

PART I.  
 RECORDS OF THE QUEEN MARY LAND STATION.

RECORDED BY MORTON H. MOYES, B.Sc.

INTRODUCTORY REMARKS.

By D. MAWSON.

The Expedition's Western Base Station, situated in the Queen Mary Land area, was located about 1,300 statute miles almost due west of Cape Denison, Adelie Land, the Main Antarctic Base Station (see Fig. 2). There the Winter-Quarters Hut was erected upon a floating pontoon-like extension of the Continental ice sheet which has been named the Shackleton Ice Shelf. This ice formation beneath the hut amounted to about 800 feet in thickness of which approximately 100 feet stood above the level of the neighbouring sea. Heavy precipitation of snow buried the hut soon after erection and henceforth communication with the outside world was maintained by means of a covered vertical shaft in the snow surface to a tunnel leading to the enclosed verandah surrounding the main living-room. Thus Winter Quarters, Queen Mary Land, soon became known as "The Grottoes." As the whole level of the surrounding country rose, as snow precipitation progressed, the meteorological screen was periodically raised to keep pace with the snow accretion.

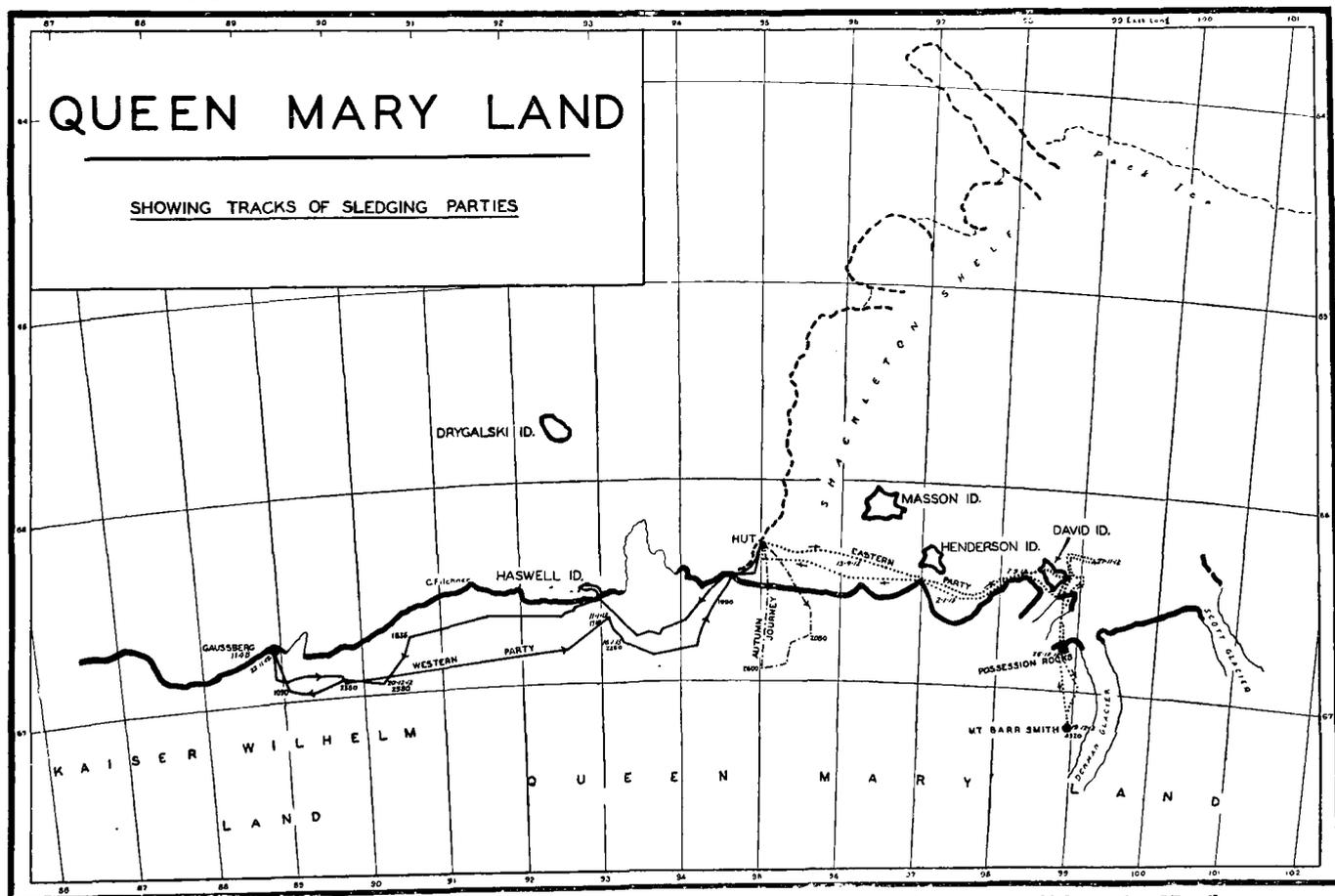


Fig. 1.—Showing the location of "The Grottoes" hut erected on the floating Shackleton ice-shelf formation 17 miles from the nearest point of land. The tracks of the more important sledge journeys are also plotted.

The exact location of "The Grottoes" is Latitude  $66^{\circ} 18' S.$  and Longitude  $95^{\circ} 1' E.$  There the hut was approximately 17 miles northerly from the true margin of the land (see Fig. 1). On account of the continuous ice sheet south from "The Grottoes," wind coming from that direction reached the recording instruments as unaltered continental air. About a quarter of a mile to the west of the station, there was open water in midsummer and a frozen sea-ice surface at other times of the year. In the quadrant from north to east the thick shelf-ice formation extended quite 100 miles.

