AUSTRALASIAN ANTARCTIC EXPEDITION
1911-14

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PART 1.

NARRATIVE

PART 2.

CARTOGRAPHY

BY

DOUGLAS MAWSON

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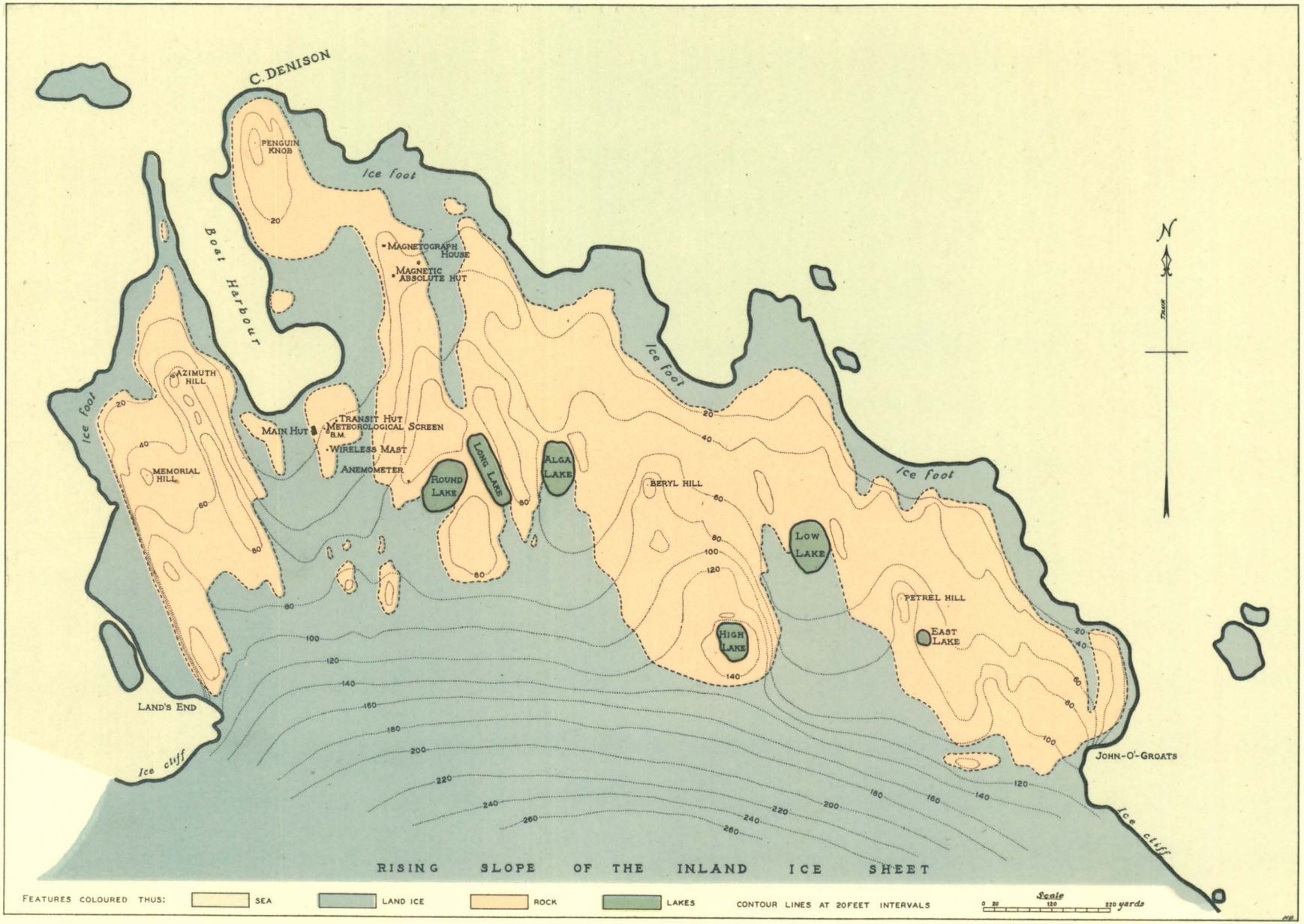

CONTENTS

PART I

NARRATIVE

OPERATIONS AND EXPLORATION OF THE MAIN BASE PARTY

ACTIVITIES OF THE WESTERN BASE PARTY

PROCEEDINGS AT MACQUARIE ISLAND

PART 2.

CARTOGRAPHY

LIST OF ILLUSTRATIONS

TEXT FIGURES

MAP PLATES

FOLDING MAPS

PHOTOGRAPHIC RECORDS

INTRODUCTION.

In the summer of 1908–09 when sledging from the Ross Sea north-west towards the Magnetic Pole across the plateau of South Victoria Land, one felt a great urge to go on and discover the limits of Antarctic land in that direction. The broader features of the Ross Sea region were then known but concerning a vast area to the west thereof little information was available. Of the extended region due south of Australia, landfalls had been vaguely recorded, but in one place only, Adelie Land, was there on record convincing evidence of *terra firma*.

Late in 1909 I proceeded to London to urge upon Captain R. F. Scott the importance of investigating the region to the west of Cape Adare. Scott was then organizing his British Antarctic Expedition of 1910–14, with the object of penetrating to the South Geographic Pole and further exploring the lands bordering the Southern Ross Sea. However, Captain Scott's plans were too far advanced to allow of modification of his programme and I had to find other means of participating in the unveiling of that section of Antarctica, adjacent to Australia. Shackleton then offered support in the achievement of my object. Having finalized plans for the undertaking, I proceeded to America to discuss my proposals with Shackleton, meeting him in Omaha in May, 1910. He was so impressed with the merits of the project that he offered to assume the responsibility of financing the enterprise on the understanding that he should command it, with myself as chief of scientific staff. With some reluctance, I agreed to this proposal for it left me free to concentrate on the scientific programme. However, this arrangement was short-lived, for other interests developed which demanded Shackleton's attention in England.

Thus it was that after discussing the all-important matter of finance with Mr. Robert Barr Smith and other influential Australians, I placed before the Australasian Association for the Advancement of Science, the plans for an Australasian Antarctic Expedition.* That was at the Sydney meeting in January, 1911. Thanks especially to the support of the President, Professor David Orme Masson, and to Professor G. C. Henderson, President of the geographical section, and to the advocacy of my old Antarctic colleague, Professor T. W. Edgeworth David, I was accorded a good hearing and promised substantial financial support. Several committees were appointed to assist where necessary in arrangements for certain sections of the scientific programme.

Apart from the essential pre-requisite, adequate funds, the most urgent necessity was to find and secure a suitable vessel for navigation in Polar seas. No ships of this kind were available in Australian waters. This necessitated my proceeding to England. Arriving there in February, 1911, I immediately got in touch with J. K. Davis, a former colleague on the Shackleton Expedition of 1907–09, whose efficiency in handling the *S.Y. Nimrod* had greatly impressed me. Davis was then in Canada, but immediately joined me in London as Second in Command of our new enterprise. During the next few months Davis devoted his entire energies and resources, in co-operation with me, to complete arrangements for what was to be a notable undertaking. The Expedition owes him very much for his splendid work at this and all other times throughout the conduct of the Expedition (Plate I, Fig. 1).

Early in April, an outline of plans for the Expedition was placed before the Royal Geographical Society† and much encouragement was received from that body.

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* The Proposed Australasian Antarctic Expedition: A.A.A.S. Reports, Vol. XIII, pp. 398–400.

† The Australasian Antarctic Expedition: Geog. Journ., June, 1911.

Though at an early stage a solid foundation to the Expedition funds was provided by a few prominent Australians, the necessary finance was not forthcoming in its entirety until late in 1911.

Captain Davis devoted much time to the search for a suitable vessel. Eventually the *Aurora*, one of the Newfoundland sealing fleet, was purchased. In the late years of last century she had seen much service in the Arctic as one of the Dundee whaling fleet. She was built of heavy oak timbers, sheathed with greenheart and with the cutwater specially protected with iron plates. Her measurements were 165 feet long, 30 feet across the beam and drawing 18 feet of water. Though she was registered as only of 386 tons we were able to transport about 600 tons of cargo as a maximum. The boilers were coal fed, driving engines of 98 horsepower; this gave her a maximum speed of about 10 knots under favourable conditions.

On her arrival in the Thames she was docked (Plate I, Fig. 2 and Plate II, Figs. 2 and 3) and very extensive repairs and alterations effected, including conversion to barquentine rig (Plate II, Fig. 1). Captain Davis personally supervised all this work.*

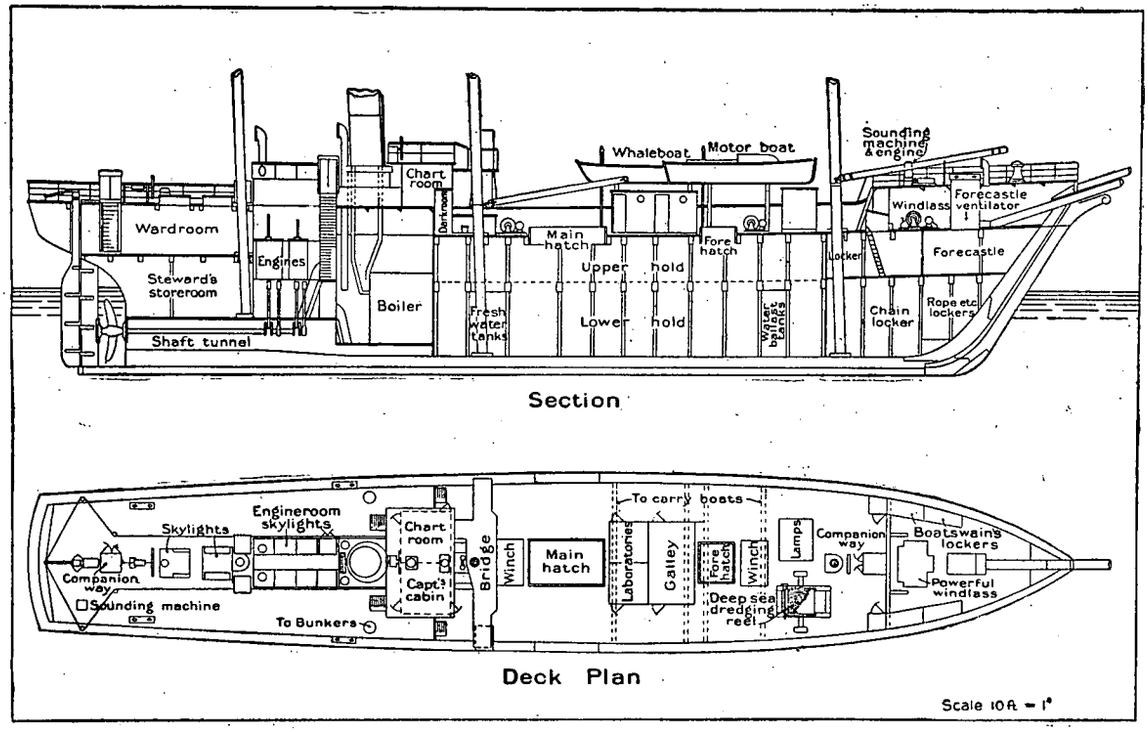

FIG. 1. Plan and longitudinal section of *S.Y. Aurora*.

The Royal Geographical Society of London gave generous assistance to our finances and Lord Northcliffe opened the pages of the London Daily Mail† in an appeal for funds. The British Government and Lord Denman, the Governor-General designate of the Commonwealth of Australia, both contributed handsomely. Splendid help was forthcoming in the form of gifts of equipment from leading manufacturing firms in Britain and Australia.

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* A more detailed account of the *Aurora* is to be found in Captain Davis's book "With the *Aurora* in the Antarctic" (London), 1919.

† May 9th, 1911, et seq.

While I was very fully occupied in Europe on these matters, the Committee of the A.A.A.S. appointed to help in the organization of the Expedition were actively engaged in Australia pressing the Commonwealth Government for financial assistance and helping in other ways.*

Meanwhile repairs and alterations to the vessel were being effected and orders were placed for a vast quantity of equipment. Dogs had to be purchased from Greenland, furs from Lapland, sledging and skiing equipment from Norway and Switzerland. All other necessities were available in Britain and Australia.

By June all matters calling for attention in Europe were well under way and were then left in Davis's hands while I returned to Australia to press the Commonwealth and State Governments for financial assistance and to complete arrangements for personnel and equipment. All these objects were successfully achieved by the end of October, thanks to the help of many good friends.

The application of wireless telegraphy in connection with shipping was, at that time, being rapidly extended in Australian waters, though still in its infancy in relation to subsequent developments. Only long-wave transmission was available and considerable power was required to span what was later regarded as only a short distance. To transmit from Antarctica to Australia was considered too great a distance for an installation of the power that we could reasonably include in our equipment. However, at this stage the Commonwealth Meteorological Bureau, then under the direction of Mr. H. A. Hunt, indicated that records from Macquarie Island, at that time the most southerly outpost of the Commonwealth, were desired to amplify available data bearing on the climate of the Australasian region. Accordingly, I decided to increase our proposed operations by installing a party at Macquarie Island with wireless equipment, which could relay to Australia messages received from our Antarctic Main Base station. The question of equipping the *Aurora* with wireless could not be considered, for her available resources in space and power were already over taxed.

Returning to operations proceeding in London after my departure to Australia, Captain J. K. Davis, by working at high pressure, managed to get all equipment, dogs, etc., on board the *Aurora* by late in July. The vessel was incorporated on the register of the Royal Thames Yacht Club, a circumstance which facilitated her operations in Empire ports.

The *S.Y. Aurora* departed from London at 2.45 a.m. on July 28th, 1911. A call was made at Cardiff where 534 tons of the anthracite briquettes of the Crown Preserved Fuel Company were taken on board. Every ton of this outstanding fuel that it was possible to carry was packed into the ship. The bunkers held only 72 tons. In the main hold were 275 tons, in the main 'tween deck 100 tons and on the decks 87 tons.

Capetown was the next port of call and from there a fast run was made to Hobart, which was reached on November 4th. The average speed for the voyage was 6·7 knots and the coal consumption 5·3 tons per day. Very rough weather after leaving Capetown resulted in considerable losses among the deck cargo of dogs notwithstanding the best efforts of Lieut. Ninnis and Dr. Mertz. These two members of the shore party voyaged out to Australia on board the *Aurora* with the special object of caring for the sledge dogs (Plate VI, Fig. 1).

Hobart was reached on the afternoon of November 4th. By that time the Commonwealth Government and the State Governments of South Australia, New South Wales and Victoria had all contributed considerably to the Expedition fund, so that there was then no immediate further anxiety regarding financial provision. The personnel of the land parties had been selected and a steady flow of equipment had set in towards Hobart which was to be the home base of the Expedition.

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* Report of the Australasian Antarctic Committee: A.A.A.S. Reports Vol. XIV (1913), pp. 1 to 5.

By the third week in November all members of staff selected for the land parties had arrived in Hobart. The final disposition of personnel* for the shore bases was as scheduled below.

The Main Antarctic Base.

Robert Bage	Astronomy, Tides and Magnetics.
Francis H. Bickerton	Air-tractor Sledge and Wireless.
John H. Close	Assistant Collector.
Percy E. Correll	Mechanician.
Walter H. Hannam	Wireless Telegraphy.
Alfred J. Hodgeman	Cartography and Assistant in Meteorology.
John G. Hunter	Biology.
J. Frank Hurley	Official Photographer.
Charles F. Laseron	Taxidermy and Collector.
Archie L. McLean	Medical Officer and Bacteriology.
Cecil T. Madigan	Meteorology.
Douglas Mawson	Leader.
Xavier Mertz	Sledge Dogs.
Herbert D. Murphy	Stores.
B. E. S. Ninnis	Sledge Dogs.
Frank L. Stillwell	Geology.
Eric N. Webb	Terrestrial Magnetism.
Leslie H. Whetter	Surgeon.

The Western Antarctic Base.

George Dovers	Cartography.
Charles T. Harrisson	Biology.
C. Archibald Hoadley	Geology.
S. Evan Jones	Medical Officer.
Alec L. Kennedy	Terrestrial Magnetism.
Morton H. Moyes	Meteorology.
Andrew D. Watson	Geology.
Frank Wild	Leader.

Macquarie Island.

George F. Ainsworth	Meteorology and Officer-in-Charge.
Leslie R. Blake	Geology and Cartography.
Harold Hamilton	Biology.
Charles A. Sandell	Wireless Telegraphy.
Arthur A. Sawyer	Wireless Telegraphy.

* Biographical details relating to each of the members of staff are to be found in " The Home of the Blizzard " (1915), Vol. II, pp. 281–290.

The ship's complement at this time comprised, besides John King Davis, Captain and Second-in-Command of the Expedition, the following :—

Norman C. Toucher, First Officer.
Percy Gray, Second Officer.
C. P. de la Motte, Third Officer.
F. Gillies, Chief Engineer.
Corner, Second Engineer.

Also seamen, stokers and galley staff to the number of nineteen.

To these, my comrades who, through all the vicissitudes of a difficult and adventurous undertaking, staunchly supported me in endeavouring to carry out the work to a successful issue, my best thanks are given.

During the last week of November, the Queen's Pier at Hobart was a scene of great activity. Every member of the land parties and the ship's crew participated in the final check and stowage of the vast array of stores* and equipment. In order to distinguish clearly between the packages consigned to the respective shore stations, each package had a coloured band painted around it, the colour being distinctive of the particular station to which it belonged. This method of branding greatly facilitated landing operations at each of the base stations and reduced the risk of losing odd packages intended for one station amongst the equipment of some other station.

It had become apparent early in November that the magnitude of the equipment provided for so many shore parties would so tax the capacity of the *Aurora* that the available stowage space for coal would be inadequate for our requirements. To meet this situation a small steamer, the *Toroa*, was chartered to carry coal, a portion of the equipment and some members of the shore personnel as far as Macquarie Island.

The departure of the Expedition from Hobart was scheduled to take place on the second day of December. Professors David Orme Masson and T. W. Edgeworth David continued to act for the Expedition in Australia during our absence and great credit is due to them for their efforts on our behalf. Mr. Conrad C. Eitel who had acted as Secretary during the busy month in Hobart remained in Hobart in that capacity throughout the ensuing year.

The cost† of the Expedition's operations during the years 1911 to 1914 amounted in all to about £60,000 plus the value of extensive gifts in kind both food and general equipment. The outstanding subscriptions from private individuals were the following: Samuel Hordern, £2,500; Lady Scott, £1,100; Eugene Sandow, £1,050; and £1,000 each provided by the following gentlemen: Hugh Denison, Hugh Dixson, William A. Horn, Roderick Murchison, Robert Barr Smith, Lord Strathcona and Sir Lucas Tooth. The Australasian Association for the Advancement of Science contributed £1,000. A large part of the cost was met by contributions from Government sources.

The outbreak of the European war, following immediately upon the conclusion of our explorations, was a disaster of the first magnitude in its repercussion upon the prompt and successful publication of reports dealing with the work achieved.

Some of those most responsible for the conduct of the scientific programme were killed; others by the end of the war were diverted into new channels of life, far removed from occupations permitting them to devote adequate time to the elaboration for publication of the data accumulated by them.

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* For some details of the stores and equipment see " The Home of the Blizzard " (1915), Vol. II, pp. 313–321.

† A progress statement was published in " The Home of the Blizzard " (1915), Vol. II, page 311. A final statement relating to the finances of the Expedition will appear in a report to the Australian and New Zealand Association for the Advancement of Science upon the conclusion of the printing of these Scientific Reports.

Perhaps the greatest misfortune was that adequate realization of the asset expected to yield sufficient funds to defray the cost of publication of the scientific reports never eventuated. This asset was in the nature of an exceptionally complete and varied film record of newly discovered lands and of the life of Antarctica—a masterpiece by Frank Hurley whose initiation into Polar photography was an event of this Expedition.

A satisfactory agreement was reached for the sale of the film rights and the final document relating thereto was to have been signed on the very day that war broke out. On that fateful day, in view of the new orientation of national affairs, the purchasers declined to complete the contract.

A small sum only was netted from lectures and exhibitions of the film in America. This and the proceeds from the sale of the popular story, "The Home of the Blizzard," were devoted to clearing up outstanding debts.

At the conclusion of the war, every effort was made to proceed with the publication of the reports. With the generous help of many scientific workers this has at length been done. Unfortunately many of the manuscripts were ready for publication long before funds were available for printing. As a result the completion of the work has been long drawn out and all that can be said is "better late than never."

The first parts to appear were printed at the Government Printing Office, Adelaide. Then the Government of New South Wales undertook the publication of the Reports, operating through a Publications Committee comprising the Government Printer, the Chief Librarian (W. H. Ifould) and a representative both of the Australian Museum and of the Expedition. These volumes have been issued from the Government Printing Office, Sydney. With a view to limiting the cost of printing, data relating to certain aspects of the work are being incorporated in publications dealing with like subjects which are in process of printing as the Reports of the British, Australian, New Zealand, Antarctic Research Expedition.

The narrative herewith submitted has been compiled from various records and reports submitted by members of staff as well as from my own observations. The ship's operations are well recorded in the vessel's log books amplified by an excellent account contained in Captain Davis's private diary.

The activities of the Western Base Party are recorded in reports received from Frank Wild and S. E. Jones, but these have been greatly amplified by reference to the private diaries of A. L. Kennedy and C. T. Harrisson.

Reports received from the leaders of the sledge parties which radiated out from Cape Denison and from J. G. Hunter, the Chief Biologist, have in combination with my own observations completed the survey of events connected with the Main Base Station.

