with individual hard work, as carried out by the Italian immigrants, in opposition to the characteristically American "desire to get rich overnight, to control large holdings, and to avoid personal labour." The warning is also true in regard to English agriculturists in South Africa, and may in time become applicable even to the enormous prairie-lands of Canada.

The Geological Survey of New Jersey, in its annual report for 1908 (1909), records its continued cooperation with the Survey of the United States. In a paper on the building-stones of New Jersey, the rocks are excellently illustrated by coloured photographs of polished surfaces, as well as by views of the buildings constructed from them.

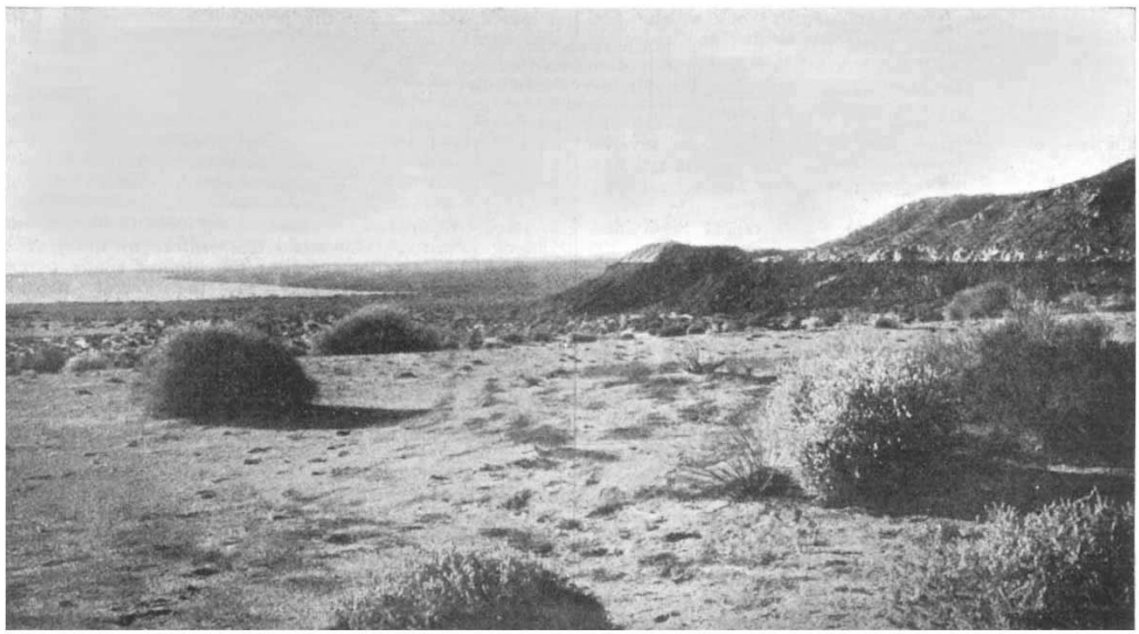

FIG. 3.—Old water-line above west side of the present Salton Sea, California.

The annual report of the Iowa Geological Survey for 1908 has been received in 1910, and is mainly occupied (pp. 21–687) by a comprehensive series of papers on the coal-deposits of the State. The peat bogs and their flora are described in the concluding papers.

G. A. J. C.

REPORTS OF METEOROLOGICAL OBSERVATORIES.

THE Meteorological Service of Canada (1906).—This report extends to nearly 650 quarto pages; the geographical position, and height above sea where known, of the numerous stations in operation in that year are given, also hourly observations at Victoria, Winnipeg, Toronto, and Montreal. From a monthly chronicle of weather conditions it would appear that, generally speaking, temperature was above and rainfall below the normal. Temperatures exceeding 100° and below −50° were, as usual, recorded at many stations, the highest being 107°, at Point Clark, Ontario, and the lowest −65·5°, at Dawson City, Yukon. The absence of maps, the impracticability of comparing data contained in various tables, and the frequent practice of separating rainfall and depth of snow, render it somewhat difficult to obtain a general idea of the characteristics of the year over such a vast area beyond that given by the chronicle referred to. For this purpose the excellent summaries in the *Monthly Weather Review*, although based chiefly on telegraphic reports, are more convenient. The weather predictions were very successful; the general total percentage of fulfilment (including partial verifications) varied from 81·3 in November to 92·4 in July, the average being 86·3 per cent.

