifully, she has been denied the last touch of firmness in her character which would enable her to play with the whole round world. We possess that—we, the nation of the glass flower-shade, the pink worsted mat, the red and green china puppy dog, and the poisonous Brussels carpet. It is our compensation."

Before he reaches California Mr Kipling found that "the American is objectionable; and yet how pleasant in every way is a nice American whose tongue is cleanest of 'right there,' 'all the time,' 'noos,' 'revoo,' 'mound,' and the Falling Cadence."

In slight, unconscious reprisal Hon. T. B. Reed, interviewed last this same month in London, avers that England would be a nice place if all Englishmen did not all the time use the Rising Inflection.

Of all letters of American travel Mr Kipling's are distinctly the most entertaining, and with the same "cocksureness" of which he accuses "the hideously versatile American" he settles conclusions as to our police and politics, commercial morality, social customs, railroads, and army. Regarding the latter, some of the visitor's comments are most truthful and the more cutting and hurtful to American vanity. The citizen's scorn and contempt for the soldier he had instance of daily in Yellowstone Park, where he saw good examples of "that Regular Army, which is a dear little army. . . . It's too tiny to be a political power," etc., etc.

His sketches of the headquarters settlement of the East India railway, of its coal fields and shops, of the Ghazipur opium factory, and of the sample sitting of the Calcutta municipal council are such perfect bits of his own best vein that one only complains that the volumes are so small. One must wish that he would write more letters of travel, more letters from Burma, from China, from Japan, from America, since these few are but foretaste and aggravation to the admirers of the greatest genius ever cradled by the *Allahabad Pioneer*, that nursery of talent in whose columns Swinett and Marion Crawford and others in an earlier day first tried their wings.

E. R. S.

Porto Rico and the West Indies. By Marguerita A. Hamm. New York: F. Tennyson Neely. Pp. 230, with half-tone illustrations. $1.25.

Among the many hastily published books on Porto Rico this excels all others in its descriptions of the social and domestic life of the people of the island. If one will overlook the cheap press-work and inferior illustrations and close his eyes to a few glaring misstatements, he will find this to be a charming and readable work. Miss Hamm possesses strong literary and descriptive ability and the feminine art of seeing those little traits of domestic life and human nature which have escaped the observation of the scientist, soldier, and newspaper correspondent in Porto Rico. Furthermore, her tone is sympathetic and appreciative. She has made an excellent compilation of the natural features of the island, but this is unfortunately marred by many mistakes which careful editing would have avoided. She adds some 2,000 feet to the height of the mountain summits, tells us that the island has been uplifted 25 feet in 25 years, talks about "mineral guano of the Tertiary period" and "the granite rocks of the island," which do not exist; described the aborigines as Caribs, and reintroduces us to our quondam friend, "the coral insect." These defects are fully compensated for, however, by her most entertaining and charming descriptions of the habits and customs of the Borinqueniane.

ROBERT T. HILL.

Hawaii: Our New Possessions. By John R. Musick. With Fifty-six Full-page Plates. New York and London: Funk and Wagnalls Company. Pp. v + 534. $2.75.

This addition to the growing literature on Hawaii is a sumptuous specimen of the bookmakers' art, being well printed, fully illustrated, and tastefully bound. The volume is largely a record of personal experiences on the part of the author, and is written in an agreeable vein by one pos-

sessed of a ready appreciation of the picturesque. The descriptions of scenery are accurate in most particulars, so that a good idea of this "Paradise of the Pacific" can be gleaned from the pages of Mr Musick's book. The much mooted "missionary" question receives considerate treatment by the author, and, as intimately connected with the same subject, the lepers of Molokai are described and illustrated more fully, perhaps, than has been done by any other recent writer on the subject. The customs, habits, and manners of the native Hawaiian are portrayed with a delicate pen, the opinion being expressed that "though the Hawaiian is a failure at the head of business, lacking the power to direct and control, he makes a trusty and faithful clerk." Of course the famous volcano of Kilauea receives a due share of attention, and the description of a visit to the celebrated extinct crater of Haleakala, "House of the Sun," is well written. Much space is taken up with a full and fairly unbiased account of the political events which precipitated and accompanied the overthrow of the monarchy, and a clear idea of those incidents is here given for the first time to the American reader. The illustrations are well chosen and artistically executed, and a careful index adds to the intrinsic value of an interesting book. The reading world is to be congratulated on the appearance of a volume pleasantly written and devoid of many of the blemishes to which the subject seems especially liable. While the actual and valuable geographic and scientific knowledge of Hawaii is not materially increased by the author, a fairly accurate description of the islands is presented.