The brief resume of the doings of the Macquarie Island Party is culled from G. F. Ainsworth's report and the diaries of L. R. Blake and H. Hamilton.

All records, maps, photographic negatives, and so far as possible, the scientific collections and relics of the Expedition have been handed over to the Government of New South Wales in fulfilment of an agreement whereby the reports would be printed by and issued from the Government Printing Office, Sydney. The manuscript material is to be preserved at the Mitchell Library and the natural history collections at the Australian Museum.

The account narrated hereafter deals methodically with the progress of the Expedition's operations supplying not only a narrative, interesting in itself, but furnishing much information needed for a fuller appreciation of what appears in the series of succeeding reports on special phases of the work.

The popular story of the Expedition has been published under the title of "The Home of the Blizzard." We wish to thank Messrs. Hodder & Stoughton Ltd. for permission to reproduce in this volume certain illustrations and text.

VOYAGES OF THE *S.Y. AURORA*

FIRST ANTARCTIC VOYAGE

HOBART TO MACQUARIE ISLAND.

At 4 p.m. sharp on Saturday, December 2nd, the *Aurora* cast off her moorings at the Queen's Wharf, and moved out into the stream, (Plate III, Fig. 1.) Leading citizens of Hobart and a great concourse of onlookers assembled at the wharf gave the Expedition a most cheering send-off, whilst a band played "God be with you till we meet again." As we proceeded towards the animal quarantine station where the dogs were to be picked up, the river was agleam with the white sails of yachts crowding down upon us in the enthusiasm of the occasion. The Governor, Sir Harry Barron, in the *Egeria* accompanied us as far as Sandy Bay Point, (Plate III, Fig. 2).

The dogs were taken on board at 5.45 p.m.; then the *Marama*, packed with friends, waving final farewells, turned back up-stream and the *Aurora* set a course to sea at full speed for Macquarie Island, the first stage of the journey South.

The ship's officers and crew on this voyage were made up as follows :—Ship's Captain, J. K. Davis; First Officer, N. C. Toucher; Second Officer, P. Gray; Third Officer, C. P. de la Motte; Chief Engineer, F. J. Gillies; and twenty petty-officers and other ratings. There were with me also thirteen members of the land parties. The remaining fifteen members of the land parties were to follow a few days later in the s.s. *Toroa* and were to catch up with the main party at Macquarie Island.

Every ounce of coal, stores and equipment that the vessel could carry both below deck and on deck had been packed into her, so that she wallowed deeply even in the calm seas met with that evening off the coast. A deck cargo of hut timber, "wireless" masts and the like, was everywhere piled high; tethered separately at intervals over everything were the thirty-six sledge dogs. Thus the handling of the running gear operating the spars and sails aloft was greatly hampered.

December 3rd.—No sooner had the vessel got clear of the land than the barometer fell rapidly and a a fresh gale developed. High seas poured over the ship dangerously at times.

December 4th.—The weather improved during the morning hours but there was increasing wind as the day progressed. The ship was standing well to the south in order to effect as much southing as possible whilst the weather remained favourable. Our position at noon was lat. 43° 54′ S., longt. 151° 36′ E.

The bilge-water discharge-pumps became partially clogged and the water rose 15 inches in the well. On investigation it was found that slack coal and other rubbish had obstructed the pump valves. Fortunately Captain Davis had foreseen this possibility, profiting by our bitter experience of the same nature when in the *Nimrod* in January, 1908; accordingly he had provided a narrow by-pass from the deck through the main hold to the bilge pumps. So, when the trouble came, the hand pumps had to be manned for a short time only; meanwhile a couple of the men got down by way of the by-pass to the main pumps and, working half in and half out of water, soon had them cleared and in operation once more.

A great number of sea birds hovered in the wake of the ship. Three varieties of Albatross were seen, namely the Wanderer, the Black-browed and the Sooty. Storm Petrels and small Prions were also in evidence.

December 5th.—The wind continued to increase and it became more and more difficult to maintain a semblance of hot meals for the twenty-two men housed in the cramped quarters aft. On deck everything was slippery with filth from the dogs. To-day a Gannet was noted amongst the attendant birds. Latitude at noon 45° 5′ S.

December 6th.—The gale continued with increased force; high seas and frequent hail squalls; wind from west-by-south. The ship's course was set at S. 45° W. The vessel little more than held her position. The day's run actually amounted to 24 miles.

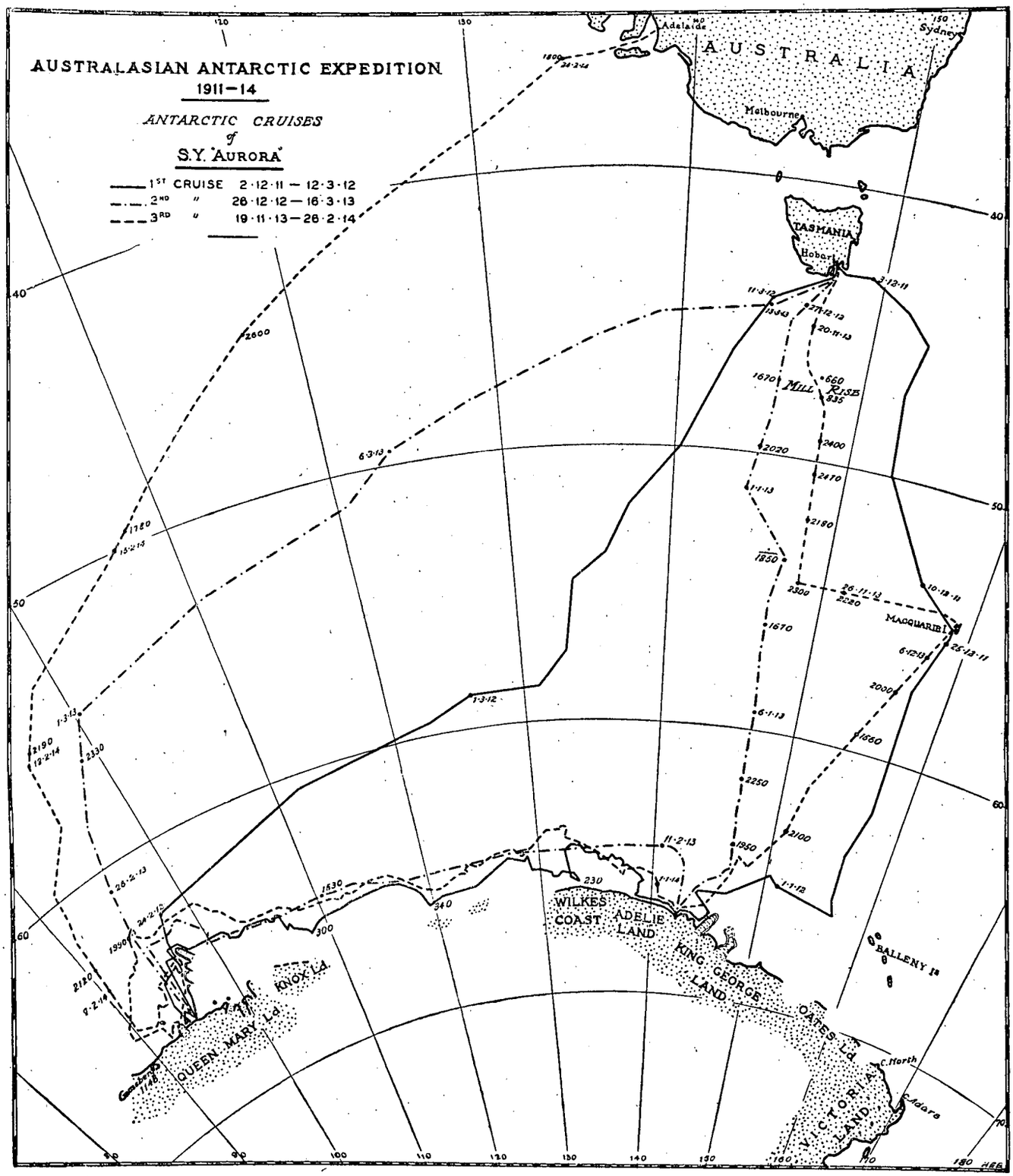

Fig. 2. Track of the *S.Y. Aurora* on three Antarctic Voyages.

During the day much damage was done. It was only Captain Davis's skilful handling of the vessel that averted more serious trouble. At 6 a.m. a heavy sea was shipped. Ninnis and Harrisson who were attending to the dogs at the time were swept along the deck and jammed under the winch, which saved them from being washed overboard. The motor-launch chained to the deck amidships was badly battered. The starboard end of the bridge was carried away. Another serious matter was that the body of the aeroplane, housed in a huge packing case lashed over deck houses forward, suffered a great deal of damage. The dogs being securely chained were not lost but left in all directions dangling from the end of their chains. These poor creatures suffered severely in this section of the voyage so that their health was greatly reduced by the time they reached Macquarie Island.

Members of the landing parties were mostly, not excepting myself, " under the weather " during those first few days; but, with only two or three exceptions, we soon got our " sea legs."

December 7th.—Towards midnight the wind had fallen off considerably and was easy during the early hours of the day. However, the ship rolled heavily in a big south-westerly swell. Noon position, lat. 47° 9′ S., longt. 152° 1′ E.

December 8th.—With a further fall of the barometer the wind had revived, gradually swinging from north-west-by-west to south-west-by-south. Noon position: lat. 49° 56′ S., longt. 152° 28′ E.

December 9th.—The weather gradually improved. Members of the shore parties were told off to effect repairs to the motor-launch and other damage done during the past few days. All hands so disposed were issued with a tot of spirits in the evening and there was some good natured revelry in the ward-room.

A notable drop in the sea-water temperature was recorded at the 8 a.m. observations, when it was 44·5°F., marking the northern limit of the zone of Antarctic surface water.

December 10th.—A heavy swell set in from the south-west but the wind soon abated. This was a busy day on board in preparation for arrival at Macquarie Island. All hands were much more cheerful. A call for volunteers amongst the shore party members to furl the foresail soon found the yard crowded with men.

December 11th.—At 1 a.m. a peculiar compass disturbance occurred; both the standard and the steering compasses swinging through 5 points for three or four minutes.

At 4 a.m. Macquarie Island was observed stretching away on the starboard bow. We came up with the land at 7 a.m. and proceeded down the west coast in order to investigate Caroline Cove which is situated near the southern end of the Island. It was planned to deposit there a store of food for the use of the party to be stationed on the Island.

At 11.30 a.m. when off Caroline Cove, a whale-boat with stores for the depot was lowered and with a boat's crew of members of the land parties I proceeded ashore, (Plate IV, Fig. 1). The *Aurora* towed the whale-boat as near to the entrance of the Cove as practicable, then cast it off and swung northward and out to sea again. Fortunately the sea was very calm and the vessel had little way on at the time, for within a few minutes of parting with the whale-boat, the *Aurora*, rising and falling in a gentle swell, was deposited on top of a pinnacle of rock submerged 12 feet below the surface. No damage of any consequence resulted from the mishap.

We found the entrance to the Cove very narrow and the waters inside so limited in breadth as to make it practically useless for vessels even of the size of the *Aurora*. Fortunately easterly weather prevailed at the time so that the waters of the Cove, which are open to the west, were comparatively tranquil.

A landing, (Plate IV, Fig. 2), was made amongst Royal Penguins and Sea-elephants, on a beautiful sandy beach at the head of the Cove. The provision depot was laid. Webb and Kennedy executed a complete set of magnetic observations on flat ground clothed in tussock-grass, just above the beach. Other members of the party collected birds and rocks.

At 5.20 p.m. the landing party arrived back on board the *Aurora*. The ship then lay for the night at 1½ to 2 miles off shore.

December 12th—We got under way at 3 a.m. and proceeded up the west coast and around the north end of the Island making for North East (Buckle's) Bay which is the chief roadstead of the Island. As we steamed into the Bay at about 7 a.m. a small vessel was observed wrecked, driven ashore almost opposite a hut and " boiling down " works erected by sealers. These buildings are on the grassy slope above the beach at the south end of the low spit which joins to the main-land mass the hill which constitutes the northern tip of the Island.

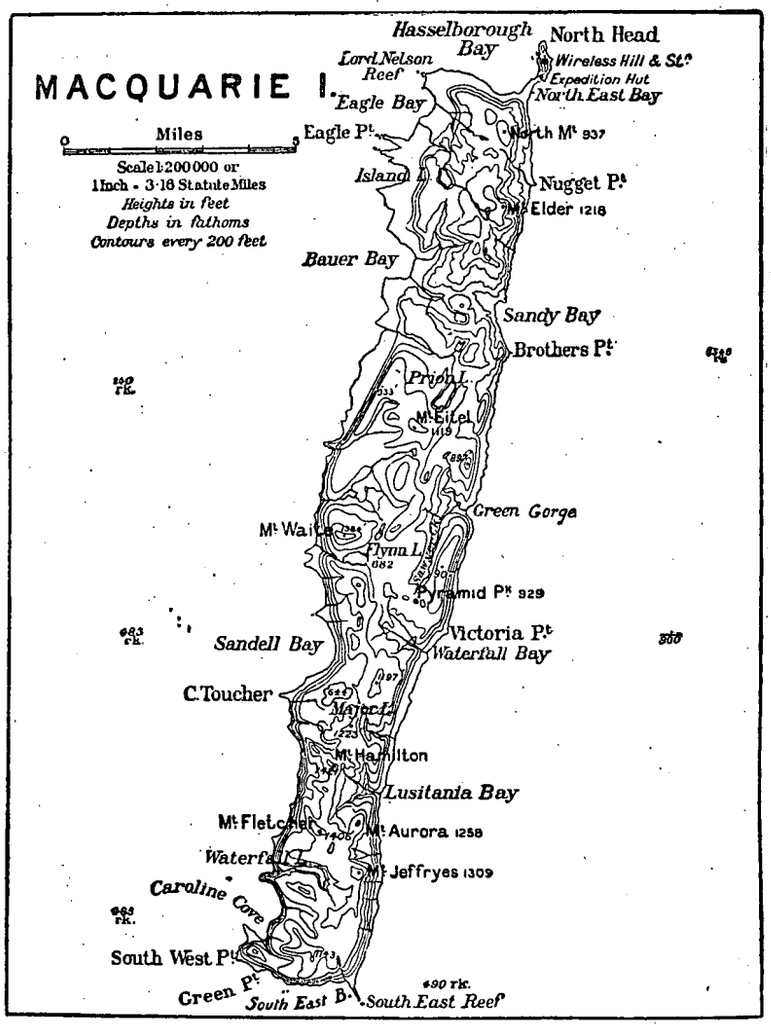

FIG. 3. Macquarie Island as charted by L. R. BLAKE.

Before departure from Hobart, we had been informed that sealers from New Zealand were operating on the Island, also that a small sailing vessel, the *Clyde*, had been despatched from New Zealand to transport their catch to the Bluff. We were now to learn that the *Clyde* having reached the Island in safety had, on November 13th, been driven ashore, dragging her anchors in a south-east gale, (Plate V, Fig. 2).

There was great excitement ashore amongst the sealers and shipwrecked crew when the *Aurora* was sighted making into the Bay. Unfortunately there was too much sea running on that east coast for the sealers to launch a boat or for us to visit the shore. By semaphore, the sealers advised us to return to the west side of the Island where the surf was less formidable. Accordingly Captain Davis steamed the ship around the north end of the Island to the entrance to Hasselborough Bay. There we met Otto Bauer, the headsman of the sealers, who, with a couple of mates, had launched a boat on the west side of the spit and rowed out to meet us. Bauer gave Captain Davis the benefit of his knowledge as to the best anchorage in the Bay and the *Aurora* was eventually brought to rest about a mile from the shore in 15 fathoms of water, (Plate V, Fig. 1).

ESTABLISHING A BASE STATION AT MACQUARIE ISLAND.

As some days were to be spent in landing and installing the small Expedition party who were to occupy the Island for the ensuing year, no time was lost in commencing operations. The dogs were landed under care of Ninnis who, for the time, was to reside ashore with the sealers, (Plate VII, Fig. 2). With plenty of fresh seal meat for food and with *terra firma* beneath them the dogs quickly recuperated.

The motor-launch, which had been repaired by Bickerton, Harrisson and others, was hoisted overboard and some of us were soon ashore selecting a site for the Living Hut and Wireless Station. Under advice from Hannam it was decided to erect the Wireless Station on the summit of the 370 feet high hill (Wireless Hill) at the north end of the Spit. A location for the Living Hut was then selected at the north end of the Spit in proximity to the Wireless Station.

It was recognised that the transport of the heavy wireless equipment, hutments and masts to the summit of the Wireless Hill would be a big undertaking. But in the state of the technique and practice of wireless telegraphy at that date it seemed certain that better results could be secured from a station on top of the hill, than on the low ground in the shadow of the hill.

Fortunately the sealers had at one time employed a wire hoist (" flying fox ") to transport seal blubber to the summit from the shore at the foot of the hill opposite the anchorage. Wild, with a small party of helpers, was deputed to put this aerial ropeway in order and to operate it. They camped at the lower end of the hoist, which was located at the head of a comparatively calm channel of water leading from the open bay through the kelp-covered rocky reefs which fringe the shore, (Plate VI, Fig. 3).

The motor launch, towing whale-boats loaded with equipment, plied between the vessel and the shore. Everything appertaining to the wireless station was landed at Wild's camp at " Aerial Cove "; all other materials were taken to the north end of the Spit in proximity to the site chosen for the living Hut. Several of the men were stationed on the summit of " Wireless Hill " to receive the loads as they arrived on the " flying fox," (Plate VI, Fig. 4). The transport of materials thus proceeded rapidly.

In the meantime, Hurley accompanied by Harrisson, who was to make biological observations *en route*, was despatched overland to Caroline Cove in order to retrieve a valuable cinematograph camera lens which the former had accidentally left there when ashore on the 11th. One of the sealers, Thomas Hutchinson, agreed to go with them as guide. They spent three arduous days in fog and rain traversing a distance of 30 miles following the rugged rock-bound shore and over high hills of the interior of the Island. Altogether a strenuous undertaking, especially so as they returned heavily laden with trophies of scientific interest.

December 13th.—The *Toroa* arrived at 3 p.m. and dropped anchor in the Bay a few cable lengths ahead of the *Aurora*. (Plate VI, Fig. 1). A consignment of sheep which came with her were put ashore to be refreshed by the verdant herbage of the Island. The launch transported goods and coal ashore; also from the *Toroa* to the *Aurora*.

December 14th and 15th.—The work of unloading continued. The final boat-load of coal from the *Toroa* reached the *Aurora* at 8.45 p.m. In the meantime it had been agreed to assist the sealers to the extent of helping them to load their barrelled oil on to the *Toroa* which would then return to Hobart with the ship-wrecked crew and the oil.

December 16th.—The chief business ashore centred in the erection of the wireless masts on the summit of " Wireless Hill." The *Toroa* completed loading and departed at 10 p.m.

December 17th to 20th.—The shore parties continued erecting masts, engine house and wireless hut on top of "Wireless Hill." (Plate VII, Fig. 1).

December 21st.—At a feverish rate members of the shore parties continued with the work. Captain Davis arranged for the boatswain and three sailors to go ashore to splice the wire cables which formed the stays of the masts. Hurley and several others to assist him were sent to the Nuggets (Finger and Thumb Point) to secure a cinematograph record of Royal Penguins.

On the 3rd instant, soon after departure from Hobart, the unpleasant discovery had been made that the deck plug to the ship's fresh-water tanks had not been screwed into place, thus allowing entry of the sea-water which washed across the waist of the ship. As a consequence the water was no longer fresh, but brackish. At that time the question of returning to Hobart to replace the supply was seriously discussed but the decision was reached to proceed in spite of the brackish water. It was hoped that a supply of fresh-water could be conveniently obtained at Macquarie Island. It was now decided to investigate the possibility of obtaining supplies of water at the Nuggets. With this intention, Captain Davis called all hands at noon to weigh* the anchor. Alas! on its arrival at the cathead the anchor stock was found to be missing. This was the first of a series of misadventures relating to the ship's anchors due to the rocky nature of the bottom met with at some of our anchorages, more particularly that at Commonwealth Bay.

1.15 p.m. we arrived at the Nuggets but found a heavy surf running, making landing impossible. The ship was then anchored at North-East Bay. Wild, with a volunteer crew, manned a whale-boat and attempted to bring the sailors off from the shore, but found the sea breaking too heavily and had to abandon the project.

December 22nd.—Bickerton and Harrisson who had been engaged off and on during the past week effecting repairs to the bridge of the *Aurora*, now completed the job.

As a landing could not be made on the east side of the Island it was decided to steam around North Head and anchor in Hasselborough Bay. At 10 a.m. a start was made to heave up the anchor. The antiquated hand windlass worked very badly so that it was not until noon that the anchor was weighed. A fresh north-easter was blowing and a fair sea running as the *Aurora*, with the motor launch† in tow, rounded North Head. The launch towed very well in the sea then running but, when on the crest of a large wave, in the disturbed water off North Head she suddenly shot forward striking the counter of the *Aurora* such a blow with her specially strengthened prow that a gaping hole was made through the planking. As for the motor launch, which had suffered in the gale after leaving Hobart, it was now still further damaged; the fore deck timbers of the launch had been started with the force of the blow. Shortly after this episode the vessel was brought to anchor in Hasselborough Bay.