Toronto Observatory (1907).—The results of the meteorological and seismological observations for the year are interesting and valuable. In the annual summary the results are compared with the means for the last sixty-eight years. The mean temperature of 1907, 44·2°, was practically normal; mean of maxima, 51·6°, of minima, 36·7°. The absolute maximum was 88·8°, in July (highest on record, 99·2°); absolute minimum, −10·0°, in January (lowest on record, −26·5°). The highest solar radiation was 112·3° (June); lowest night radiation, −13·9° (January). The annual rainfall was 25·56 inches (normal, 26·88 inches); depth of snowfall, 52 inches (normal, 66 inches). Rain fell on 100 days and snow on forty-seven days. Bright sunshine was recorded on 1921 hours, being 43 per cent. of the possible amount.

Bombay and Alibag Observatories (1909).—The equipment of these institutions is very complete; the routine operations, which include terrestrial magnetism, meteorology, seismology, and astronomical observations, so far as these relate to time-keeping and signalling, are carried out with great minuteness and regularity. The annual rainfall was 71·22 inches, being 3·94 inches below the normal (1873–96); the mean temperature was 78·9°, 0·5° below the average. Milne's seismograph registered fifty-three earthquakes; great disturbances occurred on April 11, June 3, July 8, and October 21. The table representing the magnetic character of each day shows there were 149 calm days, 182 days of small, and 34 days of larger disturbance. The mean declination was 1° 0′ 16″ E.

Helwan Observatory (1909).—The magnetic observations made during the year have been published in pamphlet form by the Egyptian Survey Department. The tables include mean monthly values of the various elements, and hourly deviations from the mean. The mean annual results were:—westerly declination, 2° 49·2′; dip, 40° 40·4′; horizontal force, 0·30031 (C.G.S. unit); vertical force, 0·25804. A list is given of the maximum and minimum values of the elements during fifteen of the principal disturbances with a daily range of more than 100 γ in the horizontal intensity (γ=0·00001 C.G.S. unit). The greatest disturbance was recorded on September 25 (to which we have already referred as regards Kew Observatory). At Helwan the range of horizontal intensity was >585 γ (the curve extending below the limit of the photographic sheet), vertical intensity 237 γ, declination 38′. The range of horizontal intensity in most of the cases quoted was from three to four times that of the vertical intensity.

Royal Prussian Meteorological Institute (1909).—The increasing work during the year was much hampered by the loss of Dr. Sprung and Dr. Kremser, and by the consequent changes in the re-organisation of the staff. The institute has now established observations of earth temperature at some of its principal stations, and the results will be published weekly for the benefit of agriculturists. The rain stations (exclusive of ordinary meteorological stations) now number 2637, and the thunderstorm stations 1482. The Potsdam Observatory has greatly increased its activity in respect of atmospheric electricity and other useful researches. Dr. Hellmann points out that a considerable improvement has been introduced in the "Statistical Correspondence" issued for many years by the Statistical Bureau (now the Landesamt), of which the institute was formerly a department. Beginning with January, 1909, that publication has doubled its size, and includes, as an appendix, under the title of "North German Weather Report," monthly observations from forty-three stations supplied by the institute, with a chart showing the distribution of rainfall. The report contains several interesting short discussions, in continuation of the practice introduced in the previous year; we have already referred to one or two of them.

