

T. Comber and T. Paterson; (6) Marine Algæ, by Mrs. Robertson, Messrs. E. M. Holmes and L. Batters; (7) Characeæ, by Mr. P. Ewing; (8) Lichens, by Mr. G. F. Scott-Elliott; (9) Fungi (microscopic), by Mr. D. A. Boyd; (10) Fungi (hymenocystas), by Mr. W. Stewart; (11) Fungi (gastromycetas), by Mr. R. B. Johnstone; (12) Hepaticæ (Liverworts), by Mr. P. Ewing; (13) Musci, by Mr. J. Murray; (14) Filices (Ferns), by Mr. W. Stewart; (15) Phanerogams, by Mr. P. Ewing.

The geological part of the handbook which is edited by Dr. Malcolm Laurie has, among others, the following contributions:—Introduction, by Mr. John Horne, F.R.S.; Metamorphic Rocks, by Mr. Peter Machair; Silurian formation, by Mr. John Horne, F.R.S.; Graptolites, by Prof. Lapworth, F.R.S.; Coals, by Mr. James Thomson; Old Red Sandstone, by Mr. J. G. Goodchild; Carboniferous Formation, by Mr. J. B. Murdoch; Plants, by Mr. R. Kidston; Corals, by Mr. James Thomson; Ostracoda, by Prof. R. Jones and Mr. T. Kirby; Brachiopoda and Gastropoda, by Mr. James Neilson; Fishes, by Dr. R. H. Traquair; Permian Rocks and Glacial Clays, by Mr. John Smith; Drift Beds and Raised Beaches, by Mr. James Steele and Mr. Thomas Scott; Rocks and Minerals, by Messrs. J. Sommerville, G. R. Thompson and J. G. Goodchild. Mr. Wm. Armour, C.E., is preparing a special geological map of the Clyde Valley for this part of the handbook.

The third handbook is to deal with (a) archæology of Glasgow, (b) educational institutions of Glasgow, and (c) the medical and charitable institutions of Glasgow. The contributors to part (a) are Mr. Robert Renwick, Town Clerk Depute of Glasgow; Mr. J. Neilson, procurator fiscal; and Mr. P. MacGregor Chalmers, who is contributing an article on the Glasgow Cathedral. Dr. J. G. Kerr is editing part (b), and some of the more important articles will deal with The University, by Mr. W. Innes-Addison; The Technical College, by Mr. H. F. Stockdale; The Training Colleges, by Mr. G. W. Alexander; Agricultural College, by Prof. Wright; Libraries, by Mr. Barrett; Secondary Education, by Dr. J. G. Kerr; and Primary Education, by Mr. G. W. Alexander. Part (c) is edited by Dr. Dickson; and contributions on the different medical institutions are given by experts such as Dr. Dalzell, Dr. Lindsay Steven, Dr. Alex. Napier, Dr. F. Fergus, Dr. Finlayson, Dr. Chalmers, and others. Prof. Magnus Maclean is the editor of this volume.

Messrs. Bartholomew are getting ready a specially prepared map. This map, along with one of the handbooks, will be presented to each member who attends the meeting, and copies of the other two handbooks may be purchased by members at a reduced price.

A large number of members from different parts of the United Kingdom have already indicated their intention of being present, and a number of foreigners have also sent in their names, including representative mathematicians, engineers, physicists, botanists and zoologists from Europe and America.

It has been agreed between the different railway companies that return tickets at single fare and a quarter will be issued, from all the principal stations in the kingdom to Glasgow, to members of the British Association, on surrender of a certificate signed by the secretary of the Association to be obtained in the beginning of September from the hon. local secretaries, 30, George Square, Glasgow. The tickets will be valid from the day before the first meeting until the day after the last meeting.

The following are the presidents of sections:—Section A (Mathematical and Physical Science), Major P. A. MacMahon, F.R.S.; B (Chemistry), Prof. P. Frankland, F.R.S.; C (Geology), John Horne, F.R.S.; D (Zoology), Prof. J. Cossar Ewart, F.R.S.; E (Geography), Dr. H. R. Mill; F (Economic Science and Statistics), Sir Robert

Giffen, F.R.S.; G (Engineering), Col. R. E. Crompton; H (Anthropology), Prof. D. J. Cunningham, F.R.S.; I (Physiology), Prof. J. G. McKendrick, F.R.S.; K (Botany), Prof. J. B. Balfour, F.R.S.; L (Educational Science), Rt. Hon. Sir John E. Gorst, F.R.S.