At 2.30 p.m. the ship was found to be drifting to the south-west. It was then discovered that the anchor shackle had parted. The loss of the port anchor was serious, because the starboard one was of little use, on account of the loss of its stock on the 21st instant. The only other anchors on board were of the small kedge type.

Captain Davis met the occasion by steaming slowly backwards and forwards across the Bay, whilst a jury stock for the starboard anchor was being fashioned out of two 10 inch by 10 inch oregon timbers bolted together around the anchor shaft. During all this time Bickerton, Close and Hodgeman were in the motor launch towed astern, keeping it bailed out.

As soon as repaired the anchor was dropped, and a whale-boat lowered and sent off to bring men from the shore, where some of the crew and almost all members of the land parties had been marooned since the preceding day. Those left on board hoisted the launch out of the water and secured it on deck where it could be repaired during the voyage south.

The work of erecting the Wireless Station and the living Hut was now, in the main, accomplished. What remained to be done could be easily completed by the small party detailed to occupy the station. Accordingly arrangements for departure were made. Loaded with men and the carcases of fifteen sheep, the whale-boat returned to the *Aurora* in the twilight at 10.45 p.m.

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* During this first cruise the winding in of the anchor cable was laboriously effected by man power operating a hand windlass. On return to Sydney, however, a deck winch was installed which was available both for winding-in the anchor chains and the dredging cable.

† The motor launch was solidly constructed and 25 feet 6 inches in length. It could not be handled by any of the davits then existing on the *Aurora*. Consequently, on account of the time and labour involved in rigging tackle and hoisting it inboard, the operation was avoided whenever possible. After the first Antarctic Cruise stronger davits capable of handling the launch were installed.

December 23rd.—With a stiff north-easter blowing and some sea running in the Bay, the work of getting the rest of the sheep and dogs off from the shore was rendered difficult and arduous, for since the motor-launch was out of commission our only communication was by rowing ashore in the whale-boat. A number of these trips were undertaken throughout the day. In the middle of these operations the ship again dragged her anchor. It was then weighed and the vessel had to stand up and down the Bay. Late in he afternoon it was decided to make an effort to get the rest of the sheep from the shore. I picked a sturdy boat's crew including Wild, Madigan, Harrisson, Kennedy and several others. Towing the whale-boat behind the *Aurora*, Captain Davis brought us as close to the head of the Bay as practicable. It was rough water and squally. A landing was made between rocky reefs at the North end of the Isthmus.

The Island Party quickly bundled the sheep aboard. Then there was a brief hand-shaking as we took leave of Ainsworth, Hamilton, Blake, Sandell and Sawyer, to whom was assigned the conduct of the Expedition's programme on the Island. With the wind howling across the Isthmus as we parted, the occasion was rendered more eerie by the rumble and shudder of an earthquake. The latter phenomenon, we were to find, is not uncommon at Macquarie Island. As we pushed off, the Islanders gave us three cheers which were heartily reciprocated.

Again alongside the *Aurora*, with the wind blowing a fresh gale, it was quite an acrobatic feat swinging the live sheep on board as the boat ranged in the surge of the sea quite 12 feet vertically against the side of the *Aurora*. By 6 p.m. all was snug on board including the whale-boat, which did not avoid receiving some heavy bumps as it was got on board. The jury anchor stock having been repaired, the anchor was then dropped for the night. It held well, notwithstanding the squally conditions.

MACQUARIE ISLAND TO COMMONWEALTH BAY.

On the morning of December 24th the wind still continued blowing strongly from the north-east, but it fell off as the day advanced. At 10.45 a.m. the anchor was weighed and the vessel proceeded down the west coast.

As our water supply was far from satisfactory we were anxious to get replenishment from the shore. With the wind and sea beating on the east coast of the Island, the only hope for water now lay in Caroline Cove. My visit of December 11th had impressed me with the possible utility of this haven in easterly weather But on account of the narrowness of the Cove in comparison to the size of the *Aurora* Captain Davis was not pleased with the proposal to take the vessel into such confined waters. On the other hand, to attempt to water ship from the shore, with the vessel standing out to sea, would have so prolonged the proceeding as to make it impracticable. We arrived off Caroline Cove at 2 p.m. To test further the possibility of taking the vessel into the Cove, I picked a boat's crew and, with Wild (Plate VIII, Fig. 1) to assist, proceeded to sound the Cove and its entrance. Though the entrance is narrow we found 10 fathoms of water right up to the rocks on either side. There is also good water over a large part of the Cove within.

Though still disliking the prospect of taking the vessel into such narrow waters, Captain Davis then steamed the *Aurora* into the Cove, mooring her with head to the open sea, secured forward by the starboard anchor and aft by a kedge anchor.

No time was lost in rowing ashore with casks to bring off water. The main stream at the head of the bay is poluted by Penguins which make their way along its course to a rookery on the high ground above. We therefore filled the barrels from a small side stream which offered purer water.

During the afternoon a calm descended over the Cove. As the evening drew on, only the weird sounds of abundant wild life, the splashing of oars and the songs, mostly students' songs, of happy vigorous youth disturbed the enchanted scene.

With a gang of men ashore and two whale-boats plying to the ship, a useful amount of water was got off before dark.

December 25th.—I was awakened at 3 a.m. by feeling the ship bumping gently against the rocks on the south side of the Cove. We found that a light gust of wind had descended from the highlands and, stretching the fore and aft cables, had sagged the vessel down on to the rocks. This had all happened in the moment when the watch had entered the galley to stoke the fire.

Captain Davis was out in a jiffy and, with all hands hauling on the anchor cables and the engines moving the vessel forward, she was soon ha uledoff the rocks without having suffered any damage Nevertheless, Captain Davis, now thoroughly distrusting the Cove, decided to lose no time in getting out of it; so he steamed the vessel steadily ahead out to sea. The forward anchor was hauled in as we proceeded. The kedge anchor aft held its ground so the wire cable parted as the vessel moved forward and as a consequence we were minus one more anchor. Any further attempt to water ship was abandoned, and at 5.35 a.m., after the boats were got on board and all made snug, the voyage south commenced.

The ship's head was laid to the south. The day was fine and cloudless. By 11.40 a.m. we were abreast of the Bishop and Clerk rocks, distant from them about 2 miles to the west. This being Christmas Day the midday dinner was embellished by the addition of wine and cigars.

After the extremely arduous fortnight spent at Macquarie Island, all hands to-day revelled in the fine weather and comparative rest aboard, (Plate VIII, Fig. 1).

All land party men on board were divided into three watches corresponding with the regular ship watches and were detailed to assist the ship's crew in the working of the ship. Even meals were served in three shifts for neither the galley staff nor the small ward-room was adequate to cope with all hands at one sitting.

At 1.30 p.m. all sail was set and the vessel pressed south in good style, (Plate IX, Fig. 1).

December 26th.—Noon position was lat. 57° 15½′ S., longt. 157° 25′ E. The day's run amounted to 128 miles on a mean course S. 18° W. true. The weather was most favourable, being clear and sunny, with a light east-north-east wind.

For about half an hour round about 1 a.m. an auroral manifestation was witnessed as a cloud-like luminous ribbon across the sky, at times exhibiting rapid vibratory motion. At 5.30 a.m. and again at 11 p.m. large quantities of kelp were seen floating past the ship.

This day Harrisson who had made a fine collection of birds' eggs and skins whilst at Macquarie Island, finished preserving and packing them. The shore party members spent much of the day killing and skinning more of the sheep, for we were now sufficiently far south for the carcases hung in the rigging to remain perfectly fresh for an almost indefinite period.

Several of the men developed petty ailments such as boils, which resulted from overwork and exposure on a poor and irregular diet. For the first time in my life I fell a victim to this trouble. This was the culmination of twelve months of great anxiety and effort on my part involved in the financial provision for the Expedition and its organization and equipment. Now that some of the load was lifted by the safe installation of the Macquarie Island Party I took what rest I could for the ensuing fortnight.

The sleeping accommodation provided on board for members of land parties was of the roughest kind, it being understood that they would have to make shift during the short period which it was anticipated they would be on board. The ship's cabin accommodation was indeed little more than enough for her regular officers and crew. However, by temporarily making use of two deck laboratories and of a large shelving space right at the stern above the counter, and entered from the ward-room, everybody was provided with 6 feet by 2½ feet where to lay his head on watch below. This, however, entailed utilizing the settee in the chart-room, where Murphy managed to snatch a disturbed rest, and the settee in the Captain's cabin which I found a somewhat unsatisfactory substitute for a berth. As the ward-room was greatly overcrowded, Davis and I had our meals in the Captain's cabin.

The small grey Prion was plentiful for the first 100 miles south of Macquarie Island but thereafter their numbers rapidly fell off. One Cape Pigeon was seen this evening and an occasional Storm Petrel was observed during the day. Black-browed Albatrosses were still with the ship and both Wanderers and Sooties were seen.

December 27th.—Thick drifting mists were encountered at 4 a.m. Thereafter drizzling rain continued for most of the day, with light wind from the north. Noon position lat. 59° 38′ S., longt. 157° 21′ E. The ship's run for the day amounted to about 133 miles on a course about true south. The air temperature at noon was 43° F. and water temperature 42° F.

Fresh-water was now strictly rationed; none was available for washing and for drinking somewhat less than a cup of tea or coffee was allowed per meal. Several albatrosses and numerous Cape Pigeons were about the ship in the morning but in the evening the seascape became almost birdless, only an occasional Prion appearing. Whales were seen in the evening.

December 28th.—Misty and drizzling most of the day. By noon the water temperature had fallen to 37° F. The day's run to the south amounted to 140 miles.

In the evening patches of floating kelp drifted by. At 11 p.m. what appeared to be land was sighted to the south-south-west. A course was laid for it, but that which had simulated land was soon found to be merely cloud on the horizon.

The bird life noted included odd Albatrosses (Wanderers, Sooties and Mollymawks), also Cape Pigeons and Prions. At 6 p.m. a school of whales passed close to the ship.

December 29th.—Overcast and misty weather with only light breezes. At 6 a.m. a large whale was seen. Antarctic Petrels were recorded at intervals in the early morning hours, also again late in the day.

The noon position by dead reckoning was lat. 63° 49′ S., longt. 156° 14′ E.

At 4.20 p.m. was sighted the first ice, in the form of three icebergs (Plate IX, Fig 2). Thereafter occasional patches of brash-ice were met with (Plate X, Fig. 1). Some of the square canvas was clewed up. Of the shore party men, Madigan, Harrisson and Bickerton appeared to be the most active aloft.

At 6.20 p.m. we encountered a narrow belt of weather-worn pack-ice extended in a north and south direction. The temperature continued to fall until at midnight the water registered 35° F. and the air 33·5° F.

This day a start was made to prepare sledging equipment. Under direction from Wild, land-party men set to work to make canvas man-harness (Plate VIII, Fig. 2).

December 30th.—We were now so far south that no darkness was experienced even at midnight, it being light enough to read on deck without any inconvenience. Bergs and small ice were passed (Plate IX, Fig. 2). Thick mist prevailed at 4 a.m. so that vision was limited to about a ship's length ahead. The sea could be heard thundering against an unseen iceberg nearby.

A Finner Whale was observed swimming alongside at 4 a.m. and Antarctic Petrels were within sight. At 8 a.m. the fog partly lifted and ice was observed to be scattered over the whole sea surface; included were some fair sized bergs which loomed up indistinctly through the fog. A whale was seen spouting nearby amongst the floating ice.

The noon position was lat. 65° 14′ S., longt. 156° 5′ E., thus the run to the south since noon the previous day amounted to 85 miles.

Sleet descended in occasional showers throughout the day. At 3.45 p.m. Adelie Penguins were passed resting on floating ice, the first penguins observed since leaving Macquarie Island. At 10 p.m. seals were seen resting on the ice. At 11.30 p.m. compact pack-ice with large bergs embedded in it was reached. Snow Petrels and Antarctic Petrels were much in evidence.

Here further progress south was barred and the ship was allowed to drift while Davis and I discussed the situation. It did not take long for us to come to a decision. We turned to the west hoping to make further progress south in that direction.

December 31st.—The day commenced dull and gloomy with a moderate sea. We passed through heavy drift-ice (Plate XI, Fig. 1), until 7.30 a.m. when the ship again entered open water.

The noon position was lat. 65° 40′ S., longt. 155° 39′ E., thus making for the previous 24 hours, a run of 28 miles on a mean course S. 22° W.

During the afternoon the ship traversed drift-ice (Plate X, Fig. 4). Seals basking on rafts of ice were passed on several occasions during the day. At 5 p.m., when in loose pack-ice, a Sea-leopard was shot and hauled on board to supply fresh meat for the dogs.

During the evening hours several very large icebergs were passed. The day closed with light easterly winds and smooth water.

January 1st, 1912.—The weather throughout the day was dull and overcast with occasional bursts of sunshine; light breezes and smooth water. There were frequent showers of snow after 8 p.m.

Throughout the day the *Aurora* skirted along the northern edge of the pack-ice, steaming slowly to the west (Plate X, Fig. 3). We anxiously searched for a break that would allow of further progress to the south but none offered. Nor was there any water-sky to the south giving encouragement for progress in that direction. Lieut. Wilkes of the United States Expedition in 1840 had reported land in this locality in latitude 67° 10′. We were most anxious to break through the pack-ice to it and station a land party there, where they would be in comparative proximity to the Magnetic Pole for the study of terrestrial magnetism under especially advantageous circumstances. Alas ! our hopes were not to be realised for the unbroken line of pack formed an impenetrable barrier. Hour by hour we were driven further to the west without advancing any further south or coming within sight of land.

About 8 a.m. some large bergs were passed. Seals, often a dozen or two at a time, could be seen sleeping on the ice, waking up only if the ship passed within a ship's length or so of them.

For a moment in the forenoon something like distant land appeared on the southern horizon (seen from the crow's nest), but faded as we gazed at it. Voyaging in the pack-ice regions of Antarctica one soon learns to be extremely critical and cautious in interpreting appearances of land. Under certain conditions of sky and air, such appearances of ice-covered land on the horizon or islands in the pack are of almost hourly report. But when real land undisturbed by mirage is seen by those acquainted with Antarctic landscapes, there is no longer any doubt as to its character.

The observed latitude at noon was 65° 18′ S., and longitude by dead reckoning 151° 50′ E. The 24 hours run had amounted to 97 miles.

Several hours were lost during the day when the ship had to be stopped for repairs. About 3 p.m. the pack, apparently held by grounded bergs, extended to the north-west across our course. Here amongst the pack many great bergs were seen. One of these situated far within the margin was unusually high with rounded top, suggesting the possibility of its being an island. Some of the bergs hereabouts bore dark stains due to mud and stones embedded in the ice.

January 2nd.—Still working westward along the pack edge searching for an opening to the south. Gloomy and overcast in the morning but clearing later in the day. Moderate breeze and sea in the morning but waning as the day progressed.

During much of the day the pack-ice exhibited a sharply defined edge. Jostled by a swell from the north, the marginal zone of the pack, worn down by attrition, displayed a striking gradation from coarse blocks at a couple of hundred yards within, to smaller and smaller fragments of ice until as fine as dust on the very margin.

During the forenoon the ship was driven into the pack and made fast to ice masses with the object of "icing ship." A party working on an ice raft loaded baskets with ice and snow, which were then hoisted on deck to be melted down to replenish the fresh-water tanks. Unfortunately the range of the ship under the north-easterly swell carried away the after ice anchor. Further activity in this direction was then deferred until the sea conditions should be more favourable.

Two large whales were sighted in the early morning. Petrels of several species, notably Snow Petrels, were seen in abundance from time to time. On rafts of ice, Adelie Penguins disported themselves. In the water, numbers of jelly-fish were conspicuous. Later in the evening a Giant Petrel was seen, the first observed in Antarctic waters during this cruise.

The observed noon position was lat. 65° 30′ S., longt. 147° 59′ E. The mean course for the twenty-four-hour period was S. 83° W., and the distance run 100 miles.

Members of the land parties were employed during the afternoon killing and dressing the remainder of the sheep.

Near midnight a large tabular berg some three-quarters of a mile in length was passed nearby. Away to the south at a great distance, far amongst the pack, two very long bergs, the largest perhaps 3 to 5 miles in length, could be discerned against the glow of the midnight sun. The air temperature for the day had ranged between a maximum of 31° F. and a minimum of 27° F.

January 3rd.—The day commenced with a fresh breeze blowing from the south-east; the sky became overcast and snow showers were a feature of the early morning hours. Meanwhile the ship followed the edge of the pack-ice which was here quite compact. The pack edge trended north-west until 4 a.m. then turned to the south-west. Visibility was limited by fog and snow. At 5.15 a.m. the vertical wall of what seemed to be a tabular berg or a shelf-ice formation appeared, at first dimly seen, just within the edge of the pack-ice. The ship followed along this wall which proved to be an extensive formation of great interest (Plate XI. Fig. 2).

Where first met, the wall trended east and west but by 8 a.m. a corner was reached where it trended away to the south-east with a water-sky over the region to the west of it. A narrow belt of pack-ice extended to the west from the corner of the ice wall and through this Captain Davis directed the ship, heading south for we had decided to follow the wall south because it appeared to have every prospect of proving to be a shelf-ice tongue extending from land. At 10 a.m. the ship's course was altered to south-east. During the morning Adelie Penguins were in evidence and Weddell Seals were observed basking on ice rafts.

The ship's position at noon by observation was lat. 65° 46′ S., longt. 143° 21′ E.; the average direction and distance of the run for the past 24 hours being S 82° W., 115 miles.

At 1.45 p.m., the ship was close alongside the ice wall which there trended south-south-east. A whale passed between the ship and the ice wall.

The height above the sea of this great table-topped ice formation was only about 40 feet when first met in the early morning but increased to the south, being quite 120 feet as seen at 4 p.m. At this hour, the ice wall on our port bow, took a turn to the east-south-east. As the barometer was observed to be dropping and the wind freshening, Captain Davis considered it advisable to advance no further but to remain in the lee of the ice wall until the impending gale should have passed by. Accordingly the ship was put about. On the low-domed top of a large iceberg, some 80 feet high, four densely packed flocks of Petrels, mostly Antarctic Petrels, could be seen, contrasting strongly with the pure white of the ice. In the lee of the berg Captain Davis took a sounding, the depth found was 210 fathoms and the bottom mud. So we had at last reached shallow waters and there appeared to be every possibility of truth in the conjecture that the ice wall was a floating tongue extending from land.

The possibility of "icing ship" from the berg by operating on its lee side, where the bounding ice cliff was lowest, was investigated but abandoned as impracticable. Whilst close alongside the berg we watched a seal crouching in shallow water on a projecting ice shelf evidently in dire fear of Killer Whales which to the number of a dozen were patrolling nearby. The Killers passed so close that we could see a light band behind the great triangular dorsal fin and a yellow streak near the head.

The evening, which was sunny but with a rising wind, was spent steaming slowly up and down in lee of the ice wall. Bird life was remarkably abundant including flocks of Antarctic Petrels, Silver-grey Petrels, Cape Pigeons and Snow Petrels. Occasional Prions and a Giant Petrel were also recorded.

January 4th.—The day was spent steaming slowly up and down in lee of the ice wall; a fresh gale blowing. Snow squalls in the afternoon. At 8 a.m. the air temperature was 26° F., and the sea-water temperature fell to 29° F., in the evening.

At 1.30 p.m. huge pieces of ice were observed to break from the ice cliff; the litter of ice therefrom, floating on the sea, drifted away rapidly with the wind which came from the south-east-by-south.

Birds were not so numerous as on the previous day but all the species then seen were again observed and in addition some Wilson Petrels. Some of the dogs had been in low health for days past and were feeling the effects of exposure to the blizzard winds.

January 5th.—Blowing hard in the early morning hours accompanied by snow and sleet. Air temperature 29°F. The ship was still sheltering under lee of the barrier wall, which, however, could be seen only occasionally as a dim outline, darker than the mist of flying snow.

Five of the dogs died this day after a series of fits. This was a serious loss as the dogs are already too few for the programme ahead. Dr. Jones conducted a post-mortem examination and diagnosed death as apparently being due to gastro-enteritis.

Later in the day the wind abated somewhat and visibility increased. A continuous cloud of snow could be seen pouring over the ice wall.

At 6.20 p.m. the weather had so improved that the ship was again headed to the south-east at full speed. The berg inspected on the 3rd was observed to have drifted several miles to the north-west disposing of the suggestion that it was aground.

At 10 p.m. the ice wall was seen to turn to the east, extending in that direction as far as the eye could reach. To the south lay open water encumbered by very little drift-ice.

As the ship progressed Snow Petrels and Antarctic Petrels were observed in numbers resting on drift-ice. At about 9 p.m. numbers of whales were spouting in our vicinity; one Finner Whale kept company with the *Aurora* for some time.

January 6th.—The vessel continued steaming to the south-east (true) into a strong cold south-east-by-east wind. The day commenced overcast and misty. By 2 a.m. the ice wall was lost to sight in the distance. The sea remained almost free of ice except for occasional icebergs. Schools of whales were within sight during most of the early morning hours.

The noon position was 66° 37′ S., and 144° 58′ E.; a sounding gave no bottom at 230 fathoms.

At 12.50 p.m. a flat-topped ice formation bounded by a vertical wall (shelf-ice) was visible on the horizon ahead, extending far to the east and to the west. A sounding at this time gave no bottom at 180 fathoms.

At 3.30 p.m. the vessel arrived alongside the shelf-ice formation.* A sounding taken here, in 66° 57′ S. and 145° 16′ E., gave the depth as 398 fathoms and the bottom mud.

