PART I.

THE METHODS AND RESULTS OF THE VARIOUS OBSERVATIONS, AND EXPLANATION OF THE TABLES.

CHAPTER I.—INTRODUCTORY REMARKS.

1. Introduction.

All work on the Meteorological records of the Expedition was held up during the Great War, as almost all the members of the Expedition concerned, including myself, were on active service during that period; but since my return from Europe and appointment to the staff of the University of Adelaide, I have spent all my available spare time in elaborating the records of the Cape Denison station, for which I had been responsible.

Assistance was given by the Adelaide Divisional Meteorological Office, who extracted the hourly readings of barometric pressure, temperature, and relative humidity from the charts of the self-recording instruments, and prepared the wind analysis, so that Tables IV, V, VII, VIII and X, were originally their work. The temporary clerks appointed by the Public Service Inspector's Office, through Commonwealth regulations, were in some cases quite unsuitable, and though the work was supposed to have been checked, many errors were noticed when the printer's proofs were being read, with the result that I had to go through the whole of the pressure and temperature charts again myself, checking all the daily maxima and minima, and correcting such errors as this examination disclosed in the hourly readings for the day. The wind and sunshine records were dealt with entirely by myself, as were the daily meteorological log books, from which the six-hourly absolute observations, by which the charts of the self-recording instruments were standardised, were extracted, classified, and corrected, and from which the tables for cloud, snowfall and snowdrift and the meteorological journal were prepared. Thus it may be said that these results have been set out by, or under the supervision of, one who took a large proportion of the observations, and was familiar with the conditions and with the vagaries of the instruments and the other observers, and able to interpret correctly the various notes on the occasional imperfections of records.

2. Staff.

I attended at the Adelaide Observatory for several weeks before the departure of the Expedition, and received instructions in methods of observation and care of instruments from the Government Astronomer, Mr. G. F. Dodwell, and the Meteorologist, Mr. E. W. Timcke, both of whom extended the greatest kindness and courtesy towards the members of the Expedition. On landing in the Antarctic, Mr. A. J. Hodgeman was appointed Assistant Meteorologist at Adelie Land.

The Leader of the Expedition, Sir Douglas Mawson, was the only member with previous experience of Antarctic Meteorology at the Main Base, Adelie Land, and work was started under his supervision. His interest, advice, and assistance were maintained throughout, which greatly enhanced the quantity and quality of the work done.

3. Instruments.

The instruments used included a mercury barometer and a barograph, Fahrenheit thermometers, both mercurial and spirit, for shade temperature observations, two thermographs, Robinson recording anemometer, Dale's anemograph for wind direction, two hair hygrographs, Campbell-Stokes sunshine recorder, nephoscope, and other apparatus improvised in the Antarctic and described below. Certificates accompanied the barometers, and every thermometer was tested at the National Physical Laboratory at Teddington, and certificates supplied. The anemometer was specially tested by Mr. Bassett on the return of the Expedition, as described in the Appendix A.

4. Period Covered.

Observations commenced at midnight on January 31st, 1912, and ended at noon on December 15th, 1913, a period of $683\frac{1}{2}$ days or $22\frac{1}{2}$ months.