It is not anticipated that there will be any difficulty in accommodating the members at Glasgow. There are a large number of comfortable hotels and the committee is preparing a list of such hotels, as well as of suitable lodgings and furnished apartments. Many Glasgow citizens have also indicated their desire to offer private hospitality to members. The Secretarium will probably be in Queen Margaret Hall, which is situated within five minutes walk of the University.

MAGNUS MACLEAN.

THE RECENT TOTAL SOLAR ECLIPSE.

THE several parties of observers who journeyed so far to see the eclipse on Saturday last were not, it appears, favoured with such good weather conditions as obtained during the previous two eclipses in India and Spain. No detailed accounts of the results are yet to hand, but from several brief telegrams in the daily Press we may gather a summary of the general observations made.

Mauritius.—The observers at the Government Royal Alfred Observatory at Mauritius appear to have had the greatest success. Even here the partial phases were only incompletely determined owing to clouds, the first contact being quite lost; the last three contacts were, however, determined fairly well. The party at this station consisted of twenty-two observers. With respect to the total eclipse itself, fifty-two photographs of the corona were obtained with the Mauritius photoheliograph, the Greenwich coronagraph, the Newbegin telescope and several smaller cameras. In addition, forty-one photographs of the partial phase were taken for determining the diameter and place of the moon as a control over the ephemeris data, and eighteen photographs of the spectrum of the eclipsed sun's surroundings.

Drawings were made with a 6-inch telescope, and a cinematographic record of the eclipse also obtained.

Mr. Claxton had organised a comprehensive scheme of meteorological observations. The general report from this station is that the corona was of the expected minimum type, but fainter, more yellow and diffused than that observed in Spain last year.

Sumatra.—The expeditions to the Eastern Archipelago did not have a clear sky during totality. The instruments from Greenwich, in charge of Messrs. Dyson and Atkinson, were set up on the volcanic island of Auer Gedang, about six miles from the coast of Sumatra, on the central line of totality. Here the sky was covered with heavy rainclouds during the morning, rendering the prospect anything but hopeful. A slight improvement took place as the time of eclipse drew near, but unfortunately the sky never quite cleared. The form of the corona was observed, and the planets Mercury and Venus seen. Totality lasted 6 min. 21 sec.

The Dutch party in the same neighbourhood—at Karang Sago—were somewhat more successful, although there the sky was throughout covered with thin clouds.

Successful photographs are reported to have been obtained of the corona with different telescopes, and photographs of the spectra of the corona and chromosphere with two spectrographs. Several other branches of investigation, including photographs with the prismatic camera, measurements of polarisation of coronal light and determination of heat radiation of the corona, were unsuccessful.

The observations at the inland station of Solok were an almost total failure.

At Singapore the eclipse was very well seen, totality occurring about 12.51 p.m. An interesting series of observations of the temperature variations were made there. The reading before eclipse in full sun was 143° , which fell during totality to 81° , which was 2 degrees below the normal shade temperature.

RECENT WORK OF THE U.S. WEATHER BUREAU.¹

THE Report of the Weather Bureau for the year ended June 30, 1899, which appeared at the end of last year, extends over two volumes. The first, which includes the usual administrative report and the climatological statistics of the United States Weather Service, is a volume of the ordinary dimensions, while the second and special volume, being part vi. of the whole report, is devoted to Prof. Bigelow's discussion of the United States' contribution to the international cloud observations. It is a bulky volume of no less than 787 quarto pages.

Glancing at the first volume, attention is turned naturally to those points in which the practice of the United States Weather Office differs from that adopted in this country, and the first point to be noticed is that from March 1899 the period covered by the night forecasts was increased to forty-eight hours, and that the extension of period has worked successfully, whereas the limit of the British forecasts is twenty-four hours. It is true that the British Isles occupy a remarkably difficult position on a weather map. They are not only at the extreme west of Europe and catch the first effects of weather changes travelling eastward, but they are in a special manner the battle-field of the elements and are vexed with all the storms that belong to so-called temperate latitudes and western shores. These adverse circumstances in a British mind should provoke more daring enterprise rather than complacency with partial successes, yet we are still without telegraphic reports from Iceland, a recognised centre of atmospheric influence, and wireless telegraphy has not yet extended westward the available area of information.