After consultation with Captain Davis, the ship was headed to the south-south-west along the ice wall in the hope that in that direction we would come to land.

The vertical face of this shelf-ice formation ranges from 120 to 150 feet or more in height; it was found to run on mile after mile in a succession of bays and headlands. Here and there the sheer wall is relieved by great caves hollowed out by the waves. The atmosphere was foggy and periodically showers of snow descended. In the evening hours the wind moderated. The temperature remained at about 31° F.

At 7.15 p.m. high ice-covered land came into view, at first seen dimly through the fog. Crevassed land-ice was observed to extend from great heights right down into the sea, but no sign of outcropping rock could be observed. At 7.45 p.m. the water was still found to be deep; no bottom at 200 fathoms.

*The deduction at the time was that the shelf-ice formation with which we were in touch from the 3rd instant until after midnight on the 5th was co-extensive with that which we came up with at 3.30 p.m., today. However, a year later, during the second Antarctic cruise of the *Aurora*, Captain Davis was able to prove that the formation first met on January 3rd., as recounted above was actually an enormous tabular iceberg temporarily grounded and not attached to the shelf-ice reached at 3.30 p.m., on January 6th.

At 10.5 p.m. three small ice-covered islets were observed in an ice-walled bay, subsequently charted as Buchanan* Bay. A sounding at this time found only 32 fathoms of water.

The ship's course was altered towards the islets. Henceforth throughout the evening hours until midnight, soundings were taken every few minutes revealing depths ranging from 24 to 60 fathoms. At about midnight three more groups of ice-capped islets were sighted.

January 7th.—At 12.20 a.m. we found no bottom at 270 fathoms. At 1 a.m. the head of Buchanan Bay was reached, where a sounding gave 200 fathoms on rock bottom. Falling snow interfered with visibility so it was decided to move out into deeper water and lie off the coast awaiting better weather. Accordingly at 1.30 a.m. the ship was turned about and steamed slowly out, passing ice-capped islets off the headland on the west side of the bay. On the headland a patch of dark rock could be seen outcropping through the land-ice slopes; also rock could be discerned at water-level on some of the islets. A line of grounded bergs extended still further out to sea beyond the island chain.

The ship was allowed to drift slowly to the west during the morning hours. At noon our position was ascertained as 66° 55′ S. (observation) and 144° 52′ E. (dead reckoning); the depth was found to be 150 fathoms on pebbly bottom.

Showers of snow and fog clouds obscured a view of the land, so that we were favoured with only fleeting glimpses of it. Throughout the day only gentle easterly breezes were experienced.

Having so long been denied the luxury of a wash in fresh-water most of the hands were now found indulging in snow bathing.

At 1.30 p.m. the ship was again got under way and steamed slowly westward through the fog. The Kelvin sounding machine was kept in continuous operation, recording a very irregular bottom ranging from 25 fathoms to no bottom at 200 fathoms. At 2.30 p.m., with the object of " icing ship ", an attempt was made to lay the vessel alongside an iceberg but this was found impracticable.

The journey westwards was resumed at 3.30 p.m. Islets of rugged rock, capped with ice, came out of the mist, and with them small grounded bergs, whose blue-white appearance contrasted pleasantly with the brown rocks.

At 5.30 p.m. we were ranged close to the ice cliff face of high, ice-covered land, steaming along past icebergs and ice-capped islets. The soundings on to 8 p.m. ranged from 150 to 20 fathoms. The mists lifted further and revealed groups of islets extending for some 3 or more miles off the coast and lines of grounded bergs beyond. Soundings between 8 and 10.30 p.m. ranged from 24 to 55 fathoms.

At 10.15 p.m. we were abreast a possible landing place, merely a short stretch of rock on the sea-front, backed to the south by gently rising ice slopes leading to the high ice-cap beyond. With the intention of further examining the possibilities of this place in the morning, the ship was headed out to sea and at 10.50 p.m., when 7 miles off-shore, the engines were stopped and the ship allowed to drift whilst all hands but the watch turned in.

January 8th.—The ship lay to in the early morning hours hoping for a clearance in the weather. The sun appeared about 6 a.m. and the mists gradually cleared.

We now determined to explore further to the west before coming to a decision as to the spot where a landing party should be established. Accordingly, soon after 6 a.m., progress was continued passing numerous ice-capped islets standing off the coast, which here stretched out extending about due west. Soundings of 110 fathoms to no bottom at 200 fathoms were recorded during the morning. The day became beautifully fine and clear before noon.

The noon observed position was 66° 47′ S., 143° 14′ E. A sounding at this spot gave no bottom at 250 fathoms.

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*Named in honour of J. Y. Buchanan, chemist and hydrographer of the *Challenger* Expedition, who gave me much advice in regard to our hydrographic programme.

At this time there could be dimly seen away to the west, beyond a southward recession of the coast, a further projection of the land; to this the ship's head was directed. At 12.30 p.m., Wild, who had been in the crow's nest, reported that a rocky area margining the land-ice sheet at a point about 15 miles off on the port bow appeared to have possibilities for land operations. The ship was directed towards this black speck for its closer examination.

By 3 p.m., the *Aurora* had arrived within about half a mile of the north-east margin of a fringe of low rocky islets and grounded bergs. A whale-boat was lowered and with a crew of good oarsmen I pushed off to investigate the possibilities of the area as a landing place for a main Antarctic shore station.

In planning the Expedition we had reckoned on establishing a main shore base as near to the Magnetic Pole as possible. Already in our search for a suitable landing place we had been driven to the west of the meridian of the Magnetic Pole, and every mile that we now went westward carried us still further away. Consequently I was now so anxious to land the party that we were prepared to accept as suitable, any location that provided facilities for landing equipment and offered possibilities for supplies of food in the nature of penguins and seals.

As we rowed in towards the rocks we were agreeably surprised to observe rookeries of Adelie Penguins and numerous seals basking on the shore. On nearer approach much of the rock area was found to be composed of small islands. These we named the Mackellar Islets to commemorate Mr. C. D. Mackellar of London, a staunch supporter of the Expedition, one of whose benefactions was the presentation of a voluminous library of good reading and reference books. We threaded our way between this rocky chain and then discovered that about 2 miles of water lay between the larger islets and the mainland. On the coast of the mainland opposite the Mackellar Islets a black, rocky, water-front of about one mile in length was found relieving the monotony of the ubiquitous ice cliffs which constitute the normal coast-line of Antarctica. Towards these rocks we proceeded. Between the islets and the mainland the bottom was found to be very irregular and numerous shoal patches were observed. Looking down through the shallow waters, a dense growth of sea-weed was observed to cover the bottom.

A narrow cove subsequently known as the Boat Harbour was located extending several hundred yards into the rocky area of the mainland. Into this we went and at the head came to a natural quay fashioned in glacier-ice. We were soon ashore, (Plate XII, Fig. 1).

Having moored the whale-boat securely, we set about hurriedly examining the neighbourhood. Within half an hour I was satisfied that the locality was suitable for the establishment of a wintering base. No time was lost in getting back to the *Aurora* to communicate the good news. We arrived on board at 8 p.m.

LANDING THE EQUIPMENT AND PERSONNEL OF THE MAIN BASE STATION.

Our first consideration was to find a suitable anchorage for the *Aurora* in close proximity to the "Boat Harbour" where we had decided to land the equipment for a shore base station. When ashore I had observed that there appeared to be a deep water approach to the vicinity of the Boat Harbour on the west side of the Mackellar Islets. Accordingly, it was arranged that, whilst some of us made directly for the Boat Harbour with the motor launch and a whale-boat laden with stores, Captain Davis should take the *Aurora* around to the west of the Mackellar Islets with the expectation of finding there a safe anchorage.

We in the launch and whale-boat, laden with carcases of mutton, benzine and other stores, departed from the *Aurora* at 9.40 p.m. At 10.15 p.m. a strong south-east wind sprang up and we were glad to reach the shelter of the cove. Having landed the cargo we observed the *Aurora* with head to wind steaming in towards the land to the west of the Boat Harbour.

Captain Davis brought the ship in as closely as he could with safety under the high coastal ice cliffs which gave some protection from the strong off-shore wind.

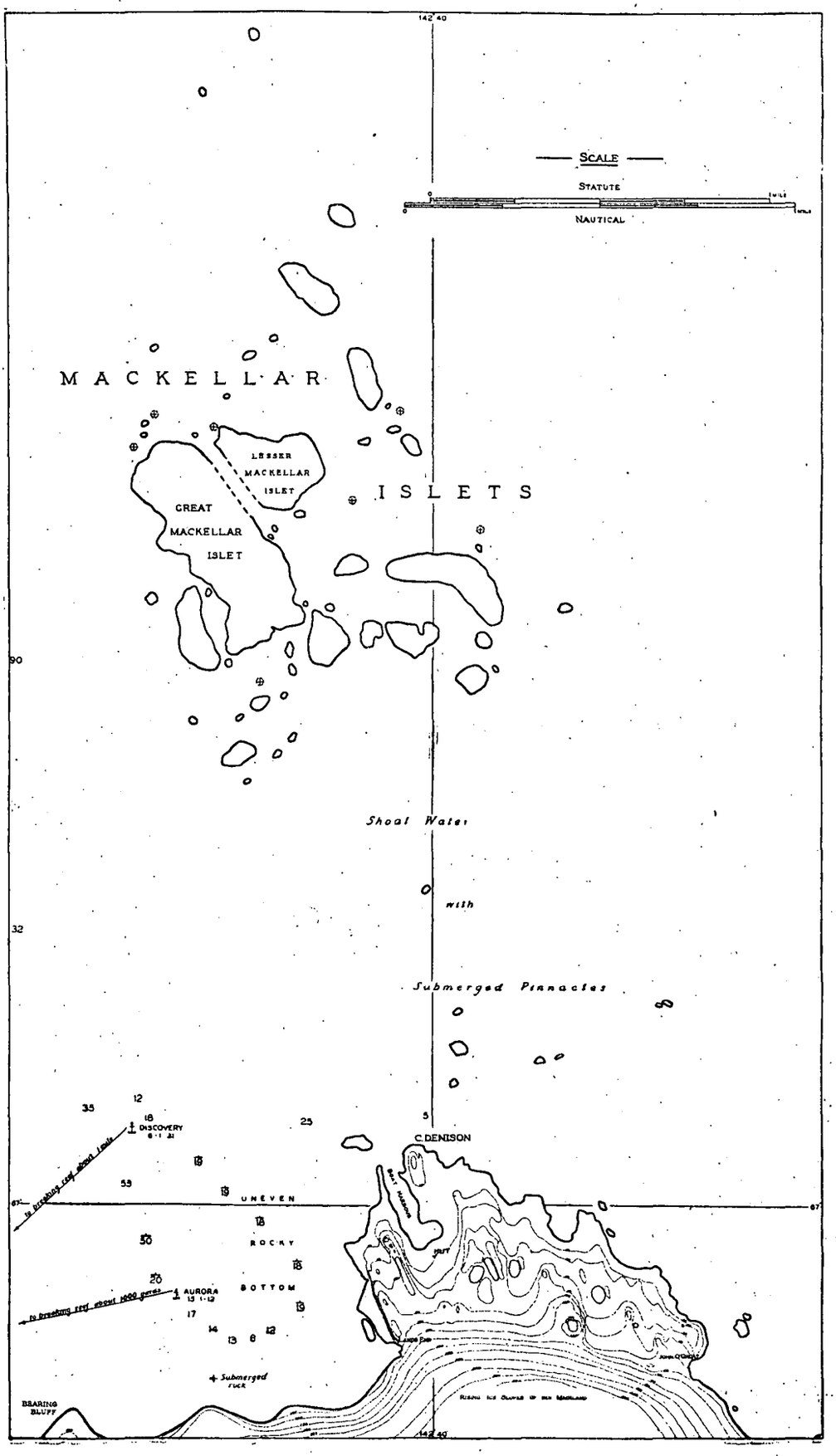

Fig. 4. The Mackellar Islets and anchorage off Cape Denison.

The bottom proved to be extremely uneven which accentuated our anxiety for the safety of the vessel already sufficiently acute owing to the rising gale and constricted sea room. We in the launch and whale-boat reached the *Aurora* at 11.50 p.m. and got tow-lines aboard. It was not until 40 minutes later that anchor was dropped in 13 fathoms. The air temperature at that time was 24° F.

January 9th.—The gale of wind off the land steadily increased in violence and there was great anxiety lest the single remaining anchor should carry away. In view of this possibility all hands were engaged throughout the early morning hours getting the boats on board again and resecuring all cargo that had been unlashed ready to go ashore. The barometer had dropped steadily from 29·13 inches at midnight on January 8th to 28·65 at midnight to-day. The sky remained clear and blue. The temperature at midnight was 22° F.

About half a mile away to the east of the anchorage lay the rocky promontory where we were to land the main shore party. This projection appearing from under the great sheet of ice which covered the land we named Cape Denison after Hugh Denison of Sydney, one of the main supporters of our enterprise. South of the anchorage, distant only about five or six hundred yards, towered ice cliffs 120 feet to 150 feet in height. This ice cliff face extended in a wide sweep from the Cape Denison rocks to points far away in the west and the north-west. This we designated Commonwealth Bay, marking our association with the Commonwealth of Australia.

Though we were anchored so close under these cliffs, the violent off-shore gusts, which rose to a crescendo in the evening hours and were of hurricane force, whisked the tops off the short hard seas and filled the air with flying spray. The wind shrieked through the rigging and caused the vessel to tug viciously at the 75 fathoms of anchor chain which had been paid out with the object of minimising the strain on the anchor. At the height of the hurricane the sea was beaten down and the surface water was picked up by the wind and swept forward in sheets of spray and foam so dense that nothing of the body of the sea itself was visible.

January 10th.—The temperature fell to 18° F. at 3 a.m. The hurricane continued through the morning hours but began to take off rapidly in the afternoon until only a fresh breeze remained in the evening.

The inhospitable nature of this new land and the severity of the weather prevailing in this region had already warned me that the task of wintering parties was likely to be a difficult one. In view of this outlook and the fact that I had on the shore staff, apart from myself, only one other, Frank Wild, who had had previous Antarctic experience, I had now decided to limit our Antarctic shore stations to two. We had on board three huts and could, had the circumstances been more favourable, have landed three parties respectively of twelve men, eight men and six men. I now decided to combine the weakest party with the main party to be landed at Cape Denison.

The shore staff spent the afternoon getting the gear ready for transport to the land. At 7.20 p.m. the motor-boat was lowered and three runs to the shore laden with cargo and return trips laden with ice to replenish the water-tanks were made before 11.50 p.m., when the launch was hoisted on board for the night. Myself and several others now took up residence ashore, so that should bad weather intervene to prevent communication with the ship, work ashore could still continue.

January 11th.—Weather for the day was fine and cloudy with a fresh breeze off the land. At 8 a.m. both whale-boats and the launch were lowered and worked briskly between the ship and the shore all day (Plate XII, Fig. 2.). At 6 p.m. the shore staff was divided into two watches of six hours each and continued running backwards and forwards to the shore all night (Plate XIII, Fig. 1).

January 12th.—The weather was still favourable for disembarking stores, hut timbers and wireless masts, so the work went on without a break all day until 9 p.m. when owing to increasing wind the work was suspended. The whale-boats were hoisted aboard and with Wild and some of the other men, I went ashore in the launch to kellick her in the Boat Harbour and to camp ashore. By midnight it was blowing a fresh south-east gale.

January 13*th.*—The gale continued with fierce squalls prohibiting communication between ship and shore.

January 14*th.*—The hurricane continued. The barometer which at 8 p.m. had reached the low figure of 28·57 inches then began to rise gradually. The air temperature fell to 21° F.

January 15*th.*—At 1.30 a.m., the wind rapidly fell off to a calm. Immediately all hands again commenced unloading operations. However, an end was quickly put to our activities, for at 2.10 a.m. the wind increased suddenly and within five minutes was blowing a fresh gale. At 2 p.m. the wind again dropped rapidly, and by 3 p.m. unloading operations were again in full swing. At 8.30 p.m. the gale returned, suspending all work.

January 16*th.*—The wind did not abate until about 3 p.m. when unloading was recommenced and continued until 10.50 p.m.

January 17*th.*—A moderate gale prevailed during the early morning hours but by 7.45 a.m. had decreased to a strong breeze. We came off to the ship with the launch but succeeded in getting only one load ashore owing to a strong squally wind developing. The sky was heavily overcast and there were showers of snow. A fresh gale was blowing in the evening.

January 18*th.*—Blowing a fresh gale in the early morning but abating sufficiently by 11 a.m. for transport between the ship and the shore to be resumed. The work progressed briskly all day until 10 p.m. The men were given the rest of the evening to write final messages home and to pack their personal gear for the move ashore on the morrow. During the day the coal supply (about 25 tons) was taken ashore; so also were the aeroplane and the dogs (Plate XIII, Fig. 2).

As had been a regular practice during these landing operations, the boats on return journeys to the ship took back ice quarried from the glacier at the head of the Boat Harbour. In this way the fresh-water supply on the *Aurora* had been maintained during her stay at the anchorage and there was now accumulated in the tanks sufficient fresh-water for the next 26 days.

Already Webb had conducted a series of careful observations for position at a shore station. The mean of these gave the position of Cape Denison as lat. 67° 0′ S., longt. 142° 40′ 46″ E. This is interesting for comparison with the more exact determination made by Bage in 1913 with the aid of wireless time signals, which fixed the longitude of the Magnetic House (erected at the Cape) as longt. 142° 40′ E.

January 19th.—A fine clear day with no more than a gentle breeze from the south-east. Boats still continued to ply to the shore taking personal gear and some of the scientific instruments, including the chronometers. The ship's party spent most of the day getting the ship ready for sea. One of the whale-boats and the launch were hoisted on board at 3.30 p.m., the other was to be retained at the shore base, where it was expected that it would be useful during the year, especially in pursuance of the marine biological programme.

Late in the afternoon the arduous job of winding in the anchor with its 90 fathoms of heavy chain cable was commenced. On account of the antiquated hand windlass this was a laborious undertaking. There was a break for tea. A toast was drunk in Madeira wine which had circumnavigated the earth on board the famous *Challenger**.

Mutual farewells were exchanged between those left on board who were to make explorations further to the west and the eighteen members constituting the party now about to occupy the Expedition's Main Base Station. After finally discussing the ship's programme with Captain Davis, I was ready to go ashore.

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*This was presented to our Expedition by J. Y. Buchanan, a then surviving member of the *Challenger's* oceanographic staff.

Captain Davis's instructions embraced the following main features. He was to explore the coast line to the west as far as opportunity would permit. A second Antarctic Base, to be manned by a party of eight under leadership of Frank Wild, was to be established at a suitable spot somewhere to the west but not nearer than a couple of hundred miles, and preferably about 500 miles distant. It was distinctly recognized that what could be done for this landing party would depend upon what land, if any, did lie to the west and whether the pack-ice would permit the *Aurora* to contact with it. Captain Davis was to prosecute these objectives so long as the season and the ship's fuel supply would permit.

During the interval between return to Hobart and setting out the following summer to revisit and relieve the Antarctic Bases, the *Aurora* was to undertake cruises into sub-Antarctic seas south of Australia for the conduct of oceanographical investigations.

At 8.45 p.m., the anchor having been safely cated, the Main Base party clambered down into the whale-boat and we parted amidst salvoes of cheers. I had every confidence in Davis and Wild to carry out the important tasks assigned to them. As we rowed ashore that night I felt that, with the co-operation of the seventeen stalwarts grouped around me, we too, with God's help, should be able to give a good account of ourselves.

CAPTAIN DAVIS'S EXPLORATION WEST OF KING GEORGE LAND.

During the early hours of January 20th, the *Aurora* steamed along the coast on a north-west course from the anchorage at Commonwealth Bay. By 1 a.m., the vessel was abreast the far distant point of the land as seen from Cape Denison. There the general trend of the coast changed, making more to the west. Thus far, except for a rocky point at some 8 miles west of Cape Denison, the land was entirely ice covered and the sea-front a vertical ice cliff. Several small ice-capped islets close inshore were passed about 2 a.m. At 3.45 a.m., a long reef was observed extending from the land out into the sea athwart the ship's course. Rocks just awash could be seen well in towards the shore from the ship, and there were also observed several patches of broken water outside that as well as a long line of discoloured water running out for several miles. Captain Davis altered the ship's course to N 33° W. (true), to avoid it. The depth of water was found to be 42 fathoms.