The Deutsche Seewarte (1909).—This report is divided into two parts:—(*a*) general part, containing interesting particulars relating to the staff, the agencies for the supply of instruments, &c., the observers on land and at sea, together with other details; (*b*) reports of the chiefs of the different departments. By looking through these an idea is gained of the great variety and importance of the work performed under the superintendence of the Seewarte. They include (1) oceanography and maritime meteorology; in addition to such work as sailing directions and ordinary meteorological charts, daily synoptic weather charts of the North Atlantic and adjacent coasts have for many years been issued in conjunction with the Danish Meteorological Institute, and these furnish invaluable data for studying the sequence of weather conditions over western Europe. (2) Verification of nautical, meteorological, and magnetic instruments, both at the Seewarte and at the agencies, of which there are twenty-two, and the determination of the deviation of compasses in iron ships. (3) Weather telegraphy; in addition to a very wide distribution of weather telegrams and storm warnings, this branch superintends the agricultural weather service between May and September, and conducts experiments from time to time on the possibility of making profitable use of wireless telegrams from ships in the Atlantic. (4) Other branches deal with the testing of chronometers and watches, the collection of materials referring to coasts and harbours for the benefit of navigators, the collection and publication of observations at distant stations, &c. The investigation of the upper air by means of kites is carried out daily when weather permits, and the results telegraphed at once to various services; in the summer half-year the ascents are made at 6h. a.m., and in other months at 8h. a.m.; the altitude attained generally reaches or exceeds 2000 metres.

The Sonnblick Observatory (1909).—The results of meteorological observations made at the summit of the Sonnblick, 10,187 feet above sea-level, show that the mean temperature for the year was 18·0°; the highest monthly mean was 33·6°, in August (the only month with mean above freezing point); absolute maximum, 48·2°. The month with lowest mean temperature was February, −3·1°; absolute minimum, −23·4°. The total annual precipitation amounted to 61·65 inches, on 233 days; most of this fell as snow; rain only occurred on eighteen days, and hail on three days. Fog was prevalent on 271 days, the least being in January. As in previous years, the report includes observations and interesting details relating to some other mountain observatories and to upper-air research.

Norwegian Meteorological Institute (1909).—The observations and results are published in two volumes:—(1) Meteorological Year-book: The principal tables include hourly readings for Christiania, daily observations for twelve stations, monthly and yearly summaries for sixty stations. (2) Rainfall (and Snow): Daily observations are given for 200 stations, monthly and yearly results for 476 stations, and normal values for the years 1876–1905. The volumes have appeared in the same form for many years, and contain valuable and trustworthy data for an area extending as far north as latitude 71° in the Arctic Ocean. The yearly rainfall varies considerably, according to locality; the isohyets for 1909 range from 1000–2000 mm. and upwards along the Atlantic coast, with closed areas of 3000 mm., while near the Swedish borders the lines vary from 400–800 mm. and upwards. The methods of measuring both rain and snow are explained, with illustrations of the gauges.

The Southport Meteorological Observatory (1909).—Every effort is made to render this report as interesting and complete as the important position of the establishment on the eastern shore of the Irish Sea warrants. Fifteen carefully prepared tables show the principal results obtained there and at the subsidiary stations at Marshside and Barton Moss; rainfall returns at nine other stations in the district, and a useful tabular comparison between the year's values of temperature, rainfall, and sunshine at sixty health resorts and ten large towns in Great Britain are included in the report. The outstanding feature of the year was the remarkable coldness of the summer months, due to unusual prevalence of cold polar (N.W.–N.E.) winds, while at other times the centres of depressions frequently passed to the southward of Lancashire, producing miserable, gloomy weather. The mean temperature of the year was 47·4°, 0·8° below the average; the highest shade temperature was 78·4°, on May 21, the lowest 18·0°, on December 21. The greatest daily range was 33·6°, on May 20, and the least 2·0°, on February 4. The annual rainfall amounted to 35·72 inches, 2·82 inches above the thirty-five years' average. In December precipitation amounted to 5·94 inches, which Mr. Baxendell states was unprecedented, being nearly 3 inches above the mean; but for this the annual amount would barely have equalled the normal.