The weather service in the United States is indeed a popular one. From a table in the report it appears that the total number of addresses in the United States supplied with forecasts and special warnings reached the astonishing figures of 24,467,106. With these no British statistics can be compared.

It would require too much space to enter into details of the climatological data, which include, amongst other things, means of hourly readings at 28 stations. It should, however, be remarked that the year under review was noteworthy for the establishment of a number of stations for the storm-warning service in the West Indies at the conclusion of the war with Spain, and for the extensive system of aerial investigation by means of kites at 17 stations. This work was continued until the middle of November, 1898, by which time 1217 ascensions of 1000 feet and above had been made.

The second volume, written by Prof. F. H. Bigelow, is devoted exclusively to the cloud observations made in accordance with international agreement between May 1, 1896, and July 1, 1897. It is a very interesting and valuable contribution to the study of meteorology by observation of clouds, and the discussion is very fully carried out. The observations were of two kinds—theodolite observations at Washington, by which observers could determine the actual heights and velocities of individual clouds, and nephoscope observations at 15 stations in the United States from which velocities were estimated by the somewhat precarious method of assum-

ing the height of the particular type of cloud observed. The theodolite observations are printed in columns arranged according to the type of cloud observed, and occupy 93 pages of the volume. Their discussion leads directly to some very interesting results as to the variation of the velocities of clouds with height.

The nephoscope observations numbered some 23,000. In order to coordinate them the whole United States area is first divided into six districts, and the position of each station for each observation with regard to a centre of high or low atmospheric pressure is identified by assigning it to one of twenty subsidiary areas within a circle of 1500 kilometres surrounding the centre of high or low pressure, as the case may be. In this way the distribution of velocity round the centres of "high" and "low" areas for each cloud level can be set out and the gradual change in distribution from the surface wind to the regular easterly march of the cirrus at about 10 kilometres height is traced.

In further discussion of the velocities at the different cloud levels, the general easterly drift at different levels is allowed for, and the residual vectors of velocity are plotted in diagrams to show the circulation components in "highs" and "lows" at the different cloud levels.

The same data enable the barometric gradients to be calculated, and the interesting results follow that the circulation phenomena are most vigorous in the middle group of cloud levels, viz. the Strato-cumulus to Alto-stratus group, and that there is no experimental evidence to show that there is an overflow of air from the upper part of a cyclonic area causing a higher pressure around it, as has been generally assumed.

The application of these results to the several districts of the United States in different typical states of weather is represented in 66 maps of the movement of the air at different levels over the United States. This completes the primary reduction of the observations. The remainder of the volume is occupied with the application of the inductive results obtained. First a section is devoted to the diurnal variation of the barometer. The diurnal variation of winds (taken from European stations) and of cloud motions at the alto cumulus, cirro cumulus and cirrus levels, taken from the cloud observations, is compared with the diurnal variation of magnetic force as part of a discussion of a possible relation between diurnal variation of barometric pressure and magnetic force. Without expressing an opinion upon Prof. Bigelow's own views, which have given rise to some controversy, it may be said that this discussion is very suggestive in view of the ideas which have recently been developed from Prof. Thomson's suggestion of "bodies smaller than atoms," Arrhenius and others, of the possible reception of particles from the sun carrying electrical charges which can move with the upper atmosphere.

Prof. Bigelow next deals with the general theory of atmospheric circulation in relation to the light thrown upon the subject by the cloud observations. He commences the discussion by a general review of his mathematico-meteorological troops. All the numerical, thermodynamical and hydrodynamical formulæ available for meteorological warfare are paraded for inspection by the reader, and they are clothed in a new uniform on account of the need for a standard system of notation for meteorology. The uniform does not always quite fit. " $\text{Pounds} \times (\text{foot})^2$ " seems to require some sort of inversion before it can appropriately clothe pressure. But that is a small matter. The array of formulæ is very imposing, not to say repellent, and this part of meteorology needs a uniform that is less oppressive for the civilian meteorologist. But Prof. Bigelow's investigation moves generally upon sound lines. His criticism of Ferrel's solution of the problem of the local cyclone is sound, and his diagram (chart 69) representing the alternation of high and low areas as resulting from the play of pressure due to the action of two opposing streams of air is a very useful representa-

¹United States Department of Agriculture. Report of the Chief of the other Bureau. 1898-9