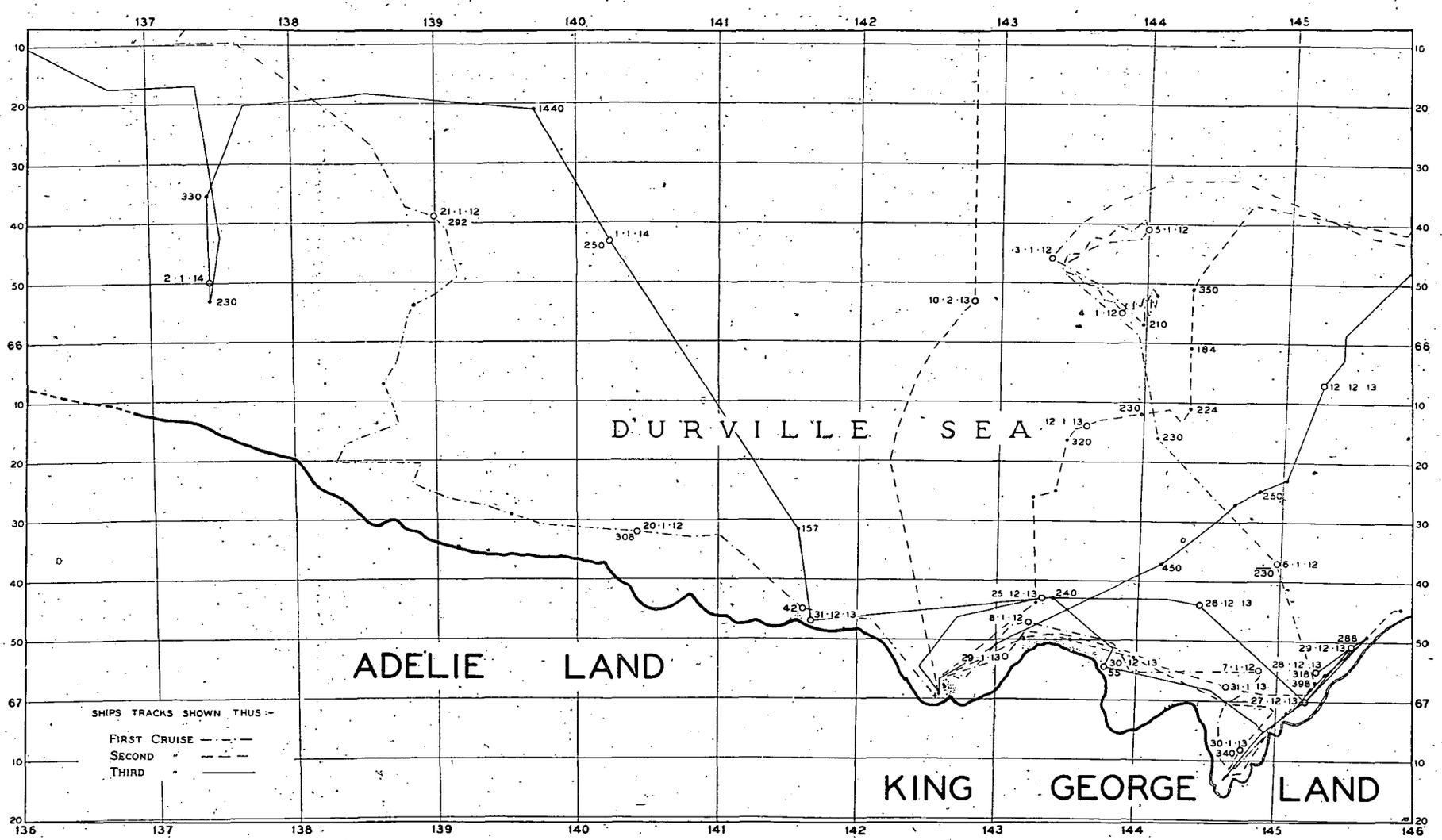
All along this coast, the near proximity to the Magnetic Pole results in very poor directive force in the magnetic needle. Thus the compass is easily disturbed and errors uncertain. Some special disturbance appears to have been detected when the vessel was in proximity of the reef around the northern end of which the *Aurora* now steamed. Frequent soundings were taken and their locations fixed on the chart as accurately as possible. Some of their soundings appear on the map on page?. Soundings made between 4 a.m. and 8 a.m. ranged between 32 and 100 fathoms.

At 8 a.m., the course was altered again to the westward and the ship headed towards the next point of the land seen in the distance. Several very large icebergs were passed, evidently aground. Soundings taken throughout this watch ranged from 100 fathoms to over 200 fathoms.

By noon the vessel was nearing the point of the land sighted at 8 a.m. Off this, numerous weather-worn and crevassed icebergs were grounded. Numerous small islands could be seen close inshore. This cape is evidently D'Urville's Pointe Géologie, where members of his historic expedition landed upon a small, off-lying, rocky islet.

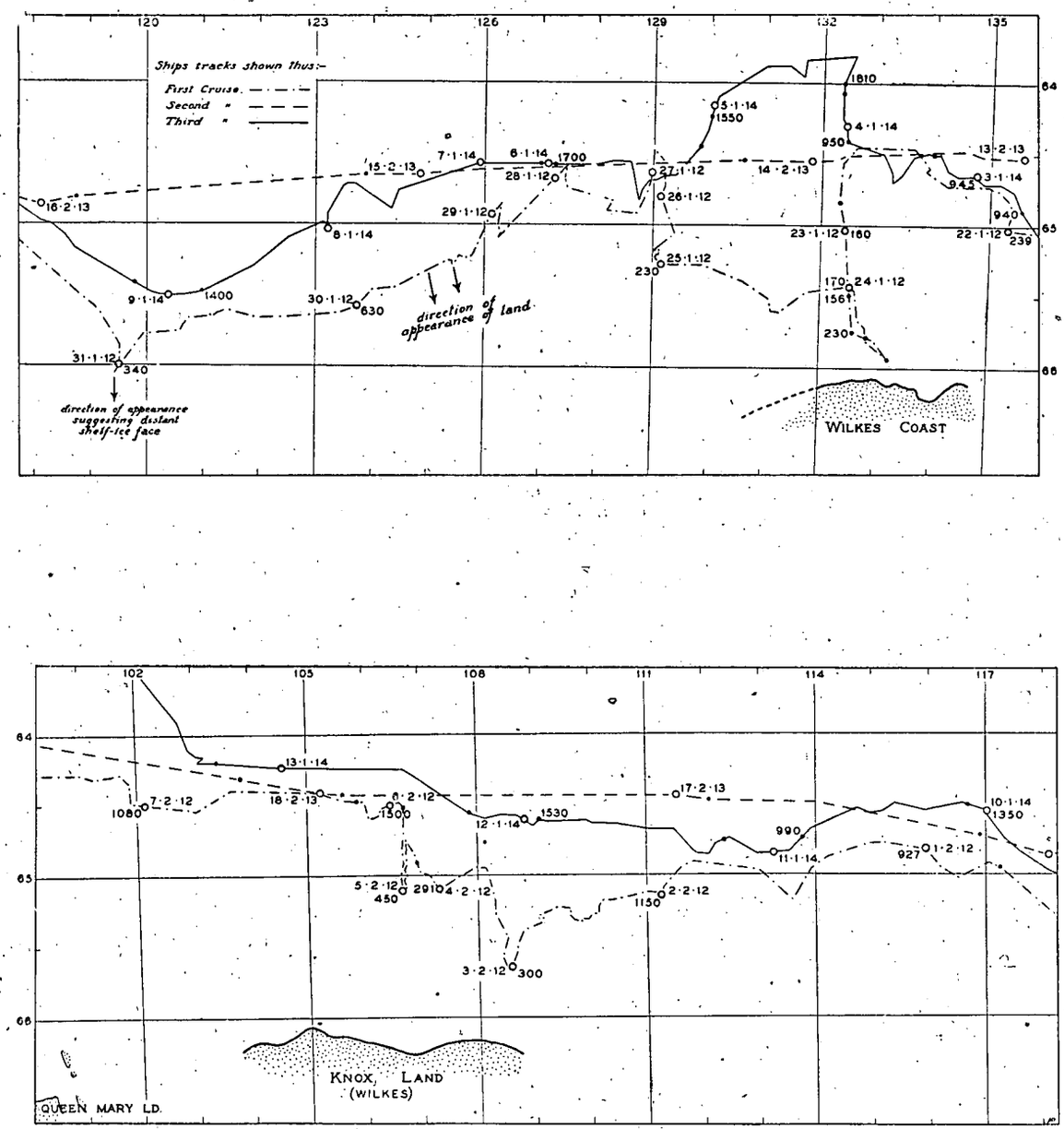
A sounding at noon gave a mud bottom at 308 fathoms. The ship's position was then 66° 32′ S. and 140° 26′ E. Continuing to the west, the coast which was almost entirely ice was observed to extend in a series of broad and shallow bays with a general trend extending somewhat to the north of west. At 10.30 p.m., a large field of dense pack-ice was met. This stretched away to the north-east along which course the *Aurora* was directed.

January 21st.—The ship continued skirting the pack-ice which, at 4 a.m., was trending to the north. In the 4 a.m. to 8 a.m. watch numerous large detached pieces of ice were passed, many of them populated with Adelie Penguins and some with Crab-eater Seals.



Tracks of the *Aurora* off the coast of Adelie Land and King George Land.

To face page 32.



Tracks of the *Aurora* on three voyages in the region between Adelie Land and Queen Mary Land.

To face page 33.

The noon position was 65° 39′ S. and 139° 0′ E., when the trend of the adjacent pack edge was to the north-west. A sounding gave the depth as 292 fathoms, but the driver with sample of the bottom was lost when winding in the wire.

The sky clouded over soon after noon. Adelie Penguins and a Cape Pigeon were reported. By 9 p.m., the course was altered to west, following the pack-ice. At 10.20 p.m., the pack was observed ahead. From the crow's nest, with the aid of field glasses, the coast line could be seen running out into a cape and taking away to the south-west; and there was some appearance of shelf-ice distant 15 or 20 miles at least. Throughout the day there was a fresh east-south-east wind and an air temperature of 30° to 31° F.

Birds observed in the evening were Snow Petrels, an Antarctic Petrel, a Wilson Petrel and a Giant Petrel.

January 22nd.—1 a.m., the pack edge turned to the west and the ship's course was altered accordingly. At 1.30 a.m. a heavy swell from the north-west was encountered. During the 6 a.m. to 8 a.m. watch Skua Gulls were observed in the vicinity. At 10 a.m. several large whales appeared nearby.

By 11.50 a.m. the vessel approached, through fairly clear water, the head of a very wide embayment of the pack-ice. Captain Davis records that " from the mast-head there was an appearance of a barrier (shelf-ice) inside the pack extending from south through west to north. As many immense grounded bergs were interposed between the skyline and the supposed barrier, it was impossible to say with certainty whether this was or was not a barrier. At this time there was a very strong ice-blink all around the semi-circle of the compass mentioned. The icebergs appear to be more rounded towards the edge of the pack and more tabular further in."

The noon observed position was 65° 2′ S. and 135° 20′ E. A sounding revealed the depth as 239 fathoms.

By 1.30 p.m., the *Aurora* retreating from the bay on a north-north-east course cleared the north-east point of the embayment and was able to take off to the north-west.

At 3 p.m., a large whale spouted in the vicinity of the ship. At 4.30 p.m. a point of the pack was rounded and progress then made to the west (true). By 8 p.m. the ship was again headed off to N. 66° W. (true). At 9 p.m. the pack swung around ahead of the ship. At 9.30 p.m. an attempt was made to force a passage to the north-east through the belt of pack (Plate XIV, Figs. 1 and 2). By 11 p.m. the vessel passed out of the pack and was again following along its margin to the north-west.

Throughout the day there had prevailed a light easterly wind, and a long northerly swell making the ship roll considerably. The air temperature ranged between 30° and 35° F. Meanwhile the barometer rose steadily as the day progressed. Animal life sighted during the afternoon included seals asleep on the pack-ice, a Sooty Albatross and very numerous Snow Petrels.

January 23rd.—By 1.30 a.m. a point of the pack was cleared and the course again resumed to the west. From aloft the pack could be seen stretching away to the south-west with open water ahead. Davis remarked; " So the northern limit of the pack has probably been reached." At 3.30 a.m. a large whale sported alongside the ship.

A couple of Sooty Albatrosses were sighted at 4 a.m. The charted position of D'Urville's Côte Clarie was crossed between 6 and 7 a.m., and no sign of land visible. At 7.15 a.m., as there was no indication of pack to be seen, Captain Davis altered course to S. 33° W. (true) and later at 9.40 a.m., to S. 10° E. (true). The log states: " Keeping a sharp lookout for land reported in 1840." By noon the vessel which earlier in the day had sailed over " Cape Carr," had arrived only a little north of the " high land " reported by Wilkes.

Harrisson spent most of the morning in the crow's nest and although it was beautifully clear all around, he could see no sign of land or of the pack.

At noon the ship's position was 65° 2′ S., and 132° 26′ E. A sounding was taken recording a depth of 160 fathoms. Then the course S. 10° E. was resumed. In the early afternoon, a school of Blue Whales appeared close to the ship.

At 4 p.m., a long line of large grounded bergs surrounded by drift-ice was encountered. The ship took about an hour to pass through this formidable array of bergs which stretched away for miles. Some of these great bergs were so closely packed that there was no room to pass between them. The assemblage also formed docks and coves. The colour of the water was seen to be changing. At 4 p.m., Captain Davis recorded: " No signs of land or barrier (shelf-ice)."

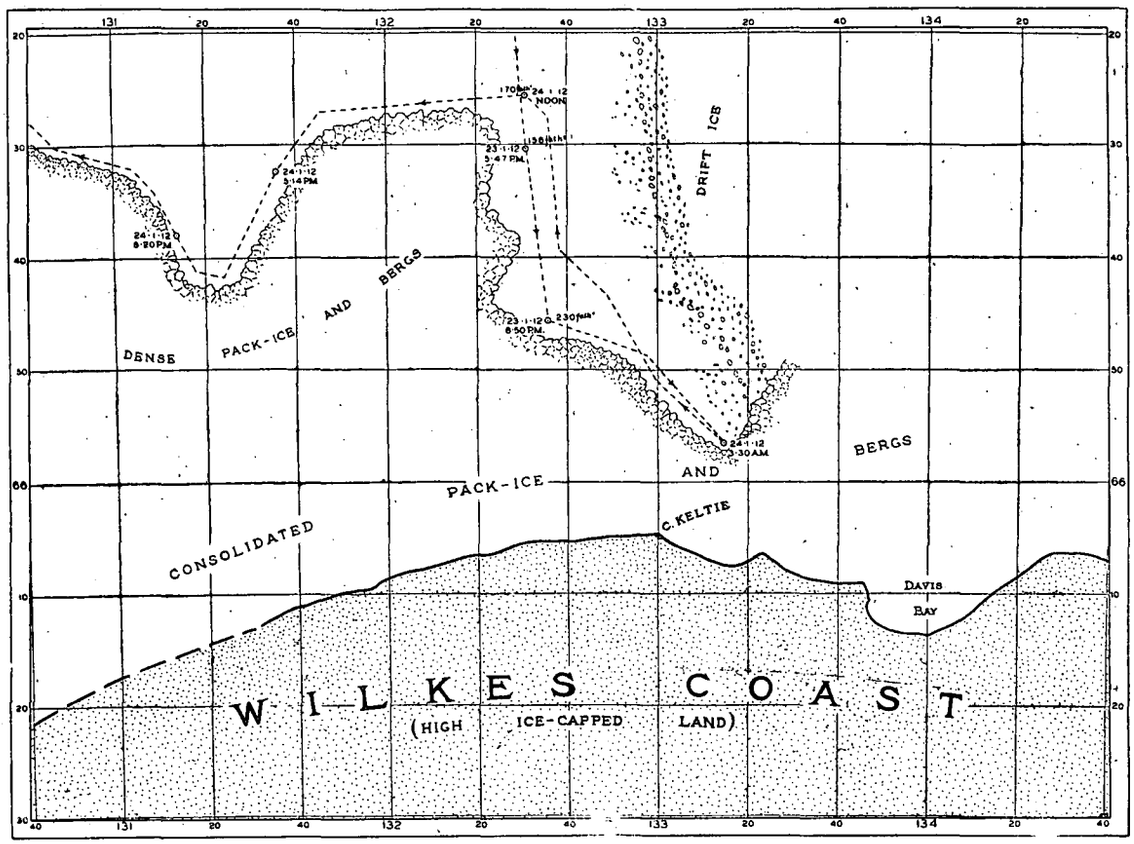


Fig. 5. Wilkes Coast roughly outlined by Captain Davis on board the *Aurora* after its discovery in January, 1912.

However, at 5.30 p.m., Captain Davis logged the sighting of ice-covered land to the south; " Land definitely observed stretching across the southern horizon." As seen from the crow's nest it was in the form of a long, even line of ice just rising above the southern horizon. The ship's position at the time was 65° 30′ S., and 132° 31′ E. A sounding recorded 156 fathoms on mud bottom. Captain Davis estimated the distance of the land from this location as about 40 miles but this, of course, was not based on actual measurement for the land presented no fixed landmarks upon which to take sights.

The ship proceeded directly towards the land passing many large bergs, apparently grounded. At 8.50 p.m. further progress was halted by a line of loose pack. Further south within the pack lay a long chain of massive bergs and beyond these was what appeared to Captain Davis to be a sheet of unbroken bay-ice. It was thought at the time that it probably extended right up to the land.

A sounding of 230 fathoms on a mud bottom was obtained at this spot, lat. 65° 45½′ S., and longt. 132° 35′ E. At this point Captain Davis logged the estimated distance of the land at 20 miles, the height as 2,500 feet, and remarked that the land " consisted of snow-covered slopes and in every way resembled Adelie Land." Many seals and penguins sported themselves in the vicinity.

As the pack margin to the east appeared to edge away to the south the ship's head was turned in that direction. Davis recorded: " We then stood S. 55° E. (true) in order to trace the land across a wide bay appearing in that direction."

During the day the air temperatures on deck had ranged between 28° and 35° F. Under a fairly high barometric pressure the weather had remained fine and clear all the day. Moderate easterly winds earlier in the day changed to light airs from the west in the evening.

Harrisson, whose artistic talent was not slow to appreciate the harmonies of nature, wrote in his diary concerning the scene at 9 p.m.: " To the eastward all was a soft glow of crimson and rose, and a soft greenish shade on the still water; and white bergs standing out against the rosy mist of sunset, the sun's last rays lighting them as softly. It was indescribably soft and beautiful."

January 24th.—At 3.30 a.m., the ship came up to loose pack, which trended to the north of east. The land also appeared to be trending to the north of east. From the ship, the bearing of the furthest north point of land away to the east bore S. 69° E. (true). Captain Davis now records the following details regarding this new land.

" The nearest point of land was now distant about 10 miles. Ship's head was directed to the north-west again. The general nature of the land on nearer approach to it was seen to be much the same as that Adelie Land. It was entirely snow-covered and no bare rock was visible from aloft. The snow slopes appeared to be much steeper than those of Adelie Land, and, as far as could be seen, running for the most part right down into the water without any ice cliffs*; but as there were a great many icebergs and much pack in-shore and as we were a considerable distance off-shore, it was difficult to make this out with certainty.

" With strong glasses from up aloft the land was seen to be greatly crevassed and also deep sastrugi could be seen running apparently in a south-south-easterly direction."

The ship's 8 a.m. observed position was 65° 47′ S., and 132° 48′ E. The vessel was then on a north-north-west course traversing an area of pancake-ice. Harrisson recorded that " the pancakes were 12 to 16 feet across and rose only a few inches above the water. Looking down on them from the crow's nest reminded me of water-lily leaves floating; only these were pure white, and occasional 'grubs' on them in the shape of sleeping seals."

The observed noon position was 65° 26′ S., and 132° 31′ E., and there a sounding was taken, 170 fathoms on mud bottom. This sounding was taken on the edge of the line of grounded bergs traversed between 4 and 5 p.m. the previous day.

Davis logged as follows: " 12.15 p.m. passed through a cluster of very large bergs, surrounded by loose pack-ice; some that the ship passed alongside must have been nearly 200 feet high, for when observing from the mast-head, one found that one was about on a level with half-way up them."

Harrisson remarked: " Two bergs which we passed between were exceedingly beautiful, white and marble-like, that glorious blue vapour-like light in the crevices; shelves and ridges fringed thickly with long icicles. Off the end of one, a column of purest marble as high as the berg, and about as far off, must have stood on a submerged part, for it was a comparatively slender column."

At 12.30 p.m., the ship was clear of drift-ice and a course was set N. 75° W. (true). At 1 p.m. a water-sky was seen to the west-south-west and no pack visible; the course was altered to S. 84° W.

At 3.30 p.m. the land was again visible stretching along the southern horizon. No pack-ice being visible to the south-west, Captain Davis altered course to S 30° W. (true) and stood in towards the land.

Harrisson remarked, that after tea (about 6.30 p.m.) " land was plainly visible apparently running about east and west, very distant but markings such as hollows discernable. A little ahead of us it appeared to run out to a point or take away more to the south-west. Ice-capped and desolate, appalling in its monotonous frigidity! Its nearly 100 miles visible since the early hours of the morning, not a single irregularity, mountains or hills, broke the even level of its sky-line! "

*As the land-ice slopes must inevitably end in cliffs at sea level the suggestion is that the coast was more distant than estimated by Davis, at which distance the coastal cliffs would be below the horizon of vision from the ship (Ed.)

Between 6 and 7 p.m. the ship passed bergs of an immense size and height.

At 7.45 p.m. the pack was met trending to the westwards, so the course was altered to N. 76° W. Davis continued : " 8.12 p.m., following the pack from north-west to west. Bergs plentiful; very little drift-ice about. 8.20 p.m., apparently the south-western end of the land as seen from aloft observed to bear about S. 15° W. (true). An enormous number of bergs seen close in-shore."

The day was one of good clear weather until late in the evening when it became overcast and slightly misty at midnight, with falling barometer. Light westerly to south-westerly winds in the early morning fell to calm at noon and light easterly breezes subsequently.

January 25th.—Skirting pack-ice and passing occasional bergs. 1 a.m., two Snow Petrels flew around the ship. At 2 a.m., the wind freshened from the east-by-south. The ship continued to follow the pack edge. Light snow began to fall at 4 a.m., and increased as the day wore on.