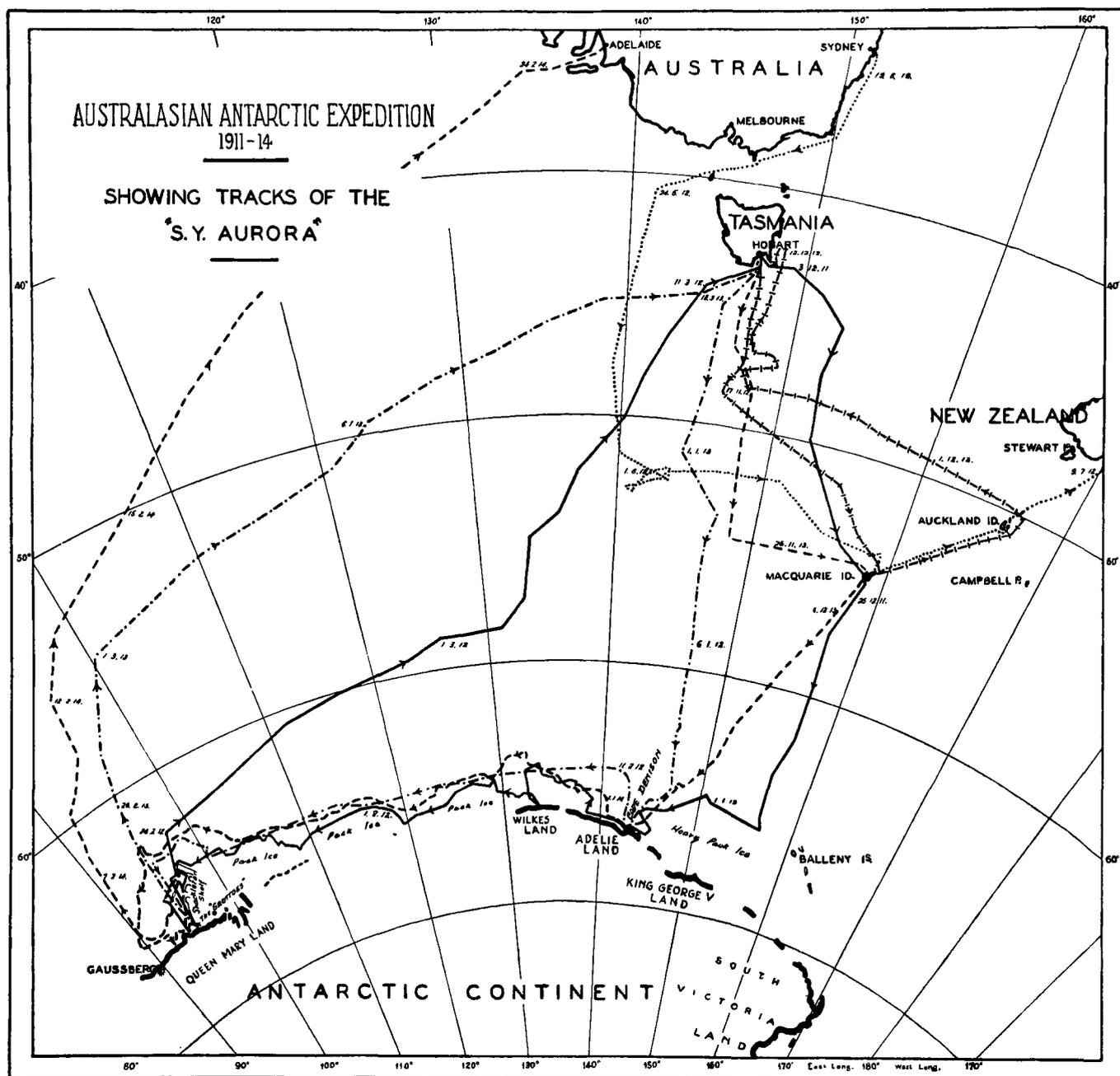


Fig. 2.—Regional map illustrating the relative positions of the Expedition's Eastern and Western Antarctic Bases, respectively at Cape Denison, Adelie Land, and "The Grottoes," Queen Mary Land. Also the "Aurora" tracks on three Antarctic and two Subantarctic cruises are shown.

A general view in the neighbourhood of "The Grottoes" is presented in Plate I, Fig. 1, which shows only the peak of the roof of the hut protruding from the general level of the surface of the Shackleton Shelf. Plate I, Fig. 2, shows the barograph housed on a shelf above Moyes' bed in the hut. This instrument was of similar construction to those employed at the other stations. The mercurial barometer was hung from the wall of a wooden partition near the centre of the hut. Plate II, Fig. 1, shows the meteorological screen with the door open and Moyes standing alongside.

Morton H. Moyes acted as Meteorologist for the Queen Mary Land Party and maintained the records during the year of occupation of "The Grottoes" station. Owing, however, to overwhelming deluges of snow descending upon and burying the newly erected screen and meteorological instruments, the records for the first several weeks were partly vitiated and have not been included herewith. The layout of the meteorological instruments in relation to the hut is illustrated in Fig. 3.

The screen was of standard pattern, supplied by the Commonwealth Meteorological Department. Moyes early recognised the futility of continuing with measurements