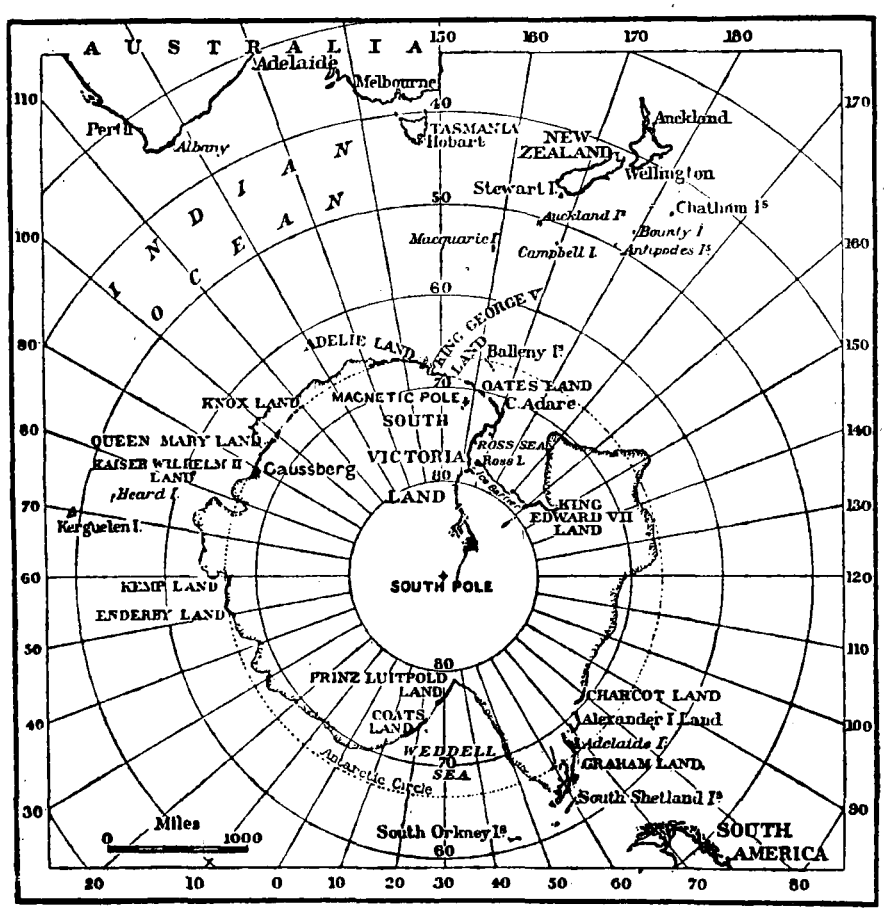

Fig. 1.—The South Pole Regions.

5. Geographical Position and Time.

The Cape Denison Station of the Expedition was on the coast of Adelie Land, in the centre of Commonwealth Bay, in latitude 67° 00′S. and longitude 142° 40′E., that is, due south of a point half way between Adelaide and Melbourne. The local

mean time kept at the Station was that for this meridian, 142° 40′E., or 9 hrs. 30 min. 40 sec. east of Greenwich, which is practically the same as South Australian Standard Time, 9 hrs. 30 min. East.

The coast in the vicinity is free of ice except on occasional calm days in winter, and runs roughly east and west, indented by broad bays. Sixty miles to the east the Mertz glacier stretches some 80 miles from the coast out into the sea in a north-easterly direction. From here the coast trends away south-east with much solid floe ice in bays and between glacier tongues, and pack ice extending up to 200 miles to the north. To the west there is open sea for rather over 100 miles, where pack ice begins, and extends some 60 miles north and fringes the coast far to the west. The high land appears to continue almost due west. The sea off the Adelie Land coast was found to be open on each of the three cruises of the " Aurora " in the summers of 1911, 1912 and 1913.

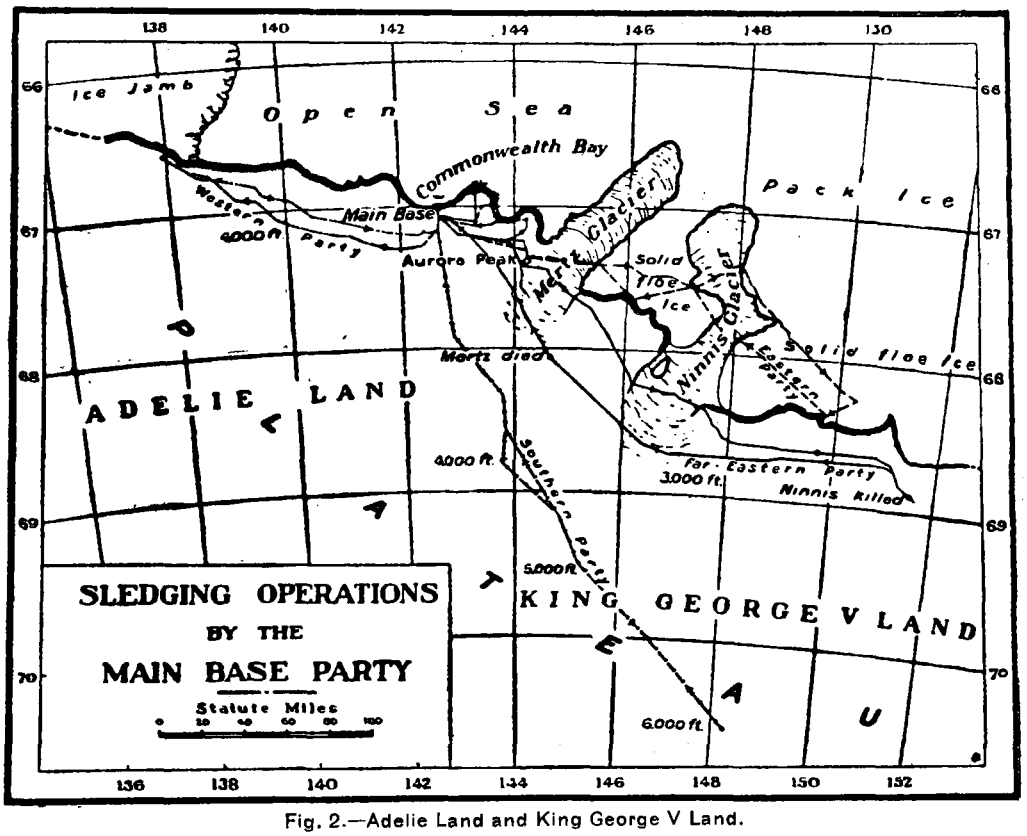

Fig. 2.—Adelie Land and King George V Land.