Falmouth Observatory (1909).—The important meteorological and magnetical work performed by this institution has been carried out with great assiduity during the year. The observations are supplied to the Meteorological Office (from which it receives an annual grant of 250*l.*), to the National Physical Laboratory, and other organisations. An event of special interest during the year was the visit of the magnetic survey ship *Carnegie*; the scientific staff of the vessel was furnished with valuable data in connection with the proposed magnetic survey of the Atlantic and Pacific Oceans. The results of the "climatological" observations (taken for the Royal Meteorological Society) show that the mean maximum temperatures were 46·4° in February, 69·6° in August; absolute maximum 80·0°, in August (the highest in that month for twenty-eight years). Mean minimum, 36·8° in March, 55·3° in August; absolute minimum, 26·4°, in February. The annual rainfall was 37·6 inches, nearly 4½ inches below the normal. Some interesting details are given of the great magnetic storm of September 25, which disorganised the telegraphic system of this country and parts of the Continent. The mean value of magnetic declination for the year was 17° 48·4′ W.

Observatory Department of the National Physical Laboratory (1909).—This report shows that the useful work of the observatory to which it refers continues to expand; this is especially noticeable in the verification of instruments (exclusive of watches and chronometers), the total number being 41,318, nearly 11,000 more than in the previous year, and including 25,861 clinical thermometers. The meteorological observations call for no special remark; the automatic records are tabulated for each hour, and are published in detail by the Meteorological Office, as one of its principal observatories. The chief magnetic disturbances took place on January 3, 30–31; March 19, 28–29; May 14, 18; September 25, 30; and October 19; the most remarkable was that of September 25 (see NATURE, September 30, 1909). As in previous years, a table is given of the magnetic elements at a number of observatories, and reports of the results at Falmouth and Valencia. The largest seismic disturbances occurred on January 23 (earthquake in Persia), July 30 (earthquake in Mexico), and October 20–21. An account of the work at the affiliated observatory at Eskdalemuir, Dumfries, N.B., is included in the report; we note that some useful researches on

atmospheric electricity and on solar radiation are being carried out there.

In our issue of June 23 we referred to the important changes that were being carried out in connection with the control of the two observatories at Richmond and Eskdalemuir.

SCIENCE AT THE JAPAN-BRITISH EXHIBITION.

THE arrangement of the British Science Section at the Japan-British Exhibition differs considerably from that of the Franco-British Exhibition. At the latter exhibition a separate annexe was set aside for science which made it comparatively easy to arrange the exhibits uniformly; but although the building was close to the entrance, the majority of the public passed it by and went straight through to the grounds. The fact is, the average man is rather afraid of anything called scientific, and unless he is brought to examine such an exhibit unawares is very apt to fight shy of it. Yet it was noticeable that those who did go into the building, even if they had no scientific knowledge, found a great deal to interest them, and frequently stayed a considerable time.

This year the Science Section is housed in the upper galleries leading from the Uxbridge Road entrance into the grounds. Consequently, all who go to the exhibition by that entrance, and the majority do, must pass through the Science Section. The exhibits are more broken up than in the Franco-British Exhibition; but this is rather an advantage than otherwise, as it takes away the museum appearance of the exhibit. Another advantage to the public is that there are two special attendants, who are able to explain the exhibits to the public in an intelligent manner. It has also been decided that certain members of the Science Committee shall give short lectures on special subjects in a portion originally intended for a band-stand, which has been curtained off; whether they will attract and keep an audience remains to be seen.

Science is so diversified, and its scope so enormous, that it is not possible to give in the space of a short article a comprehensive account of the exhibit which has been collected. Of course, it must be understood that the exhibit is not comprehensive in the sense that it covers the whole range of scientific research; but what it does do is to give to those unacquainted with scientific work an idea as to what is actually done by those engaged in scientific study. The Agricultural Section will be of interest to almost everyone; the South-eastern Agricultural College at Wye exhibits some most interesting specimens and preparations showing the various insects, mites, and eel-worms which are injurious to crops and stocks, and in some cases even harmful to man. The largest section is that dealing with the enemies of fruit trees and bushes, because the damage done to these is enormous, and has received a great deal of attention. There are, for example, specimens of the various aphides, green and black fly. The insect pests of the hop are also fully illustrated, one of the aphides being the most important, or rather, from the grower's point of view, the most disastrous. It was very prevalent in 1909, and is calculated to have cost the hop-growers in England 120,000*l.* in combating the attacks of this insect.