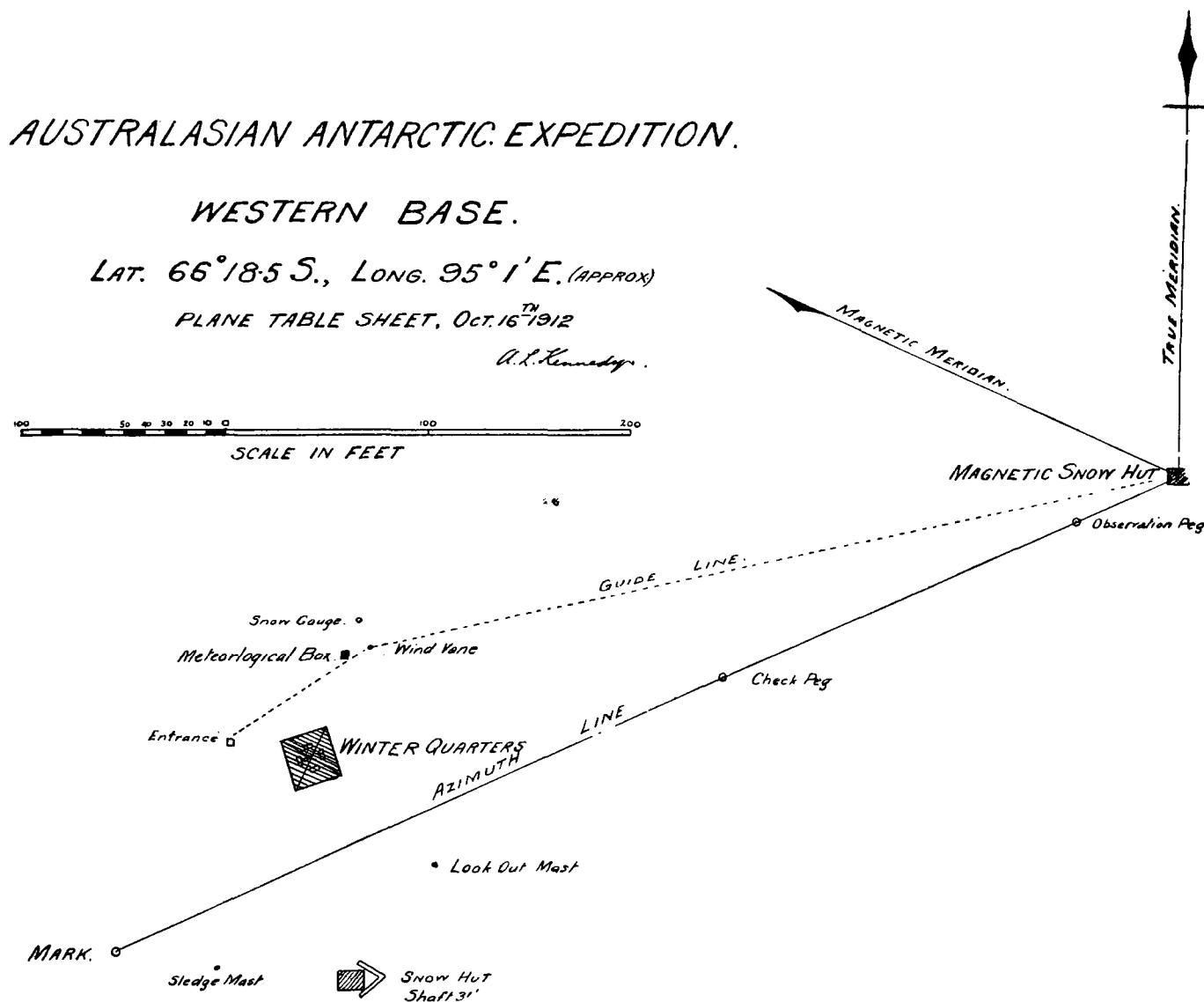


Fig. 3.—Plan of the lay-out at "The Grottoes" illustrating the relative positions of the Winter-Quarters Hut and the meteorological screen, snow gauge, and wind vane.

of snow collected in the simple type of snow gauge which he had erected near the screen. As an indication of snow precipitation it was obviously useless, for dense volumes of drifting snow at times completely submerged the gauge. As was anticipated, no fall of rain was recorded.

Under direction of Mr. H. A. Hunt, Commonwealth Meteorologist, Mr. W. B. Newman, an officer of the Department, reduced and tabulated Moyes' data for publication. Our best thanks are due to him for executing this tedious task.

*Pressure.*—Hourly values form the subject of Table I. The mercurial barometer, Adie No. 429, employed at "The Grottoes" was housed inside the hut and was thus not subjected to the extreme conditions which prevailed without. This barometer was tested at the National Physical Laboratory in May, 1911, and the following corrections (in inches) were given :—

Pressure...	...	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0
Correction	...	+0.005	+0.005	+0.010	+0.010	+0.010	+0.015	+0.015	+0.015

In March, 1914, it was compared with the standard barometer at the Meteorological Bureau, Adelaide, when the Divisional Meteorologist, Mr. E. Bromley, reported that it read consistently too high and required a correction of approximately—0.020 inch.

The pressures at which this correction was applicable are not stated.

It is clear that between May, 1911, and March, 1914, the error of the instrument had changed. It is, however, not possible to say how or when the change occurred. Furthermore, the corrections at the epochs mentioned appear to have been about equal in magnitude and opposite in sign. Neither was very large. It seemed, therefore, that the best procedure was to adopt the readings of the barometer without any index correction.

*Temperature.*—Hourly values of air temperature are the subject of Table II. Owing to the action of the thermograph frequently being interfered with by drifting snow, the accuracy of the record did not warrant tabulation of hourly values beyond the nearest whole degree. On many occasions when the thermograph was out of action, three-hourly eye readings of thermometers were available. On these and a few other occasions, the missing hourly readings have been interpolated. The interpolated values are printed in italics.