Very little rock is exposed along the coast of Adelie Land. In general the ice cap rises steeply from the coast to the plateau to the south. The rise is about 1,500 feet in the first 5 miles, after which it is much more gentle, reaching 4,000 feet in about 50 miles. At 50 miles one appears to be on a flat plateau, but the ice cap still rises to the south and 6,000 ft. is reached in the neighbourhood of 300 miles inland, as reported by Magnetic Pole Parties. There are no mountain ranges or abrupt changes of level.

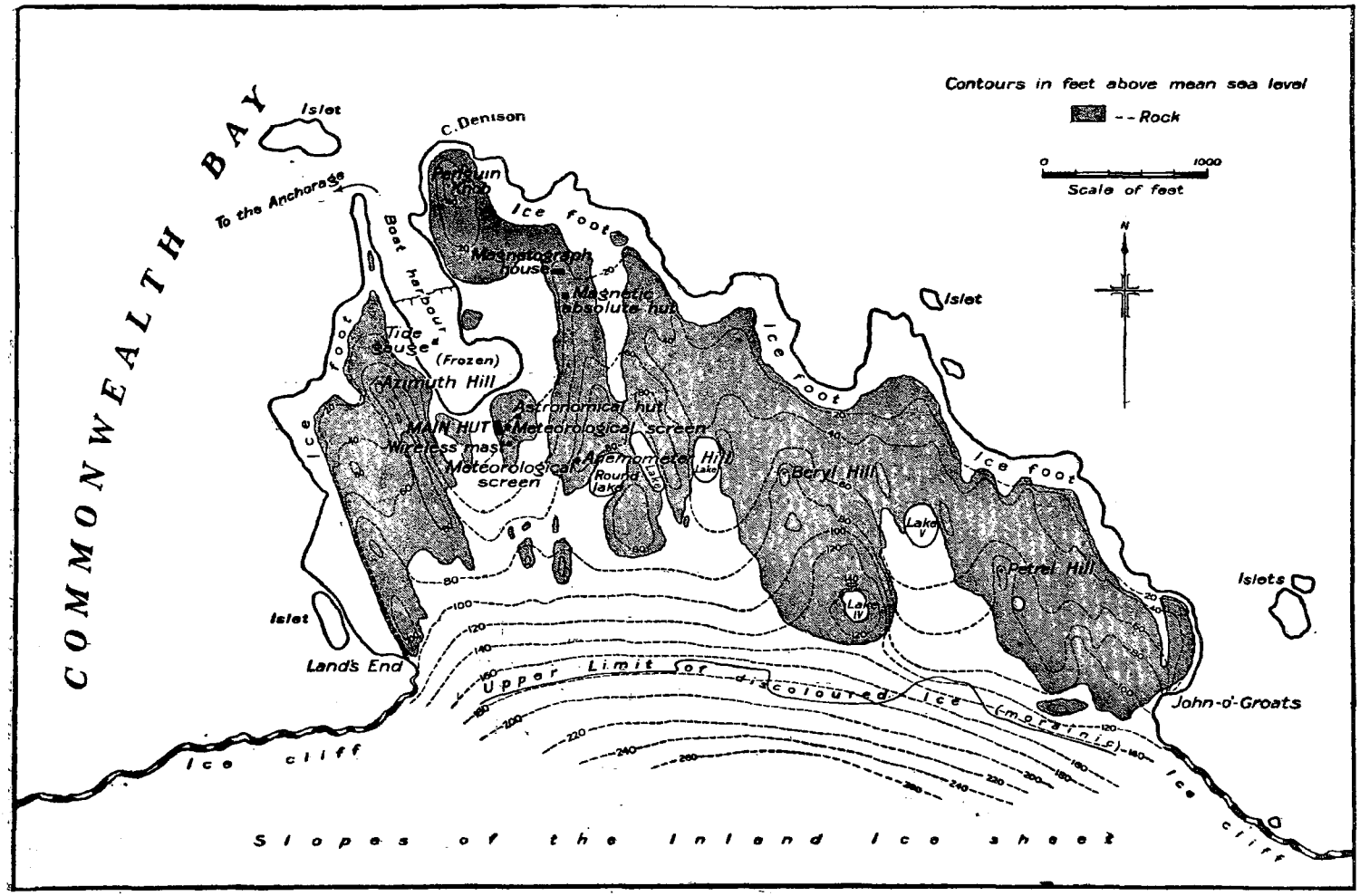

Plate 3.—Cape Denison, Commonwealth Bay, Antarctica.