HARRIE WEBSTER, U. S. N.

Ruins of the Saga Time: Being an Account of Travels and Explorations in Iceland in the Summer of 1895. By Thorsteinn Erlingsson, on behalf of Miss Cornelia Horsford, Cambridge, U. S. A. With an Introduction by F. T. Norris and Jón Stefánsson, Ph. D., and a Résumé in French by E. D. Grund. London, 1899. 8vo, pp. 1–112 and map.

As known through various publications, Miss Cornelia Horsford has undertaken researches relating to the early Norse discoveries in America. The inquiries have been taken up and pursued with great vigor and in a notably comprehensive manner, and the work has differentiated into several lines. Among these are (1) studies of the Sagas, (2) investigation of pre-Columbian and early post-Columbian cartography, (3) critical examination of artificial structures and other relics in eastern Massachusetts, and (4) comparison of these relics with the known products of the Norsemen in Iceland, Scandinavia, and elsewhere. Considerable portions of the work are conducted by Miss Horsford in person, frequently with the aid of expert archeologists; other portions are performed by experts under her directions and auspices. Certain summary results appeared in her article in THE NATIONAL GEOGRAPHIC MAGAZINE for March, 1898, while some of the details were derived from the work in Iceland, which is described at length in the recently issued memoir. The publication bears the stamp of the Viking Club of London. W J M.

THE Instituto Geologico de Mexico in its eleventh bulletin publishes a detailed list of the minerals and mines in the Republic.

GEOGRAPHIC MISCELLANEA

An institution for the study of tropical diseases will shortly be erected in Hamburg by the German government.

The Japanese government has decided that all children must be vaccinated before the age of ten months; the first revaccination is to take place at six and the second at twelve years of age.

The *Scientific American* announces that the ground on the shore of Botany bay, New South Wales, where Captain Cook landed 120 years ago, was recently formally opened as the "Captain Cook Reserve."

Prof. J. B. Hatcher, of Princeton University, has returned from a successful expedition to Patagonia, where he has been making extensive researches in geology and palæontology during the past eight months.

"A Fossil Egg from South Dakota," by Dr O. C. Farrington, vol. I, No. 5, Geological Series, Field Columbian Museum, describes what is believed to be the petrified egg of an Anatine bird of the early Miocene age.

The *Independent* states that Lieut. Hjalmar Johansen, Nansen's only companion on his sledge journey, has written a narrative of the fifteen-month trip after leaving the *Fram*, entitled "With Nansen in the North."

The American Geologist for August contains two articles of special note: "Glacial History of the New England Islands, Cape Cod, and Long Island," by Warren Upham, and "The Evolution of Climates," by Marsden Manson.

The expedition equipped by the Liverpool School of Tropical Diseases for the study of malaria in Sierra Leone sailed recently from the Mersey. Freetown will be the center of experiments with special regard to Major Ross's theory that malaria is propagated by mosquitoes.

A cablegram from Valparaiso, Chile, early in August described a tidal wave of unusual violence at that place. It is quite possible that the wave arrived at Valparaiso from Mauna Loa, in which case it would also be felt at some other points on the Pacific coast, as far north as Alaska.

Mount Dawson, a peak of the Selkirks hitherto unclimbed, has been ascended by Professor Charles E. Fay, of Tufts College, and H. C. Parker, of Columbia University, members of the Appalachian Club. Mt Dawson is the highest of the Selkirks thus far ascended, being about 10,000 feet above sea-level.

Nature states that the magnetic observatory at Vienna has had to be discontinued in consequence of the electric tramways and electric light wires. The Austrian government is now considering plans for a new observatory, to be situated at some distance from Vienna and to be provided with instruments of the latest construction.

It is stated on the authority of a Finnish official that the Czar's desire to connect the Finnish and Russian railways and at the same time effect economy necessitates the abandonment of the project for a railway connecting with Sweden and Norway, which was approved by the Finnish

senate. The Finnish railway will be connected with the Russian system by bridging the Neva.