*Wind.*—Direction and velocity are tabulated at three-hourly intervals in Table III. The velocities were personal observations and were logged on the Beaufort scale of 0 to 12. It is anticipated that the figures entered express very closely the actual conditions, for Frank Wild, the officer in command of the party, had had long experience of Antarctic conditions, having enlarged his long sea experience by two years with the first Scott Expedition in Winter Quarters at McMurdo Sound in the Southern Ross Sea, and more than a year at Winter Quarters, Cape Royds, with the first Shackleton Expedition.

The velocities herein appearing as Table III are tabulated in the form of miles-per-hour. This conversion has been effected in accordance with the table of equivalents given in the "Observer's Handbook," Meteorological Office, London, 1921. Following is the conversion table as used :—

Beaufort Number.	Miles per Hour.
0—Calm ... ..	0
1—Light air ... ..	2
2—Light breeze ... ..	5
3—Gentle breeze... ..	10
4—Moderate breeze ... ..	15

Beaufort Number.	Miles per Hour.		
5—Fresh breeze ... ..	...	...	21
6—Strong breeze ... ..	...	...	27
7—Moderate gale ... ..	...	...	35
8—Fresh gale ... ..	...	...	42
9—Strong gale ... ..	...	...	50
10—Whole gale ... ..	...	...	59
11—Storm ... ..	...	...	68
12—Hurricane ... ..	...	...	above 75.

This table is derived from observations at certain stations in the British Isles and is intended to give the velocity of the wind at 33 feet (10 m.).\*

*Percentage Frequency and Mean Velocity of each Direction.*—This information, which appears as Table IV, has been deduced from an analysis of Table III. Table V is a monthly summary derived from Table IV.

*Cloud Observations.*—These were not frequent, so that in preparing Table VI for publication Mr. Newman has divided the types into two layers only. The International Middle Level has been included in the Lower Level as printed. Directions of cloud drift were seldom noted by observers at “The Grottoes.”

In scanning the Expedition's Meteorological records it will be apparent that in the pack-ice belt girdling the Antarctic Continent the skies are usually more or less completely overcast and fog and falling snow is very prevalent. But quite a different state of affairs prevails on the ice-capped land, for clear skies are there a common feature. On travelling south through the pack towards the land a break in the sky ahead is often the first indication of approaching land. A very regular feature observed from Winter Quarters was this break from cloud over the sea to clear sky over the land. This is well shown in Plate IV, Fig. 2, where the pall of cloud over Commonwealth Bay and the sea to the north ends abruptly at the margin of the coast.

Brilliant days of clear sky and bright sun are occasionally experienced in the pack-ice, but they are exceptional. Inland the case is otherwise, for skies that are clear or but little clouded prevail, and the development of cloud presages approaching blizzard winds. On these occasions “mare's tails” and cirrus radiants steal across the sky far over the continent and presently falling and drifting snow reduced the usual serenity of the plateau to blind confusion. Plate IV, Fig. 1, well illustrates cloud conditions on the plateau 50 miles south of Winter Quarters, Cape Denison, immediately prior to the advent of a blizzard.

The northern coast of Antarctica, especially where it extends to the neighbourhood of the Antarctic Circle, is a region of excessive precipitation. There dense stratus and cumulo-nimbus clouds accompanied by heavy snow falls periodically extend over the land for a distance of 100 miles or more from the coast. Plate II, Fig. 2, illustrates the final clearing stages of a mid-summer gale and snow storm in the coastal waters off the Mertz Glacier Tongue. As figured, the snow clouds have broken up to fracto-nimbus and fracto-cumulus and are hurrying away to the W.N.W.

Far inland beyond this coastal belt of excessive precipitation, in the cloud-deficient region precipitation is very light and often takes the form of a settling of minute ice crystals from a practically cloudless sky. In the latter case very interesting optical phenomena may be observed such as parhelia, prismatic arches, mock suns and the like. A notable example of this kind was observed at 10 a.m. on the 9th January, 1913, by

\* Report on Beaufort Numbers and the Velocity of the Wind. M.O. publication 180, 1906, by Dr. G. C. Simpson.