At noon the ship was heading west (true) through heavy falling snow. No observations for position were possible but by dead reckoning the ship's position was given as 65° 19′ S. and 129° 10′ E.; a sounding at this spot gave 250 fathoms and bottom of glacial mud.

The rest of the day was spent in thick weather partly drifting with the engines stopped and partly in groping amongst pack-ice. By midnight a fresh gale was blowing and the barometer falling.

January 26th.—The day was spent in weathering a strong gale. Davis wrote : " 1 a.m., clear of pack and kept ship on course making about north (true). Wind and sea increasing; quantities of bergs about, over which the sea was breaking very heavily. Also a considerable amount of heavy drift-ice. 3 a.m., ship getting clear of bergs. 4 a.m., heavy bergs to leeward, with quantities of loose drift about. Blowing a strong gale from east-south-east with very high and confused sea. Heavy swell from east-north-east. Glass falling very rapidly, 29·32 at midnight and 29·18 at 4 a.m. The ship continued on same course and gradually got clear of bergs. Very misty weather. No sights for longitude were possible during the morning. At noon the sun showed up for a few minutes and a meridian altitude was obtained; the position being observed lat. 64° 48′ S., and longitude by dead reckoning 129° 10′ E. At noon a strong gale was blowing from the east-by-south with a very high confused sea. The barometer fell to 29·00 inches at midnight and a very high and confused sea was then running. The ship was kept with the wind and sea on the starboard bow throughout the night."

During the afternoon three Sooty Albatrosses, a Storm Petrel and several Silver-grey Petrels were observed. At 8 p.m. several Blue Whales were near the ship.

January 27th.—Weather dull and overcast. Sea still confused and high, but wind moderating slightly. Occasional snow squalls. At 8 a.m., the barometer recorded 28·91 inches and was still falling but the wind and sea had moderated considerably. No ice was to be seen, so Captain Davis put the ship on a course to make about south (true). Several whales were observed about noon and later. No sights of the sun were possible. The ship's position at noon was by dead reckoning 65° S., and 129° E.

A thick mist limited vision during part of the afternoon. As the day progressed the wind from the east-south-east increased though the barometer was rising. At 5 p.m., drift-ice and bergs appeared. Some of the bergs were a quarter to a mile in length.

At 9.40 p.m., the ship was directed towards a large berg and sheltered under its lee. A strong gale with driving snow and a high and very confused sea was in being at midnight.

The birds recorded during the day were Sooty Albatrosses, Wilson Petrels, Silver-grey Petrels and Antarctic Petrels.

January 28th.—In the early morning it was blowing a strong gale, with high sea and snowing heavily but the weather improved considerably towards 8 a.m. By 11.15 a.m., it had cleared sufficiently to set the ship on course, S. 30° W. (true), at full speed; at that time the sea was free of ice.

Good sights were obtained at noon, placing the vessel in 64° 41′ S. and 127° 14′ E. At 3 p.m., the ship passed an immense berg with several more in sight to the southward. Ice-blink was visible to the north-east and south. By 4 a.m., the wind had abated to a strong breeze but the atmosphere was foggy and a long sea swell was running. At 6 p.m., occasional loose drift-ice was traversed and several bergs of various sizes sighted. At 6.45 p.m., they came up with close pack trending north and south, and the ship was put about. At midnight the barometer was observed to be falling; a fresh gusty wind was then blowing from the east, and occasional hail squalls passed by. The air temperature ranged between 31° and 32° F.

Birds recorded were Wandering Albatrosses, a Mollymawk and six Sooty Albatrosses; in the afternoon Antarctic Petrels, Silver-grey Petrels, Wilson Petrels, a Cape Pigeon, a Snow Petrel and a couple of Giant Petrels.

January 29th.—The ship proceeded at half speed. At 0.30 a.m., a large whale spouted near the ship. 4 a.m., the barometer continued falling steadily, but the wind decreased; the sea was open water and no sign of ice. 9 a.m., several large whales were observed in the vicinity of the ship. 9.40 a.m., the ship was put on a south-west (true) course but still at half speed. The sun was not visible at noon. At 12.15 p.m., as the weather was clearing, the engines were increased to full speed.

1.30 p.m., a large berg was passed and later, occasional smaller ones. 3.30 p.m., they came up with streams of brash-ice; speed was reduced to a half and the ship turned to west to avoid the ice. The barometer commenced to rise in the afternoon. At 4 p.m., a long confused swell came in from the north-east and from the south-east. 5 p.m., occasional loose drift-ice passed by and a strong ice-blink was observed to the south-west.

After tea two very large bergs of the domed top, circular kind loomed up and two more were seen in the distance; beyond was another one partly discernible in the thick mist.

At 8 p.m., the weather cleared and Captain Davis reported that what appeared to be land was visible to the southward, with pack-ice in the foreground. A sounding was taken with the Kelvin machine and a depth of 110 fathoms recorded. A few minutes later Captain Davis took a check sounding with the Lucas machine and got no bottom at 260 fathoms. As a result it was assumed the first sounding was erroneous, the sinker apparently having not reached bottom; at 9 p.m., the vessel was directed along the edge of the pack at half speed.

January 30th.—"Moving at half speed along the line of pack, trending west-south-west."

At 2.30 a.m., Davis recorded: "Sunrise, and saw what appeared to be high land to the southward, but owing to the heavy clouds and the early morning light this was very difficult to say with any certainty at all."

At 3 a.m., a large Blue Whale was sighted. Light snow fell throughout the early morning watch; some of the falls were in the nature of beautiful, perfect, six-pointed-stars. 4 a.m., the sky was still gloomy and overcast but clear to the south-east. A fresh east-south-east wind and smooth sea prevailed.

4 a.m., a great many large, round-topped, island-shaped bergs seen to the south. Between 9 and 10 a.m., the ship was coasting along pack in amongst which were a number of large bergs.

At noon a latitude observation gave 65° 34½′ S., longitude by dead reckoning, corrected back from 31st was 125° E., a sounding gave 630 fathoms. The voyage was then continued at full speed to the west along the margin of the pack-ice.

2 p.m., still following the edge of the pack at a distance of 3 cables lengths. Huge bergs in sight, many of them over one mile in diameter.

5 p.m., gloomy and overcast weather but calm. To the south lay dense pack and a long line of bergs, some rugged and others tabular in form. Emperor Penguins and seals basking on the pack were passed. Finner Whales were observed in the vicinity.

About 7 p.m., a long line of enormous bergs was observed amongst the pack to the south. Harrisson recorded seals and penguins on the pack, amongst them two Emperor Penguins. At the same time scores of Snow Petrels and Wilson Petrels were to be seen.

The weather thickened about 8 p.m., and speed was reduced to slow. At 9 p.m., they were still following the pack; between the ship and the pack, the sea was frozen over with a thin covering of transparent ice. At midnight the weather was dull and overcast with light snow falling.

January 31*st.*—They continued groping to the west through fog, no pack visible, but occasional streams of brash-ice and odd bergs. By 2 a.m., the fog had lifted considerably and as no pack was visible the course was altered to south-west (true). Blue Whales and Finner Whales were sighted, and Snow Petrels to be seen in numbers. 4 a.m., light easterly airs, but the ship was rolling considerably to a long north-east swell. 7.50 a.m., the sky clearing and sun showing; full speed was made to the south-west, and no pack in sight. 8 a.m., the course changed to south-west. 10.30 a.m., the vessel was stopped for sounding, and bottom found to be glacial mud at 340 fathoms. Both the surface temperature of the water and the bottom temperature were found to be −1° C.

11.15 a.m., further progress south was halted by pack. Captain Davis pushed the ship into this a little way and made fast to a floe in order to ice ship, (Plate XV, Figs. 1 & 2). The weather remained fine but misty; several Adelie Penguins drifted by on floes.

The observed position at noon was 66° 0′ S. and 119° 30′ E. A sharp lookout was kept for signs of land. Captain Davis logged as follows: " At noon Totten's High Land (of Wilkes's chart) should have been bearing about south (true) 11 miles distant. The horizon was clear and from the mast-head nothing was to be seen to the southward but heavy pack; beyond this a faint blue line* was to be seen extending around the southern horizon. This, however, had more the appearance of a lane of open water in the pack than land. Soundings indicated a nearer approach to land. The pack at noon had become sufficiently heavy to make further progress south very slow and within three miles of the ship it (the pack) was seen to be a mass of consolidated bergs."

At 3 p.m., they cast off from the floe and headed north and then north-west through loose pack-ice. Open water was reached at 6 p.m., the ship continued skirting the edge of close pack trending to the north-north-west. The atmosphere became clearer.

Viewed from the crow's nest after 6 p.m., the south-east, south and south-west horizon was clear, but pack extended as far as the sky line. Beyond this there were very distant cumulus clouds lit up by bright sunshine, though all was dull and overcast throughout the rest of the sky. Harrisson records that the following birds were in the vicinity of the vessel in the early evening hours :—a Skua Gull, Adelie Penguins Snow Petrels and a Wilson Petrel. At midnight, snow was falling and a light breeze coming from the south-east to south-south-east.

February 1*st.*—The ship continued skirting the pack-ice at a distance of about three cable lengths on a N. 50° W. (true) course. Except for the belt of pack to the south, no other ice was in sight in the midnight to 4 a.m. watch. After 4 a.m., the weather improved somewhat but heavy snow showers and occasional mist continued; the barometer (28·91 ins.) was then rising steadily. Snow Petrels were about.

At 7.45 a.m., there was an appearance of high ice-covered land to the south but later as the mist shifted it appeared to be far distant bergs in the pack abnormally distorted by mirage. At noon the vessel came up with and pushed through a long tongue of loose pack stretching away in a north-north-east direction. At noon the sky was overcast, but sights had been obtained on two different occasions during the morning from which Captain Davis computed the noon position as 64° 49′ S. and 115° 57′ E. A sounding in this position recorded a glacial mud bottom at 927 fathoms. The time taken to pay the wire out and wind it back was only 35 minutes. The course was continued to the westward with the pack-ice to the south and a strong blink visible to the north-west but a water-sky lay ahead.

From noon on, the sky remained clouded and a light south-east breeze prevailed. Between 3 p.m. and 5.30 p.m., the ship was traversing a belt of light drift-ice; later she was once more in open water skirting the main pack. At about 6 p.m., a number of whales appeared.

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* It is within my Antarctic experience that such a blue horizon line under certain conditions of lighting may represent either the face of very distant shelf-ice or the coast line of a land ice-cap when seen at great distance and just emerging above the horizon. It is also quite possible that such an horizon line can be accounted for as a purely optical phenomenon related to mirage—D. Mawson.

Soon after 7 p.m., there was visible from the crow's nest what appeared to be a solid line of either large icebergs, a mirage-distorted wall of shelf-ice, or irregular ice-covered hills lit up by the sun. At 8.15 p.m., Captain Davis altered course S. 64° W. in order to investigate more closely this appearance.

Voyaging in the pack-ice zone of the Antarctic, distant objects may be presented in grotesque forms owing to mirage and it is often difficult to interpret their true nature. Thus in misty, dull weather particularly, appearances of land are being constantly reported. In most cases careful observation will quickly discount the possibility of land, but in other cases the issue cannot be definitely settled. A case in point is that of this (Feb. 1st.) evening as can be judged by Harrisson's account written after spending an hour in the crow's nest. Referring to the appearance to the south-west between 8 p.m. and 9 p.m. he stated :—" It looked like a barrier or very distant high land. Then to the west the sun appeared to light up the face of a barrier, tinging it pink, length after length, and buttress after buttress with occasional irregularities and little peaks. That part faded, but along to the west it spread and grew so bright there's little doubt it is only a very level bank of distant cumulus cloud ! Probably the blue and grey markings behind are only cloud, too !

The vessel passed through scattered pack until 10.45 p.m., when dense pack with strong blink showing behind it headed the vessel further to the north. Captain Davis now concluded that the feature that had been under observation earlier in the evening was apparently a long line of distant bergs in the pack.

Many Snow Petrels were about during the evening hours; one became confused in the rigging and fluttered down to the deck.

At midnight the air was perfectly calm, and the sky overcast with light falling snow. The air temperature was then 29° F., and surface water 30·5° F.

Late in the evening Captain Davis had for some time directed the *Aurora* towards what appeared to be a wall of barrier (shelf-ice) ice. But as he advanced it melted away before him. It was only pack lifted by mirage to appear like a high wall of ice.

February 2nd.—At 3 a.m., a very heavy fall of snow with huge flakes covering the decks about an inch deep within half an hour. About 3.30 a.m. to 4 a.m., many Blue Whales were observed; also Snow Petrels were about in numbers of which about eight came down on deck and were devoured by the dogs.

The course, which had been towards the north-west in loose drift until 4.30 a.m., was then altered to approximately west in open water for the pack-ice fell away rapidly to the south from this locality. Very little ice was encountered during the later morning hours and Captain Davis was able from time to time to stand the ship more to the south.

At noon the sky was heavily overcast and the ship's position was calculated by dead reckoning, corrected by an ex-meridian observation at 12.45 p.m. This resulted in a fix as 64° 40′ S. and 111° 43′ E. A sounding at this spot gave 1,150 fathoms and a mud bottom. Though overcast the air was clear; large icebergs could be seen lying to the southwards. The pall of clouds extended overhead and far to the south but left the lower southern sky free where bright sunshine appeared.

At 1.20 p.m., the ship was clear of all heavy drift and brash, so proceeded full speed ahead on a course approximately west-south-west. Several seals basking on the ice were passed. A north-easterly swell came in during the afternoon.

At 5.30 p.m., no heavy ice being in sight, the course was altered to S. 10° W. (true) in loose pack-ice and the engines eased to slow. Harrisson counted nineteen Emperor Penguins on the floes and Adelies were in considerable numbers; Snow Petrels were plentiful, also there were observed some Giant Petrels, Antarctic Petrels, Silver-grey Petrels, Wilson Petrels and one Cape Pigeon and one Skua Gull. Seals were lying basking on some of the floes.

At 10.25 p.m., the pack became considerably denser; from up aloft heavy bergs and thick pack could be seen ahead. The course was altered to the west towards a water-sky. By midnight the barometer had risen considerably (29·53 ins.); the air temperature was 28° F., and surface water 29·5° F.

*82908—C2.

February 3rd.—At 1.30 a.m., the vessel was clear of thick ice and passing through loose drift-ice. After 3 a.m., as there was no heavy pack visible the course was altered to S. 20° W. Light snow was then falling. At 4 a.m., they were steaming through small drift-ice in a south-west direction. The morning was beautifully calm and the sea perfectly still reflecting the clouds.

At 8 a.m., the sun appeared for a few moments allowing an observation for position to be taken. During part of the later morning hours the ship was directed due south through drift-ice and occasional loose pack.

At noon the vessel was in a slack area entirely surrounded by pack as far as the eye could reach as viewed from the crow's nest. A sounding gave 300 fathoms over a bottom of glacial mud. There was a strong blink to the south but a very definite water-sky to the south-west. An attempt was made to take the ship through to the water-sky. Sights were obtained at 4 p.m., which, crossed with a 2 p.m. sight, gave the ship's position at 4 p.m. as 65° 39′ S. and 108° 35′ E. The pack was too heavy, however, and Captain Davis had to work the vessel back to the north-east and north to extricate it. Advancing thus through the heavy pack, the ship was able to push her way out at the rate of about 1 mile per hour. On the way the engines on one occasion were pulled up to a full stop with a nasty jar owing to the propeller striking the ice. During this time, several Sea-leopards were passed resting on the ice close alongside the ship; also two Emperor Penguins were seen.

During the evening the sky gradually cleared and by 7 p.m., it was beautifully bright and fine. Harrisson wrote: " The sunset over the great field of white ice was most beautiful, though not so gorgeous as we have seen it. But the bright sky, the rosy flush on the thin mist streaked across it, the pack grey and indistinct under the light, here and there a ray catching a piece of ice and turning it quite pink, and reflections wherever a pool of water could be seen. But the most beautiful effect was opposite the sun. There a thick, low bank of cloud, very dark, almost greenish at the horizon going to warm purple where it joined the pale sky above, and, for a little distance down, it was flecked with a beautiful rosy light, strong but not bright, could not call it crimson, it was all so soft yet dark. Below, in the grey ice a still pool of water almost the colour of blood! "

At 10.30 p.m., the brighter stars began to show up. Occasional Adelie and Emperor Penguins were seen in the evening watch. At various times during the day the ship was visited by Giant Petrels, Snow Petrels, Wilson Petrels, Antarctic Petrels and Cape Pigeons. At midnight the barometer was standing high (29·53 ins.)

February 4th.—They continued on a north-by-west course until 5 a.m., when open water was reached. The ship was then set towards N. 60° W., at full speed skirting the pack, with a brilliant ice-blink in sight to the southward. Occasional bergs were seen both in the pack and out in the open sea. 8 a.m., three large Blue Whales were blowing near the ship. The weather remained fine and clear.

The ship's position at noon was 65° 5½′ S. and 107° 20′ E. A sounding gave 291 fathoms apparently on rock bottom, but the driver may have struck a loose erratic.

Captain Davis continued on a west-north-west course till 3.30 p.m., when the vessel had to be let off more to the north as the pack came round ahead of the vessel. At 4 p.m., the wind freshened from the west-north-west and heavy clouds appeared from the east. The barometer was high (29·65 ins.). At this time there were a number of whales about.

Further observations for position were made at 5 p.m. At 8 p.m., the appearance of the pack, from aloft, being much looser and there being a dark sky to the south, Captain Davis decided to attempt to penetrate to it. The ship was headed south into loose pack and drift-ice. Numbers of whales were seen. During the late evening there was an appearance of the aurora polaris. Snow Petrels and Cape Pigeons had been in sight from time to time during the day.

The season was now well advanced, the midnight hours perceptibly darkening and the daylight shortening. Yet so far no landing place for the second Antarctic land party had been discovered. The ship was already much further to the west of the Main Base than was intended for a location for Wild's party, and all on board were very anxious about it.

This is expressed in Harrisson's diary, an entry of this date states: " The growing uneasiness of the past few days culminated in something like consternation to-night. We are now in the longitude in which Wilkes found open water to Knox Land; but instead of the lead south that we had hoped for, the pack has taken us a degree to the north. We have been able to reach no land along (roughly) 1,000 miles of arc in these Antarctic seas, nothing but drift-ice! We have practically proved all Wilkes's 'highlands' between Adelie Land and Knox Land to be visionary, and our hopes of landing are all centred here. Other navigators have found the pack to take off to the north here, even to 62° S. We have only enough coal to take us to Tasmania and for 9 days over and above that. So there is no time to go to the west with any hope of success. It would seem better to hang about the only known land and hope to get in before we have to turn back."

It will be seen from this that Wild's party were now dreading that, after all, no landing place might be found for them in which case they would have to return on the ship to Hobart.

February 5th.—The ship continued southward through the pack. At 2.30 a.m., the pack became denser but a lane to the eastward observed from aloft was reached by 3.30 a.m.; then a southerly course was continued until 5.30 a.m., when very heavy pack-ice barred further useful progress. At 9 a.m., the vessel anchored to a large floe and all hands iced ship until 5.15 p.m., by which time the two main fresh-water tanks were nearly filled. The observed position at noon was 65° 7′ S. and 106° 39′ E. A sounding gave 450 fathoms on hard bottom.

During part of the morning it snowed " beautiful exquisite little star-like crystals." During the afternoon the weather cleared up but the sky remained overcast.

At 5.20 p.m., as no land could be seen to the south and only extremely heavy pack lay ahead, Captain Davis decided to abandon the attempt to reach Wilkes's Knox Land, which appears on the chart as located about 60 miles to the south of the *Aurora's* position at this time. The ship was headed through the pack to the north-east. At 11.15 p.m., the vessel was surrounded by a mass of huge ice floes which had evidently only lately broken up. The height of each floe above the water was from 4 to 6 feet, many of them being several acres in extent. Captain Davis extricated the vessel from this heavy ice only with great difficulty.

Harrisson, writing his diary in the ward-room, recorded: " The shocks nearly lifted us out of our seats. She would stop dead quivering from stem to stern; every timber in her seemed to be groaning and creaking with the strain."

During the day a number of Emperor Penguins and some Adelies were sighted; also Snow Petrels were plentiful and one Wilson Petrel was noted. A few seals were seen on the ice.

February 6th.—It was not until 6 a.m. that the ship got out of the heavy ice. She then stood along the edge of the pack which thereabouts trended northward. Several Crab-eater Seals were sighted on the pack-ice.

Captain Davis discussed future plans with Wild and Harrisson. There was little time left for finding a landing place for Wild's party. Knox Land was out of the question and the possibilities discussed were, firstly, return to the land sighted south of D'Urville's Côte Clarie in the hope that now, as it was late in the season, the bay-ice would have broken out right up to the land; secondly, continue still further west in the hope of penetrating to land in that direction. It was decided to continue to the west, for my instructions to Captain Davis were (1) to attempt to land a western party under Wild; (2) to explore as fully as circumstances would permit the arc between the Main Base and Gaussberg located about 90° E. longt., where Drygalski had found land.

Even should the landing of a second party be found impossible, Davis was carrying out the second part of the programme by continuing still further west.

It was a beautiful day; light airs, clear but overcast much of the time. The sun appeared from time to time giving opportunity for good sights. The noon position was 64° 31′ S. and 106° 28′ E. A sounding at noon found 1,500 fathoms and a mud bottom. After noon the vessel was able to proceed to the west but was later gradually edged to the north. At 8 p.m., a school of Finner Whales was passed. The usual Antarctic birds were plentiful throughout the day. At midnight there were light west-south-westerly airs and a smooth sea; cloudy and overcast; barometer high (29·66 ins.).