The projected ship canal from Georgian bay to Montreal would mean a saving of 725 miles in the transportation of grain from Chicago to Liverpool. The canal would run from Georgian bay eastward through the French river to Lake Nipissing, thence through a small tributary to the Ottawa river, and on to Ottawa and the St Lawrence. All but 20 miles is open river and lake waters.

The schooner *Julia E. Whalen* has returned to San Francisco from a cruise to the Galapagos islands, west of Ecuador. The vessel carried the scientific expedition sent out last autumn by Leland Stanford University, under the patronage of Timothy Hopkins, of San Francisco. It is reported that a splendid collection of specimens of live land tortoises, birds, fish, etc., has been brought back.

Twenty six-wheel connected side-tank locomotives were built recently at the Richmond Locomotive and Machine Works for the Swedish state railways for use north of the Arctic circle. While they have a foreign appearance, they are built strictly in accordance with American practice, with a few exceptions, the most notable of which are the copper fire-box and copper hollow water-space stays.

A party from the U. S. Coast and Geodetic Survey is now engaged in gathering information on Long Island sound for a new supplement that is soon to be issued of the Coast Pilot Chart. Four topographic and three hydrographic parties are also at work near the head of the Chesapeake bay, and, at the request of the Navy Department, special examinations are being made near Governors Island, New York harbor, and at Pollock Rip, off Cape Cod.

André and His Balloon, by H. Lachambre and A. Machuron, who accompanied the expedition to Spitzbergen, recently published by Archibald Constable, Westminster, England (crown octavo, $1.50), describes the inception and preparation of André's hazardous enterprise. The book also contains a brief biography of André, about whom comparatively little is known in this country, and is beautifully illustrated by 40 full-page cuts from photographs taken by the authors.

Ten maps recently issued for gratuitous distribution by the U. S. Geological Survey embody the results of the explorations and surveys made by the parties sent to Alaska in 1898 by the War Department and by the Survey. The maps are a convenient compilation of recent Alaskan surveys, and also a summary of our present geographic knowledge of the country. Application for them can be made either to Senators or Representatives or to the Director of the U. S. Geological Survey.

During the past ten years a fuller recognition of the place of the great circle route in the problem of accelerating ocean transit has stimulated an advance to methods by which great circle courses can be taken from the Solar Azimuth Tables or measured from the chart compass with very great facility. These new developments have been recently incorporated in a second edition of *The Development of Great Circle Sailing* by G. W. Littlehales, issued from the U. S. Hydrographic Office as Bulletin No. 90.

"THE Geographic Board of Canada," which was created December, 1897, to bring about uniform usage and spelling of geographic names in Canada along the lines followed by the "U. S. Board on Geographic Names," has recently published its first annual report, covering the calendar year of 1898. The report, which is mainly a history of the organization of the Board and a statement of the rules of nomenclature that will be followed, contains a list of some 600 names approved by the Board.

WHILE recognizing that forecasts based upon legitimate data cannot be regularly made for a period greater than forty-eight hours in advance, the Chief of the Weather Bureau is encouraging the forecast officials to give to the public all information regarding unusual and severe types of weather permitted by their reports and experience. During periods of intense heat or cold or in the presence of drought or continued rains, information bearing upon the indicated duration of existing conditions is at times of incalculable value to the agricultural and commercial interests and also to the public at large.

THE Alaskan parties that have been in active operation since July 1 have made material progress on the hydrography of the Yukon River bar and on the topography of the Copper River country. Detachments are also operating in the vicinity of Stuart island and Scammon bay, the former developing the 3-fathom curve around the island and through the passage between it and the mainland, and the latter making an examination with special reference to a harbor in the vicinity of Cape Dyer. Some of the Alaskan work is reconnaissance and of a preliminary nature. Most of it bears on the important question of shortening the sea route to the Klondike.

THE War Department has in contemplation a general improvement of the roads and highways in Cuba, and orders will be issued shortly to General Brooke at Habana, directing him to secure reports from the different department commanders on the condition of the roads in their departments and the probable cost of improving the same. In several of the departments roads are already in existence, but they have become almost impassable because of neglect and lack of use. Within the past six months several improvement companies have started the cultivation of farms in Cuba, but as they have been handicapped by the condition of the roads, the work has been carried on at a great disadvantage.