Dr. Jones when on a sledge journey between Gaussberg and "The Grottoes." His entry on this occasion runs as follows:—

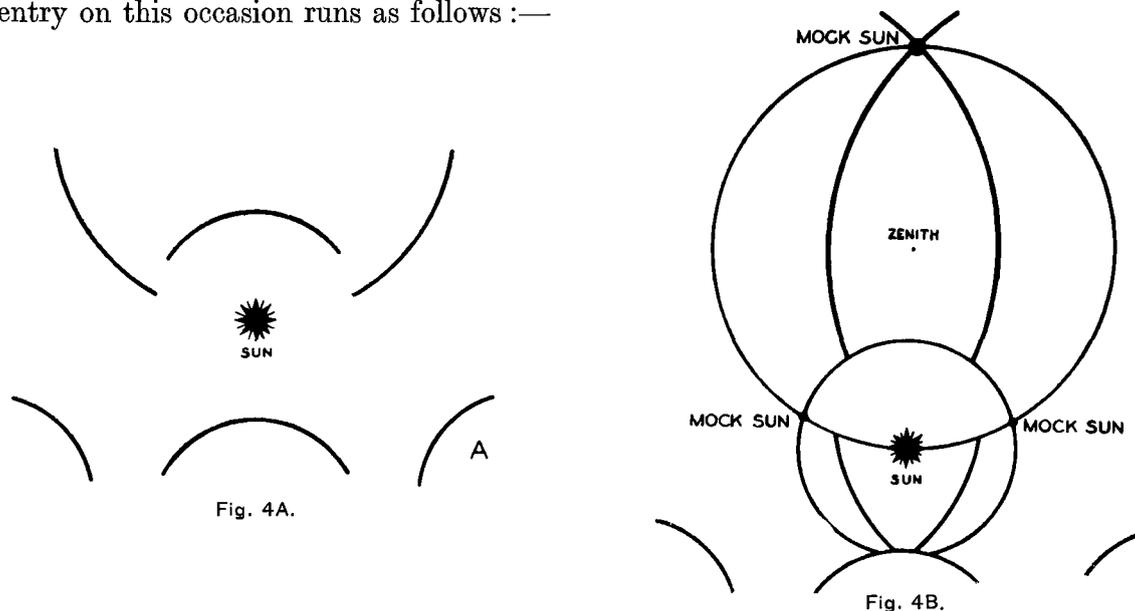


Fig. 4—Mock Sun and Prismatic Haloes observed on 9th January, 1913. An earlier appearance of the phenomenon is figured as "A," followed shortly afterwards by that recorded in "B."

"At 10 a.m. we observed a fog bank in the east. This approached rapidly. At 10.10 a.m. we noticed a prismatic arch in the east (A) and immediately afterwards saw that the air was full of fine ice crystals. There was no cloud formation (except in the east) and the sun and blue sky were not obscured. In a few moments the northern half of the heavens seemed strewn with prismatic arcs.

"At first there appeared to be no distinct arrangement, but soon several arcs joined and gave the form shown. Surrounding the sun was a ring complete except below where it was broken by a reverse arc. Passing through the sun and encircling the zenith was another circle. Two pairs of minor arcs appeared, one in each circle as shown, and one arc to east and to west. Mock suns appeared at the intersecting points of the two rings and also where the two arcs cut the larger circle. All the arcs were showing prismatic colouring except the zenith circle and its arcs which appeared white against the blue sky.

"The display lasted 15 minutes, but was not continuous, the circles frequently breaking and reuniting. The display terminated with the disappearance of the ice crystals and the obscuring of the sun by heavy cirro-cumulus."

In the coastal zone cloud formations preceding the advent of a blizzard cycle are often very striking. Plate III, Fig. 1, taken near 6 p.m. on January 22nd, 1914, in the Davis Sea, north of Haswell Island, records the southern margin of a bank of strato-cumulus cloud which at the time the picture was taken was rapidly extending from a dense centre to the north and west. Within an hour or two the wind commenced to rise until a whole gale was blowing next morning.

Plate III, Fig. 2, illustrates cloud conditions during a late autumn gale at Cape Denison, Commonwealth Bay. The dense stratus cloud bank to the north and west is seen along its southern margin to be fringed by a striking strato-cumulus formation with alto-cumulus at higher elevation.

*Daily Weather Remarks.*—Entries relating to special features of the weather and phenomena are reproduced as Table VII.

NOTE.—"Dr. E. Kidson has been engaged preparing two Volumes analysing and discussing the Expedition's meteorological data. This will be published in due course."

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PART I.

**QUEEN MARY LAND.**

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**TABLES.**