February 7th.—Until noon, the day was spent in following along the edge of the pack-ice making a course mainly to the west. The pack was heavy, with many large bergs in it. The latter were generally tabular or ice-island form; many were tilted and others wave-worn bergs. One berg seen after breakfast was " a fine round tower " of great height. In the forenoon a couple of Blue Whales feeding along the edge of the pack were passed.

At noon the ship's observed position was 64° 30½′ S., and 102° 9′ E. The depth 1,080 fathoms; when hauling up, the driver and its sample of the sea-floor were lost.

At 1.30 p.m., the ship was driven north by pack but was able to return to a westerly course at 5 p.m. At 9 p.m., rain and sleet set in, with increasing north-north-east wind and sea, and thick mist at times. The ship continued in late evening hours making a course to the westward at full speed with pack lying well to the south. The midnight surface water temperature was 32·5° F.

Harrisson reported abundance of bird life all day long; included were Snow Petrels, Silver-grey Petrels, Cape Pigeons, occasionally Giant and Wilson Petrels and resting on the floating ice were Adelie Penguins.

February 8th.—A course was made to the west throughout the middle watch, the vessel passing a number of bergs both small and large but no pack came in sight. At 4 a.m., there was a fresh north-east-by-north breeze and frequent sleet squalls passed over.

At 7.40 a.m., a high ice barrier wall (shelf-ice) came in sight about two points on the port bow. The ship's course was altered towards it. Thick weather prevailed with increasing wind. By 8.30 a.m., the vessel was steaming along the " barrier " which trended in a north-west direction.

In describing the ice formation then lying on the port beam, Harrisson remarked: " It was much lower than the Adelie Land ' Barrier ' (meaning the Mertz Glacier Tongue, Ed. :) and different in that it was not flat on top, but in general a low cliff face with a rounded surface sloping back, more slope than in the first ' barrier ' sighted on Jan. 3rd. There were bays and projecting points, and an unevenness of outline, hollows and slopes and once or twice sharp little peaks possibly 50 feet. Still there was no doubt it was a ' barrier,' nor did we see sign of land throughout the day."

After noon the weather commenced to clear. While following the ice-wall coast throughout the day many bergs of diverse forms were passed; Davis specially remarked that they presented a very wave-worn appearance.

At 4 p.m., the ship was in the neighbourhood of what appeared to be the northern end of the ice formation. At 5.30 p.m., the ice wall turned to the west and at 7.30 p.m., to the south-west. The ship continued along it at a distance of about 1½ miles. At 8.20 p.m., a sounding was made with an improvised driver, the last of the ship's supply having been lost. No bottom was recorded though a length of 830 fathoms of wire was paid out; the dead reckoning position being 63° 49′ S. and 96° 57′ E. The north end of the " barrier " was rounded by 9 p.m., and the ship then followed down the western face on a south-east course. Whales were spouting all around.

At midnight a moderate easterly breeze was blowing, the sky cloudy and overcast. Harrisson reported seeing during the day a Sooty Albatross, Snow Petrels and many other birds.

February 9th.—The ship continued following the ice wall on a S. 40° E. course. Fine but cloudy weather with falling barometer at 4 a.m. The 8 a.m., entry records making a course to the southward with icebergs becoming heavier and more numerous. Harrisson in the crow's nest at this hour wrote: " Scene from aloft most striking. Ahead far out on the starboard bow were the debris of a broken up ' barrier ' and such fragments! League-long bergs, on either hand they lay, berg upon berg, point beyond point, the whole half of the visible sea was crowded with bergs, the other half occupied with thickly strewn bergs." An hour later Harrisson again wrote: " Bergs mostly tabular, some tilted, many beautiful with their marble walls, rifts of cobalt and shades of green and blue. This great mass of bergs struck us as being stationary." " A grave-yard of Giants," Captain Davis aptly put it. Soundings made later on showed that they were probably aground. Captain Davis groped his way south amongst these bergs. The noon

position by observation was 64° 33′ S. and 97° 11½′ E. At 3 p.m., an east and west line of heavy pack was reached. From there he retreated in an attempt to make a passage south at a point further to the west. At 5.30 p.m., a sounding found bottom at 110 fathoms and brought up glacial mud with small stones and two ophiuroids : position 64° 34′ S. and 96° 58½′ E. Another sounding at 8.15 p.m. gave the depth as 110 fathoms and brought up sand and small stones : position 64° 36½′ S. and 97° 15′E.

At midnight the sky was overcast and the barometer falling. The aurora polaris lit up the sky to the south at midnight. During the day whales and many birds were observed.

February 10th.—Fresh south-easterly weather continued all day, thick and misty, with light snow. The barometer had fallen and, in the present sheltered locality to west of the " barrier " wall, Captain Davis decided to await the gale which appeared to be impending. The day was spent in steaming slowly up and down in lee of the " barrier ".

At noon in lat. 64° 26′ S., a sounding was made finding 120 fathoms over a coarse sand bottom. Another sounding at 5 p.m., in 64° 13′ S. and 97° 26′ E, gave the depth as 870 fathoms on a bottom of glacial mud enriched with diatomaceous ooze.

In the afternoon the ship steamed past a great concourse of giant icebergs. As these bergs emerged out of the mist, Harrisson observed in his diary as follows : ". . . .passing close to a magnificent one, whose towering cliffs of marble were very regularly stratified, the white being of slightly different shades and textures. Here and there the walls were ' embossed,' or held snowy mantles or icicles, two or three crevices of deepest cobalt, and here and there the marbled walls veined with blue."

Several whales were seen and some seals on floes passed, one was a large Sea-leopard. Snow Petrels were in evidence and one hit the rigging aft and fell on deck. Harrisson found its crop to be full of a half-digested mass of tiny, sardine-like fish.

By midnight the weather, contrary to expectation, had somewhat improved. Captain Davis then decided to attempt a passage south through what appeared to be very heavy pack-ice, (Plate XVI, Fig. 1).

February 11th.—The early morning hours were spent " marking time," awaiting an improvement in the weather. At 8.30 a.m., it having cleared a little, the engines were put at full speed and, working to the south and west as the ice would allow, the vessel succeeded in making excellent progress throughout the day. A large school of whales were sighted, and many seals were observed asleep on ice-floes. The sun was not visible for sights at noon.

At 4 p.m., the entire southern horizon was a closely packed mass of large bergs. A Skua Gull was seen, which was taken to indicate a near approach to land.

At 5.15, p.m. a sounding in 64° 40′ S. and 96° 0′ E., found a sandy bottom in 120 fathoms. Continuing on a general south-west course, pack-ice came into view at 6.45 p.m., barring the way south. At 7.30 p.m., a sounding in 64° 47′ S. and 95° 40′ E., gave 120 fathoms on glacial mud bottom. At this time there was a gentle east-south-east breeze, overcast and snowing. Captain Davis decided to " mark time " again during the night steaming at slow, first to the north-north-east and later back on a south-south-east course.

Snow Petrels were observed in numbers throughout the day; also one Giant Petrel. Several Emperor Penguins were seen on floes.

February 12th.—At 4 a.m., the ship was put on a south-west course at slow speed and at 8.10 a.m., to full speed. All day long the vessel traversed a sea heavily loaded with bergs and drift-ice. Fortunately, it was found to be negotiable and fairly rapid progress to the south was made.

Harrisson recorded a good description of the ice as follows : " Floating ice visible all day; before noon the sea crowded with icebergs, mostly tabular, lumpy ice, floe and brash, from the smallest driftage to bergs a mile or so in length. So thick was the drift-ice that from the crow's nest in the sector north-west right around south to the east, a thick white line shut us in, crowded in places with great bergs. I expected every hour that the vessel would be brought up by heavy pack, especially towards 5 p.m., when, from aloft,

I could see no break ahead but great lumps of ice that looked like distant solid pack. Still as we advanced the ice opened. Great blocks and floes, bergs and picturesque irregular masses, yet open enough for us to pick our way through without trouble.

"A little before sunset the scene from the crow's nest strikingly beautiful. The quantity of floating ice kept the sea very smooth. A mirage lifted the ice up in the glare of the sunset, and took all variety of forms in the golden light. I could trace trees and fences, groups of farm buildings with clumps of dark trees, cabbages, all in the golden phantasy under the sun."

The noon position was 64° 43′ S. and 94° 39′ E. The midday air temperature stood at 23·4° F. Numbers of Snow Petrels and some Emperor Penguins were reported in the morning hours. During the afternoon seals and several Emperor Penguins basking on ice-floes were passed. A Giant Petrel, several Wilson Petrels and some Snow Petrels were seen.

At 5.30 p.m., Captain Davis sounded in 65° 6′ S. and 94° 2′ E., finding the depth to be 235 fathoms and the bottom glacial mud. At 7 p.m., the course was altered to S. 25° E. (true) to avoid heavier ice. At 9 p.m., open water with only large scattered bergs was reached and the ship set true south at full speed. At midnight the weather was fine and clear but overcast and with a fresh south-south-east wind.

February 13th.—The southerly course continued until 1.30 a.m., when Captain Davis recorded as follows: "Observed in the twilight what was apparently heavy pack-ice ahead; reduced to slow speed. On nearer approach it was found to be a huge extent of solid floe (bay-ice) stretching as far as could be seen in an east and west direction, (Plate XVI, Fig. 2.). Laid ship with head on to floe and engines going at slow speed to wait till morning. 4 a.m., light airs, overcast, but fine and clear weather; keeping ship up against floe. After the sun had risen the floe was seen to be like a large island with open water beyond and on each side, it being about 2½ miles long and about 1½ miles broad."

Sights for position and a sounding were taken at 8 a.m. Depth 375 fathoms on glacial mud bottom in lat. 65° 38′ S. and 94° 28′ E. At 8.30 a.m., the ship was again under way to the south in fine and clear weather. The observed noon position was 65° 54½′ S., and 94° 25′ E. Here a sounding gave 500 fathoms on mud. At this time on the port side of the *Aurora* was a large "barrier" formation extending in a north and south direction; this was subsequently ascertained to be a grounded berg some 30 miles long.

Just before noon Harrisson, who regularly spent some time each day in the crow's nest, sighted a low, even line on the southern horizon, which reminded him of the sky line of the new land west of Adelie Land met with on January 23rd. As first seen it was apparently unconvincing, for Wild went aloft and thought it probably no more than a low cloud.

Captain Davis was delighted with the news and after examining the horizon recorded: "On the horizon running in an east and west direction, was a distinct appearance of land."

The journey south was resumed, following the western face of the "barrier" formation. At 1 p.m., Davis recorded: "Land made out for certain to the southward, running about east and west. Seemed to be of a great height to the eastward, getting lower towards the western end; several points running out north could be distinguished, also dark patches, which might be dark rock or shadows."

At 3 p.m., the ship came up with a point on the "barrier" where it trended away to the east. Progress was made to the south through broken loose ice until 5 p.m., when solid unbroken bay-ice was encountered. The position at this spot was 66° 21′ S. and 94° 14′ E., and the depth 250 fathoms on a mud bottom. Davis recorded: "The presumed distance of the land from this point was about 30 miles, all of which as far as could be seen was flat floe-ice (bay-ice) with berg and pack-like irregularities nearer the shore. Mr. Wild with one man (Kennedy) left the ship to go some way towards the land, but on return reported that he had been about 3 miles towards the land and at that distance the floe-ice was still cracked. This makes the landing of the party here impossible. From the nearest point here to the shore Mr. Wild estimates the distance to be about 25 miles."

At 7 p.m., the ship was anchored for the night to the bay-ice. Parties were landed on the bay-ice during the evening in order to secure fresh seal meat and Emperor Penguins (Plate XVIII, Fig. 1).

At midnight the fine weather still held, but the temperature had decreased to 12° F.; the surface water temperature was 29° F. Auroral lights appeared in the sky.

February 14th.—The ship lay anchored to the floe (bay-ice) all night, but at 6.30 a.m., was got under way and proceeded at half speed to the east. At 8.30 a.m., when in 66° 19′ S. and 94° 16′ E., a sounding of 220 fathoms on glacial mud was recorded. A fresh east-south-east wind commenced breaking up the bay-ice and great rafts of it went slowly north. The day was spentmainly in steaming up and down in lee of the ' barrier " face.

At 10.30 a.m., a sounding in 66° 15′ S., and 94° 15′ E., gave 160 fathoms on glacial mud. Another sounding at 11.30 a.m., in 66° 10′ S. and 94° 15′ E. gave 123 fathoms on sand. At 2 p.m., a sounding when in 66° 4′ S. and 94° 19′ E. found 160 fathoms on mud. The great " barrier " formation was found to be very rotten, crevassed and tunnelled by the sea at the southern end. Harrisson recorded early in the day : " We passed a grand chasm, some 40 or 50 feet broad, running back some ¼ mile between straight cobalt-tinted white walls. When we came back to this same spot in the evening, two great bergs had come away, leaving a large bay filled with rubble ice, and girt by unusually white walls." At 6.50 p.m., the ship was turned north along the " barrier " face at slow speed.

At midnight the sky was overcast, a moderate east-south-east breeze blowing and a swell from the north-east, with air temperature at 13° F. and surface water 29° F.

February 15th.—Still following north along the " barrier " face at slow speed at a distance of about 8 cables. Heavy icefalls from the " barrier " were frequently heard. 1.15 a.m., the vessel was near the northern end of the " barrier " and the course was altered to N. 50° E.

At 3 a.m., having made the north end of the barrier, the course was altered to due east. The sky cleared and haze lifted. Thereafter, Captain Davis followed around the " barrier " to the eastward, altering course as necessary. At 8.5 a.m., they went full speed ahead following the eastern face of the " barrier."

The high land to the south could be seen ahead and now a great " barrier " wall was sighted extending in a north and south direction at a few miles to the east of the ship. As progress south continued it became apparent that the " barrier " off which the ship had been cruising during the past two days was merely a gigantic iceberg aground or an ice-capped island. It was seen to be far separated from the land, to which it was adjoined only by bay-ice. The ice wall of the eastern " barrier " just discovered could be traced in the far distance joining the ice-cap of the land. It was thus seen to be co-extensive with the land-ice, just as is the Great Ross Barrier of the Ross Sea. Its flat top indicated that it was afloat (shelf-ice). To this we eventually appended the name " Shackleton Ice-Shelf."

As the ship progressed south it became apparent that close approach to the land was not to be effected for a sheet of unbroken bay-ice appeared ahead. By noon the seaward front of the bay-ice was reached in 66° 21′ S. and 94° 51′ E. A sounding here gave the depth as 182 fathoms. A number of Emperor Penguins disporting themselves on the bay-ice were captured for their skins.

A little further to the east the sea-front of the bay-ice was observed to join the ice wall of the shelf-ice. To this place Captain Davis directed the *Aurora*, securing her to the bay-ice with ice anchors. A sounding at this spot, 66° 19′ S. and 94° 57′ E., gave 222 fathoms on mud. Wild, Hoadley and Harrisson set out to investigate the possibility of landing the necessary stores and wintering on the summit of the high Shackleton Shelf.

In landing stores, it being late in the summer, they were likely to be harrassed by the rapid crumbling of the bay-ice. Then there was the problem of hoisting the equipment and hut timbers to the top of the shelf-ice. Finally Wild had to satisfy himself that wintering on such a floating ice mass was a reasonable proposition and not too much like suicide. It was quite obvious that great slices of this formation continually broke away from time to time and floated off as icebergs.

At 2.45 p.m., the party returned reporting to Captain Davis favourably upon the proposition. No time was then lost in commencing landing operations.

DISEMBARKING EQUIPMENT AND PERSONNEL TO FORM A WESTERN BASE STATION.

At 4 p.m., on February 15th a commencement was made to land the hut and stores for a second Antarctic base under the leadership of Frank Wild (Plate XVII, Fig. 1).

All hands, shore party and ship's crew, were engaged in landing the equipment. At 9.50 p.m., the work was suspended till the morrow. The weather was then dull and overcast with falling snow and a low barometer.

February 16th.—The wind increased and heavy snow fell during the early morning hours. At 7.30 a.m., all hands turned to. The ship's party took the stores to the foot of the shelf-ice (Plate XVII, Fig. 2) while the shore party stationed on top of the shelf-ice hauled the items up one by one by the help of a " flying-fox " erected on the brow of the ice cliff (Plate XVIII, Fig. 2). The work continued all day until 9 p.m., when landing operations finished for the night.

February 17th.—The weather generally was much better than the previous day but, as a fresh breeze came in from the west-north-west in the early morning, anxiety arose, for drift-ice bore down on the vessel. Fortunately this wind moderated after 9 a.m., so all was well and landing operations went on apace. At 5.30 p.m., good sights for longitude were got.

Harrisson working on top of the cliff recorded : " It was a lovely evening. The land in sight in the distance, also the Western-Barrier ice. The broad floe stretching away to the setting sun, as far as the eye could see, the low point of cliffs running out on the left, and black dots of seals asleep beneath them, the level floor of the floe quite pink in the evening sunlight, one or two lines of cracks leading away into the distance, the *Aurora* tied alongside the seaward edge, the sledges and men below us, the line of cliffs sweeping round from the point on our left, up to us, with their wonderful overhanging cornices, cobalt shading and pendant icicles; and wonderfully white and pure they looked against the pink tinted distance, or blue of the sky. As the sun went down, the sea and sky turned yellow, pink and purple; and the ice commenced to form on our moustaches ! " At midnight the breeze had returned to the south-south-east and it was fine and clear overhead. The temperature of the air had dropped to 7·5° F.

February 18th.—Another beautiful day. They started unloading operations at 8 a.m., and continued till 8 p.m. (Plate XIX, Figs. 1 and 2). At midnight, fine and overcast; the minimum temperature was 10° F.

February 19th.—By 8 a.m., it was blowing a south-easterly blizzard with driving snow. The shelf-ice sheltered the ship so that she was able to maintain her position.

Captain Davis recorded : " The floe (bay-ice) was showing signs of breaking up, and large pieces had already come away in parts, so it was very necessary to get the unloading finished. 8 a.m., all hands turned to, bridging in a crack (5 feet wide) on the sledge track between the ship and the glacier (Shackleton Shelf). 10 a.m., the bridge was completed and we started to discharge coal under very trying circumstances, those hauling on the barrier top being hardly able to walk against the wind." Some of the men developed mild snow blindness. The work went on all day until 9 p.m.

On knocking off work in the evening Harrisson wrote : " All very tired to-night. We can look back with satisfaction, having landed and lifted 100 feet, all our stores (for two years) and building material, and 12 tons of coal in four days and three or four hours."

At midnight the sky was overcast but fine and clear with a moderate south-east wind blowing : temperature 14° F.

February 20th.—By breakfast time, this was a beautifully fine day. The rush of the landing work was over and the day was spent taking ashore personal gear, including bed mattresses and the like. Some of the day was spent in sledging stores back from near the edge of the cliff to the hut site. Wild had adopted several sites in succession before the location for the hut was finally approved. This was owing to the discovery of small crevasses under the surface snow in each of the earlier locations.

During the past few days Captain Davis had taken every opportunity for obtaining good sights, with a view to fixing the position of the ship where she lay when unloading operations were in progress. The mean result obtained was lat. 66° 18′ 20″ S., and long. 95° 0′ 26″ E. But if regard is had to chronometer corrections arrived at by comparisons made in Hobart on return of the vessel, the longitude appears to have been more correctly about 95° 5′.

Late in the day Captain Davis accompanied by Wild made an inspection of the shore site, then all hands returned to the ship for tea. Afterwards Davis addressed the party about to be landed and Wild replied. Toasts flowed freely for some time. The evening was wound up by toasting the King and singing the National Anthem, then finally " Auld Lang Syne " with hands clasped. Then all to bed for a final sleep on the ship.

February 21st.—Fine and clear weather with smooth sea and rising glass. All hands were about by 5 a.m. Blankets and clothes were bundled up and shore party members each with his bundle dropped down off the bowsprit on to the ice, for the stern line had been taken aboard and the vessel had swung around with the bowsprit overhanging the bay-ice. The last anchor was broken out at 6.40 a.m. Cheers and farewells were exchanged between the ship and shore parties as the ship turned around to commence the voyage back to Hobart (Plate XX, Fig. 1). As it was late in the season with the ship short of ballast and the stock of fuel on board very low, the return voyage presented some anxieties. Harrisson recorded that, " Wild called a goodbye to the Captain and hope of a safe voyage. Davis retorted grimly : ' If we don't get to port, you will never be found again, a truth that we had already realised."

RETURN VOYAGE TO HOBART.

During the morning hours of February 21st, the ship was headed north along the shelf-ice (Plate XX, Fig. 2). At noon in 65° 48½ S., and 95° 11′ E., a sounding gave 54 fathoms. Davis remarked : " This ' barrier ' is very similar to the Ross Barrier, being about 80 to 100 feet high with flat top and presenting a very uniform appearance."

At 9 p.m. the weather thickened and bergs and floes became heavier. Henceforth throughout the night Davis groped his way along at slow speed. At 11.45 p.m. by going full speed astern, a collision with a large berg was narrowly averted. The weather was overcast and very dark at midnight; air temperature 6° F.