THE Grand Duke Vladimir of Russia recently opened on the Lapland coast a new port, Catherine harbor, which will probably prove of great commercial importance as a depot for the hide trade with Siberia. It is situated at the extreme north of the Russian possessions, where by a strange freak of nature the Gulf stream keeps the water open during the winter, while the more southern ports remain closed by ice. The plan contemplates the development of the immense timber area adjacent to this region. The famous ice-breaker *Yermak* and other vessels of the same type are expected to ply between Catherine harbor and the mouths of the Obi and Yenisei rivers, 1,500 miles to the east, and keep the sea route open during the summer.

THE Hydrographic Office of the Navy Department has published, under the direction of Capt. J. E. Craig, a new chart of the world showing the ocean tracks for full-powered steam vessels, with distances given in nautical miles. The most valuable as well as interesting feature of the chart is the statement of the distances of the new American possessions from the different cities of the Pacific and Atlantic coasts. The chart shows in the Atlantic ocean the tracks used by steamers connecting New York, Boston, and Philadelphia with Liverpool, Southampton, and Gibraltar, showing the northern routes used between August and January and the southern routes followed between January and August. The longest steamer route given on the map is that connecting New York and Esquimault by way of Cape Horn, 16,290 miles. This is exceeded by the track used by sailing vessels connecting New York and Yokohama *via* the Cape of Good Hope, which is 16,900 miles in length.

INTERNATIONAL measurement of the variation of latitude will soon be under way. As related in *Science* (vol. 8, p. 841), the International Geodetic Association decided last year to establish six permanent stations for this purpose at convenient intervals along the 39th parallel. The U. S. Coast and Geodetic Survey, representing the Association in this matter, has made an examination of the localities for the two stations falling within the boundaries of the United States. For the east American station it has secured a tract of land at Gaithersburg, Md., 21 miles north of Washington, and for the west American station one at Ukiah, Cal., about 75 miles north of San Francisco. At these two points neat observatories are soon to be erected from plans provided by the Association. Each observatory will be completely equipped with instruments needed in work of this precision. The other localities at which observations will be made are Midsusawa, Japan; Tscharjui, Turkestan; Calabria, Italy, and Cincinnati, Ohio.

THE Statistician of the Department of Agriculture has issued a special report, prepared by E. S. Holmes, Jr., on the agricultural situation in the recently submerged district in Texas. There were in the flooded district 330,000 acres in cotton, of which it is estimated that 86.2 per cent was entirely destroyed, and that there has been a decrease of 16 per cent in the condition of the cotton remaining. There were 124,400 acres in corn and 30,400 acres in other crops. It is estimated that 87.7 per cent of the corn and 80.1 per cent of the other crops were entirely destroyed. A conservative estimate of the actual destruction includes about 227,000 bales of cotton, representing, at an average price of four and a half cents per pound, about $5,100,000; 4,400,000 bushels of corn, worth, at 20 cents per bushel, $880,000; sugar cane to the value of $335,000, and the other crops $235,000, a total loss to the standing crops of $6,570,000. The addition of the loss to farm property raises the total to $7,414,000, or about $74 per capita of the population of the district, which is estimated at 100,000, negroes largely predominating.

IN an address before the Washington Academy of Sciences and Affiliated Societies last winter, W J McGee, President of the Anthropological Society of Washington and Vice-President of the National Geographic

Society, asserted that the human cranium has shown a marked increase in capacity and change of form during the past century. The address, which has aroused much interested discussion among scientific men, is printed in full in the July number of the *American Anthropologist*, under the title of "The Trend of Human Progress." Prof. McGee states: "The average capacity of recent European crania is much above the average among the cave men of Europe; the skulls of modern dissecting-rooms are decidedly better developed than those of ancient ossuaries; even in the history of America, to judge from the best portraits extant, the cranial conformation has changed from the retreating type of Washington and his contemporaries to the full-forehead type of the living statesman. The data are less complete than might be desired, but wheresoever there are measurements for comparison their testimony is consistent; they tell of progressive increase in cranial capacity among all peoples, with decrease among none. The process of cephalization is manifested hardly less strikingly in the reduction of prognathism, in the shortening of the forelimbs, in the tendency toward diminution in number of teeth which dentists note, and in other characters of both skeleton and soft tissues."