Astronomy is well represented, the section comprising a large number of old astronomical, nautical, and horological instruments. Examples are shown of the peculiar wooden Davis quadrant employed by the navigators in the time of Elizabeth for the determination of latitude. The Royal Astronomical Society shows, among other things, a reflecting telescope made by Sir William Herschel; also a sextant, formerly the property of Captain Cook. The transparencies of photographs of the southern heavens made by Mr. Franklin-Adams seem to attract considerable attention, and are indeed worthy of it. The Solar Physics Observatory exhibits a large number of photographs of stellar spectra taken with different instruments. There are also photographs of ancient British stone monuments which Sir Norman Lockyer has investigated and shown their astronomical connection.

The history of fire-making, illustrating the gradual evolution of the match, is very interesting, and is probably one of the most complete exhibits of its kind which has ever been shown. The exhibit includes fire drills, tinder, pistol tinder-box, and a brass fire piston. In order to operate this latter a little tinder was placed in a small cavity at the end of the piston; the piston was then rapidly compressed, and the sudden compression of the air caused sufficient heat to ignite the tinder. Optical, electrical, and chemical methods are also illustrated, and one of the first friction matches, made by John Walker, of Stockton-on-Tees, is shown.

One of the largest sections is oceanography; this section is mainly designed to show the progress of oceanography within the past forty years. Before the *Challenger* expedition in 1870, very little was known as to the depths of the ocean, and there was practically nothing known about the ocean beds. Specimens of the method of sounding are shown, also recording thermometers for ascertaining the temperature of the ocean at any depth. The series of hydrographical charts shown are intended to illustrate the process of construction of a chart from a sheet of blank paper until it is printed and is ready to be issued to the fleet. There is a very complete exhibit of compasses, which comprises specimens used in H.M. ships from 1765 to the present day. In the days when very little iron was used in the construction of ships, the errors of induced and permanent magnetism were very slight, but with the construction of iron vessels alterations had to be made in the construction of the compasses, and specimens of these compasses are shown.

Biology is very well represented; there is an interesting series of photographs illustrating the origin of the domestic breeds of horses. An exhibit of particular interest is one of the parasites which cause grouse disease, also a series of charts illustrating the method of systematic research into the conditions of life in the sea, which is the only true method for any attempt to improve the fishing industry. There are also interesting specimens illustrative of the parental care of fish. One fish carries its own eggs in its mouth, while another has an abdominal pouch like that of a kangaroo, in which the young seek refuge; but there is so much to see and so many things one would like to mention that we must pass forward with the words go and see, as there is very much more of interest.

The chemistry exhibit ranges from artificial silk to sections of ships' propellers, showing the erosion produced on different alloys. There is the handsome exhibit of nickel produced by the Mond process, oils from all over the world collected by Sir Boverton Redwood; an original example of mauve, electrochemical preparations, pharmaceutical products, and preparations of dye products from the University of Leeds.

The Physics Section is very representative, and includes apparatus in connection with mechanics, heat, optics, electrical measuring instruments, and telegraphy and telephony. The electric micrometer of Dr. P. E. Shaw is shown, which, by means of a train of levers, an electrical contact, and a telephone, enables movements of 100,000,000th inch to be detected. A seismograph is shown, and in connection with it records of earthquakes taken in London and the Isle of Wight. Much attention has of late been devoted to rubber testing and its mechanical properties; in this connection the hysteresis rubber-testing machine of Prof. Schwartz is shown. Under heat, there is a model of the calorimeter used by Joule in his work on the mechanical equivalent of heat, and near by it the most recent example of the Boys calorimeter for testing the calorific value of gases. Electrical instruments make an exceedingly fine display, amongst which may be mentioned Dr. Drysdale's potentiometer for measuring alternating and direct currents, the Duddell twisted strip ammeter, and a number of X-ray apparatus.

In the Geological Section there are some specimens of volcanic rocks from Antarctica, obtained during the recent South Polar Expedition of Sir Ernest Shackleton. The rocks were collected on Ross Island by Dr. Priestley, and consist principally of lavas belonging to the type known as kenyte. The important subject of geological surveying and mapping is exhibited historically, one of William Smith's maps of nearly a century ago being exhibited by Mr. F. W. Rudler.