Cape Denison is a small rocky projection in the centre of Commonwealth Bay, making a break in the continuous high ice cliffs of the Bay. The rock outcrop at the Cape is only three quarters of a mile across, and consists of four parallel ridges of rock some 700 yards long, running N.N.W.—S.S.E., which project from beneath the ice at the 100-ft. contour and slope down to the water's edge. A natural boat harbour runs in between two of these ridges.

Plates I–IV give views of the locality from the south, north, east and west.

6. Positions of Screens and Instruments.

The Hut was built at the shore end of the Boat Harbour, within 60 yards of the water's edge when the Boat Harbour was free of ice, and midway between the rocky ridges on either side to east and west. It was distant 200 yards from either ridge, each of which rose to 60 feet above it. The floor of the Hut was 18 feet above mean sea level. The thermometer screen, placed on a rock on the east side of the Hut, was 21 feet above mean sea level. This screen contained the thermometers, thermograph and hygrograph, and a wind vane was fixed to the top for visual observations. It was the ordinary louvred pattern screen supplied by the Commonwealth Meteorological Office. The nephoscope stood near this screen.

The anemometer was placed on the ridge to the east, 94 feet above mean sea level, and close to it was erected another screen which housed the Dale's anemograph, the wind vane projecting 3 feet above the top of the screen. The sunshine recorder, snow gauge and "puffometer" were all placed near by on this ridge. The mercury barometer and barograph were inside the Hut.

The drift gauge stood out on the ice on the west side of the Hut.

Plate V shows the general distribution of the instruments, detailed in the description of this plate.

7. Nature and Period of Observations.

During the first year, 1912, complete observations were taken every six hours, at midnight, 6 a.m., noon, and 6 p.m. These consisted of reading the barometer and screen thermometer, estimating the wind velocity and noting its direction on the vane, describing the cloud, and recording any phenomena as snowfall, drift, St. Elmo's Fire, coronas and halos, sunset colours, state of the sea, auroral displays, etc. During the latter part of the second year the screen thermometer was only read at noon each day, but all the other observations were taken at the six-hourly intervals throughout. Additional observations were also recorded during the whole period, at odd intervals

as various phenomena occurred, or as opportunity offered. These were mainly cloud observations, sudden calms or changes in the wind or drift, and snow and drift gauge readings. During the later stages of the Expedition hourly notes were made over a period.

During the daytime, from 9 a.m. to 9 p.m., the great majority of the notes were made by the meteorologists, Hodgeman and myself, but after 9 p.m. and up to 8 a.m. of the next day the night watchman was responsible, so that all members of the Expedition contributed to the meteorological observations. All records of the Aurora Polaris have been segregated in a separate volume of these Reports, and no references to such phenomena appear here.

For days on end the meteorological log reads mainly "ditto," which being traced to its source is found to mean "Wind 80. Dense drift." During those periods little could be done except keep the self-recording instruments in order, but fine weather always brought forth a correspondingly large crop of observations.

The observations were all entered up in pencil in a meteorological day-book; fifteen of these 100-page books were filled. From the day-books the observations were extracted and tabulated in comprehensive meteorological journals. This latter work was half done in the Antarctic and has since been completed by myself. The hourly sunshine from the cards was also entered in the journal.

8. Acknowledgments.

Here I wish to acknowledge the work of those with whom I came in personal contact in the actual getting of results.

First I must mention A. J. Hodgeman, Assistant Meteorologist at the Main Base. He worked through steadily from beginning to end, being one of the six who volunteered and were chosen to remain for the second year in the Antarctic as a Relief Party. In the worst storms and most trying conditions he was ever the same, calm, industrious and cheerful. Not one disagreement marred the course of our two years' association in this work, and for his loyal co-operation, and the many happy memories of our sorties out into the blizzard together, I tender him my most grateful thanks.

F. H. Bickerton was always our friend and ally. He helped us over many difficulties and took a great interest in the work. He did a lot of repairs for the anemometer, including the spinning of a new cup. Without Bickerton the life of the anemometer would have been very short.

Finally I acknowledge the indebtedness of meteorological science to all members of the Expedition, each of whom struggled with wind and drift during his night watches to add his quota to the Meteorological Observations.