THE new steamer of the U. S. Coast and Geodetic Survey, the *Pathfinder*, after receiving her scientific outfit at Washington, recently started on a voyage to San Francisco *via* Cape Horn, her destination being Alaska and subsequently the Hawaiian Islands. An examination made by Superintendent Pritchett in Hawaii last year developed the necessity of continuing the geodetic and hydrographic surveys of those islands by the U. S. government. The land operations, however, have been successfully organized and carried on for the last 25 years by the Hawaiian Government Survey. The steamer carries the necessary instruments for observations of terrestrial magnetism, densities of sea water, current velocities, and sea bottoms, as well as for the regular hydrographic and topographic survey of the coasts. A record will also be kept of the phenomena observed while *en route* along the coasts of South America. During the summer seasons the *Pathfinder* will reënforce the ships and parties of the Survey operating in Alaskan waters, retreating during the winter months to the milder Hawaiian shores. The *Pathfinder* is under the command of Frank Walley Perkins, of the Survey staff, with J. C. Dow, a well-known Transatlantic master, as executive officer. She is the largest of the Survey's vessels, and is peculiarly well fitted for the long-distance work of the character she undertakes, her coal endurance being about 6,000 miles. She carries a complement of about 75 officers and men. Including the *Pathfinder*, the Survey will now have four steam vessels on the Pacific station and three along the Atlantic and Gulf coasts, besides a number of schooners and smaller craft at various points.

The Geographical Journal for July publishes in full the address of the president of the Royal Geographical Society, Sir Clements Markham, read at the anniversary meeting, June 5, 1899. The address is a clear and concise summary of the geographic work of the past year, particularly of what has been accomplished and planned in the exploration of the Arctic and Antarctic regions. Sir Clements Markham announced that an ar-

rangement had been arrived at between the University of Oxford and the Royal Geographical Society for the creation of a School of Geography at Oxford. The Society agrees to pay $2,000 a year and the University promises a like sum. The school will be under the superintendence of Mr Mackinder, subject to the supervision of a joint committee consisting, in addition to the Vice-Chancellor, of four members of the University and three members of the Council of the Society. Mr Mackinder, as University Reader, will lecture twice a week during the three terms; and will also have special classes for advanced students. There will be an assistant who will lecture on physical geography, will hold classes five times a week, and will teach surveying and cartography; and there will be two lecturers, one on certain branches of physical geography and one on ancient geography. It is intended that a diploma shall be granted to students who complete the course, and there will be one or two scholarships of $200. These will be inducements to graduates to spend a year in mastering the principles of geography and the knowledge required for teaching the science and for making it practically useful. The upper floor of the old Ashmolean building at Oxford has been set apart for the purposes of the school, and an annual sum will be devoted to the supply of books and appliances.

Miss E. R. Scidmore, the Foreign Secretary of the National Geographic Society, who has recently returned to America from extended travels in China, Japan, and the Philippine islands, in an article in the August *Century*, entitled "The River of Tea," presents some forcible facts regarding the rapid development of Russian power in China: "At Hankow, the great tea market of the world and until within a few years the chief source of supply of British tea-drinkers, the Russian has come, and to stay, and the shadow of the Muscovite is over it all. The Russian is not only established at the gates of China, but also at its very heart, the invasion and absorption being as remarkable in this British settlement at Hankow as anywhere in Korea or Manchuria. Hankow is fast becoming a Russian city or outpost, a foothold soon to be a stronghold in the valley of the Yangtsze, which China has given her word shall never be alienated to any power but England. Although the Russians have their own concession at Hankow, they do not care to build upon it and live there, amenable then to Russian laws and consular jurisdiction, to Russian restrictions and espionage. The Russians prefer the laws and the order of the British concession, crowding in upon it at every opportunity, competing for any house that comes into the market, and building closely over former lawns and garden spaces. They compete with and outbid the few British tea merchants who remain in these days of active Russian trade aggression. Only one tea steamer took a cargo to London in 1899, two more British firms closed out and left Hankow that year, and, still more significant, only one pony showed the colors of the one British racing stable at the autumn races. In the retail shops prices are quoted and bills made out as often in rubles as in taels or dollars, and the Russians have gradually assumed an air of ownership, of seignorial rights, as complete as if they held the lease or diplomatic deeds to the place for ninety-nine years."

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