February 22nd.—The vessel continued to make its way north through masses of bergs. By 8 a.m. drift-ice and bergs were easier, allowing the vessel to resume full speed on a north-north-east course. During the morning Sooty Albatrosses, also a large number of Emperors and a few Adelie Penguins were seen. The noon position was 64° 11′ S. and 95° 52′ E. During the afternoon, they passed through ice-strewn seas, meeting seals and Snow Petrels. At 8 p.m., the northern tip of the ' barrier ' formation was reached and its position fixed with greater accuracy than formerly. Then as the barometer was falling, the wind increasing and snow falling, Davis decided to spend the night under shelter of the ' barrier.'

February 23rd.—The weather began to improve at 8 a.m., when the ship was put on a course to the north-east at full speed. The noon position was 65° 45′ S., and 96° 44′ E. During the afternoon there was a fresh north-east wind and swell. Occasional bergs were passed throughout the day. Whales, Sooties and Cape Pigeons were recorded.

February 24th.—The day was commenced with the vessel steaming at full speed on a N. 17° E. course. Auroral lights appeared in the east at 1.30 a.m., It was daylight at 3.15 a.m., revealing small bergs around the horizon but no pack-ice. At that time, it was cloudy, with a north-east breeze and swell. Passing numerous bergs between 4 to 8 a.m. Mollymawks and Wandering Albatrosses followed the ship. At 10 a.m. the ship was put on a course to the east. The noon position was 62° 29½′ S. and 97° 57′ E. In the afternoon there were passed a great number of very worn and rugged bergs. Whales were seen on several occasions during the day. Late in the day the wind veered to north-west. Occasional small bergs passed by.

February 25th.—Occasional bergs and some drift-ice went by in the early morning watch. The course was set at N. 72° E. At noon the position was 62° 7′ S., 102° 41′ E., making the distance to Hobart 1,969 miles. Wilson Petrels were seen and two Wandering Albatrosses followed the ship.

February 26th.—Drizzling rain and snow. The noon position, 61° 23½′ S., 107° 41′ E. A south-westerly gale continued blowing, accompanied by considerable swell. Small icebergs were passed at intervals all day.

February 27th.—A moderate westerly gale with considerable following sea. Rain and snow fell at intervals. Small bergs were in sight all day. Whales were reported on several occasions during the day, also Albatrosses. Noon position, 60° 33′ S., 112° 7′ E.

February 28th.—A fresh westerly gale with the ship rolling to a high following sea. Hail, snow and rain squalls. Still passing occasional bergs. Noon position, 60° 2′ S. and 117° 49′ E. Captain Davis reduced the engines to half speed in order to economise coal, as it was badly needed for ballast. Wandering Albatrosses and Mollymawks were seen.

February 29th.—The weather moderated slightly, with the ship still rolling considerably to a following sea. A small berg was sighted at 8 a.m., the last ice seen on the voyage. Noon position, 59° 29′ S. and 123° 4′ E. The auroral lights were brilliant during 8 to 12 watch.

March 1st.—A north-north-west gale. The ship continued rolling heavily, over 40° at times. At 10.30 a.m., the vessel shipped a large sea, which carried away the bulwarks in the port gangway. Noon position, 58° 38′ S., 126° 1′ E.

March 2nd.—A moderate gale continued with much rain during most of the day. At 8 a.m. the engines were stopped for an hour to effect repairs. Noon position, by dead reckoning, was 58° 42′ S., 129° 19′ E. In the late evening, the wind suddenly increased to a strong north-north-west gale with a very high sea. Captain Davis put the vessel head to the sea at full speed to maintain steering way.

March 3rd.—At 3 a.m. the wind suddenly shifted to south-west; the ship's course was altered to north (true). The wind later moved to westward. The noon position was 58° 37′ S. and 131° 4′ E. At 4 p.m. there was a strong westerly gale with very high sea, but at 5 p.m., the wind had hauled into north-west. Captain Davis kept manoeuvring the course of the ship to meet the changing wind and swell with the object of reducing the roll of the vessel, which was inordinately great owing to lack of ballast.

March 4th.—The weather improved but a heavy north-westerly swell continued. Large flocks of birds were about. Noon position 57° 27′ S., and 133° 10′ E. A south-south-west wind in evening allowed the ship to make north at full speed.

March 5th.—Heading north in the morning with a fresh south-south-west breeze. Noon position, 54° 56′ S. and 133° 54′ E. Wind changing to west later, then west-north-west. In the afternoon the ship was making a N. 25° E. course. As the weather permitted, full use was being made of sail, during this return voyage. For part of the voyage the engines were not in use, Captain Davis relying only on sail.

March 6th.—A moderate west-by-north gale blowing and the ship making to N. 30° E. Noon position 53° 57′ S., and 135° 22′ E.

March 7th.—A fresh west-by-south gale with mountainous seas. Later south-west gale with very high following sea. Noon position, 52° 19′ S., and 137° 17′ E.

March 8th.—West to west-south-west gale. Ship making about N. 30° E. Noon position, 49° 52′ S. and 140° 30′ E.

March 9th.—Light north-westerly weather but the wind backed to north-east after 5 p.m. Noon position, 47° 38½′ S. and 142° 9′ E.

March 10th.—During the morning north-east to east weather but in the late afternoon and evening the wind steadily increased from south-south-west. Noon position 46° 19′ S. and 142° 9′ E.

March 11th.—South-westerly weather and a high south-west swell. A course was set for the Maatsuyker Light at the south-west corner of Tasmania. At 7.40 p.m., the Maatsuyker Light was observed bearing N. 43° E. true. At 10.40 p.m. the Light was abeam, distant 10 miles.

March 12th.—At 5.50 a.m. the vessel rounded the Tasman Head, and by 2.30 p.m. was fast to King's Pier, Hobart.

SUB-ANTARCTIC CRUISES

THE FIRST SUB-ANTARCTIC CRUISE.

The plans of the Expedition provided that during the interval between the return of the s.y. *Aurora* from landing parties in the Antarctic and the relieving voyage of the following season, one or more cruises in sub-Antarctic waters for oceanographic investigations should be undertaken. One or more calls at Macquarie Island during the winter months were to be included as part of this programme.

The original arrangement provided that Mr. Charles Hedley, of the Australian Museum, should join the *Aurora* on any such voyages and take charge of the dredging operations and marine biology. Unfortunately, this did not materialise, for the Australian Museum could not in the end spare his services. Arrangement was then made with Mr. Edgar Waite, then Director of the Canterbury Museum, Christchurch, to join the vessel in the above capacity for the first of these sub-Antarctic cruises.

After arriving back in Hobart on March 12th, 1912, a period of twelve days was spent in port. Captain Davis then steamed the *Aurora* to Sydney, where the vessel underwent refitting and some structural additions. The latter included the installation on the fore-deck of a winding-drum for dredging operations and a powerful winch which operated both the dredging-cable and the capstan which wound in the anchor cables. After this and other improvements had been effected, including the provision of especially strong davits for hoisting aboard the heavy motor launch, the ship's operations were henceforth much facilitated.

On May 17th, a start was made on the first sub-Antarctic cruise. Mr. Edgar Waite had joined the *Aurora* in Sydney and with him Mr. E. J. Haynes, taxidermist of the Canterbury Museum staff. A third addition to the ship's company was a cinema operator, Mr. Primmer, who hoped to secure for us useful pictures illustrating the working of the vessel and dredging operations.

The ship's officers were the same as on the first Antarctic cruise, except in the case of the First Officer; the latter, N. C. Toucher, had withdrawn and his place was taken by Frank D. Fletcher.

After departure from Sydney on the afternoon of May 17th, a call was made at Port Kembla for coal, where a quantity of 307 tons was taken on board. By 7.30 a.m. on the 19th the *Aurora* was at sea again, heading south. Captain Davis decided to make a passage westwards through Bass Strait and then to proceed south on the 140th meridian. A special objective was to ascertain whether the Royal Company's Islands, which were figured on some maps, did or did not exist.

The earlier stages of the cruise were noted more especially for the extreme slowness of progress owing to a considerable spell of head winds, against which the *Aurora* made only about 2½ knots per hour. Bass Strait was traversed and lat. 40° 31′ S., long. 141° 25′ E. reached at noon on May 24th. Late that afternoon the ship, rolling considerably to a long west-south-west swell, was headed due south. The following day, in the forenoon, a large school of Blackfish was sighted; shortly afterwards numbers of Penguins passed the vessel. Black-browed and Wandering Albatrosses in numbers were a feature each day during this part of the voyage.

Noon on May 26th saw the vessel in 43° 57′ S. and 140° 26′ E. At 4.30 p.m. a sounding was made (Plate XXII, Fig. 2) in 2,590 fathoms on globigerina ooze (position 44° 12′ S. and 140° 19′ E.). This day numbers of Sooty Albatrosses appeared as well as a Cape Pigeon. While the sounding was being taken, a fine Wandering Albatross and a Sooty Albatross were secured for skins.

During the 27th the ship rolled and lurched heavily to a high and confused westerly swell and south-westerly sea.

On the 29th the weather improved greatly but a long south-westerly swell continued. At 1.30 p.m. on May 28th when in 47° 30′ S. and 139° 30′ E. a sounding was made of 2,452 fathoms on globigerina ooze. When taking this sounding the weights failed to disengage, and the wire did not part when hauling in; but on coming to the last 100 fathoms the compression on the drum was so great that it burst.

May 29*th.*—Making south and east in strong westerly weather, ship rolling heavily at times.

May 30*th.*—Weather much improved. Sooty Albatrosses about. The Lucas sounding machine having been repaired, a sounding was made at 9 a.m. in 51° 29′ S. and 140° 13′ E.; depth 2,150 fathoms. A large piece of floating kelp was passed in the early afternoon. Noon position: 51° 41′ S. and 140° E.

May 31*st.*—Making a course to the east-south-east. Barometer falling, wind freshening and sea increasing. Moderate gale; the ship pitching and rolling. At 2.45 a.m. the ship's position was found to be within 23 miles of the charted location of the Royal Company's Islands. Captain Davis made a course towards the reputed position of those islands: however, nothing was seen of them. Noon position: 52° 32′ S. and 143° 33′ E. At 6 p.m. the ship was headed west still searching for the doubtful islands.

June 1*st.*—Westerly weather; strong squally wind and high sea. The noon position by dead reckoning was 52° 11′ S. and 142° 14′ E. Barometer at midnight, 29·09 inches. Throughout to-day the ship was headed westward, zig-zagging in search of the fabled islands.

June 2*nd.*—A moderate to strong westerly gale with a high sea and frequent heavy snow squalls. At 9.30 a.m., having abandoned further search for the Royal Company's Islands, the ship was turned about and headed east.

A lot of coarse sea-weed was passed during the morning. Noon position: 52° 46′ S., 142° 0′ E. At midnight there was a very high following sea, the ship taking quantities of water on board. Barometer rising rapidly.

June 3*rd.*—All day there continued a strong west-south-west gale with high sea and violent snow squalls. The ship continued making between east-north-east to east.

June 4*th.*—The westerly gale continued but moderated. At 8 a.m. Captain Davis brought the ship on to a south-east course heading for Macquarie Island. Noon position: 51° 55′ S. and 151° 5′ E.

June 5*th.*—Moderate to fresh south-west weather.

June 6*th.*—Moderate to fresh westerly breezes. A sounding was made during the morning and a bottom sample obtained. However, too much wire had been paid out and it over-ran itself and fouled. Noon position: 53° 45′ S. and 158° 12′ E. A course was then set to pass well north of the Judge and Clerk Rocks, north of which, by dead reckoning, the ship should have been at about 8.30 p.m. Captain Davis then recorded: "The wind and sea were from the west-north-west both rising, the glass falling and the weather looking very threatening. At 8.30 p.m., being by dead reckoning about 18 miles north of the Judge and Clerk Rocks, the ship's course was altered to south-east true, then at 10.30 p.m., reckoning that we must be well to leeward of the Island, the course was again altered to S. 7° E. By midnight nothing had been seen either of the Island or the Rocks. The wind and sea were both increasing from the westward, making the course uncertain. At 1 a.m. on June 7th the clouds broke a little and star observations for position were made putting the ship in 54° 4′ S., 159° 10′ E. which was a little north and some miles east of the Judge and Clerk Rocks; this position, however, was not to be relied on as the horizon was very poor. By 2 a.m. the sea was becoming very high and the wind increasing rapidly. The ship was making very bad weather, rolling heavily to the beam sea. The course was altered to S. 10° W. (true) and by 3 a.m. to S. 25° W. (true). Still nothing had been seen of the Island and as the sea was running very high it made it rather doubtful as to whether we were to windward or leeward of the Island. At 4 a.m. the course was altered to south-west (true) and we continued running on this course but saw nothing of the Island until 6 a.m.; then suddenly the sea smoothed down in a most marked manner, making it quite evident that we had got under the lee of the Island. The course was then altered to west-south-west (true). The vessel continued running on this course till 8 a.m.; we then steered to make west (true).

"By this time it was blowing a strong gale, but the smoothness of the sea indicated that we were still under the lee of the Island: so far nothing had been seen of the Island. However, at 9 a.m. Macquarie Island was sighted on the starboard bow; on coming up to the land we were found to be making in towards the southern end. The course was then altered along the land to the northward, and the ship was brought to anchor in North-East Bay at 2.30 p.m. on June 7th."

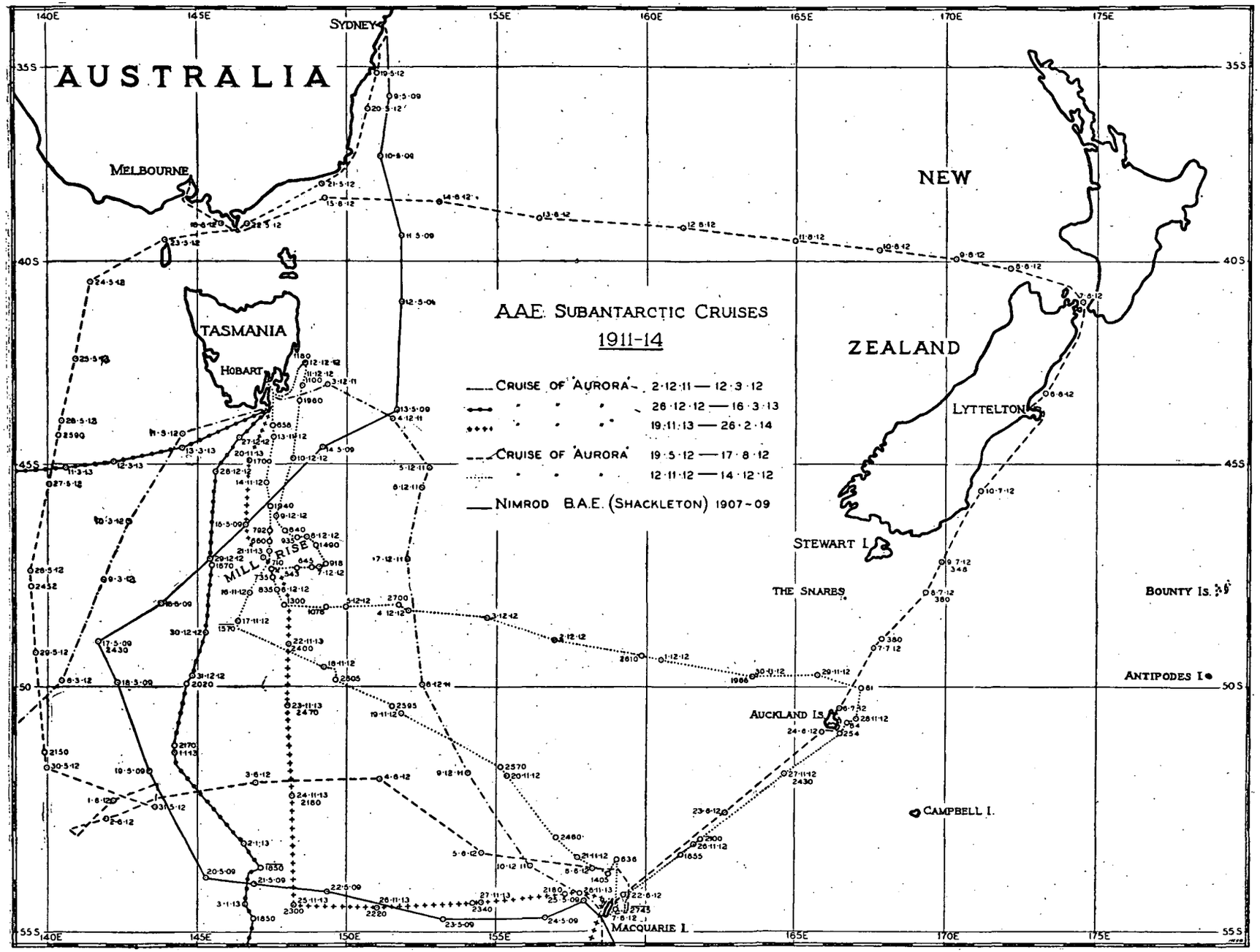

Fig. 6. Tracks of the *S.Y. Aurora* in the region between Australia and Macquarie Island.

On account of the stormy weather the cruise thus far had achieved very little in the nature of oceanography. Edgar Waite's report summarises the position during this section of the voyage as follows :— " We had hoped against hope for weather fine enough to enable the trawl to be put over, but not a single day sufficiently favoured us; in fact, the whole tale of the cruise may be expressed as gales of wind, big seas, rain, snow and general gloom. On days when the seas were somewhat less tumultuous, sounding was essayed, but only three successful records were made. Considerable property was lost, including some drivers and sinkers, dashed off by the waves before the apparatus could be lowered beneath their influence, and 2,000 feet of sounding wire went to the bottom in an unorthodox manner."

June 8th.—At anchor in North-East Bay (Plate XXI, Fig. 2). At 9.15 a.m. the whale-boat left for shore with Waite and other members of the scientific party, stores and mail. Some members of Macquarie Island shore party came off to the ship. The gale freshened in the afternoon and it was found impossible to communicate with the shore. Air temperature, 47° F. Surface water temperature, 41·5° F.

June 9th.—At anchor. The gale continued so that there was no communication with the shore.

June 10th.—The westerly gale began moderating. By 8.40 a.m. communication with the shore was again established, and several trips were made during the day.

June 11th.—At anchor. A moderate south-south-east breeze prevailed.

June 12th.—At anchor with a moderate westerly gale blowing. Boat communication was made with the shore. At 3.30 p.m. the boat returned with Waite's scientific party and specimens. Since the 8th, Waite's party had lived ashore with the Island party, spending days studying the seal and bird life and collecting skins.

June 13th.—A strong westerly breeze prevailed with rain squalls and an overcast sky. By 9.20 a.m. the anchors were heaved up and they proceeded slowly south along the coast taking frequent soundings. At 12.30 p.m. Lusitania Bay was reached and anchor dropped with 60 fathoms of chain in 12 fathoms of water. Later in the day a strong north-west wind sprang up with violent squalls and continuous rain. Air temperature, 45° F. Surface water temperature, 40·5° F.

June 14th.—At anchor. Moderate northerly to north-north-westerly weather. At 8.45 a.m. the boat took Waite and his assistant, Haynes, ashore where they remained. At 10 a.m. Captain Davis moved the ship further to seaward, anchoring her in 16½ fathoms with 90 fathoms of chain out.

June 15th.—At anchor. A fresh to strong wind came in from the north-west with fine rain and heavy mist. The land remained invisible from the ship all day. Captain Davis recorded the following :—

" In thick weather, when making Macquarie Island from the eastward, great caution is required, as the land can be approached within three-quarters of a mile, without any warning of its presence being given, except the rapidly decreasing soundings, which range from 17 fathoms at the distance of about a mile, to 10 fathoms at the distance of about half a mile. The *Aurora* was anchored three-quarters of a mile from the shore in 16 fathoms of water. A steady north-north-westerly breeze had been blowing for two days, gradually bringing fog. Early on June 14th all the high land above 300 feet had been covered with mist all day, which was gradually creeping down the hills. By the evening of June 14th all trace of the land had disappeared and no trace of it was seen till June 15th at 6 p.m., when the weather began to clear."

June 16th.—At anchor. The day began with a moderate south-westerly gale and snow squalls, moderating late in the day.

June 17th.—At anchor. 9 a.m.: a boat left for the shore to pick up Waite and Haynes, but soon afterwards the wind and sea came in strongly from the north-east. The whale-boat with much difficulty arrived at the ship at 10.15 a.m. Since the 14th Waite and Haynes had lived ashore camped in an abandoned sealers' hut which they nearly burnt by accident, owing to over-generous use of Sea-elephant blubber on the stove.

Mist and rain continued throughout the day. Towards evening there was a marked rise in the barometer.

June 18*th*.—Still at anchor, Lusitania Bay. The day commenced with a gentle east-south-easterly breeze, but as the day wore on this backed into the south-south-west.

June 19*th*.—Moderate north-west gale. 8.30 a.m.: the anchor was heaved up and proceeded at full speed taking frequent soundings. At 1.15 p.m. the anchor was dropped in North-East Bay. 2 p.m.: boat communication made with the shore.

June 20*th*.—Light to moderate westerly weather. 8.30 a.m.: the anchor was heaved up and the ship steamed in an easterly direction taking frequent soundings. 10.10 a.m.: the large trawl was lowered over the side and 1,000 fathoms of cable paid out. Commenced heaving in at 2.10 p.m. Trawl on board at 5.45 p.m., but found to contain only one jelly-fish, so obviously it had not reached bottom (Plate XXII, Fig. 1). At 9 p.m. anchor again dropped in North-East Bay.

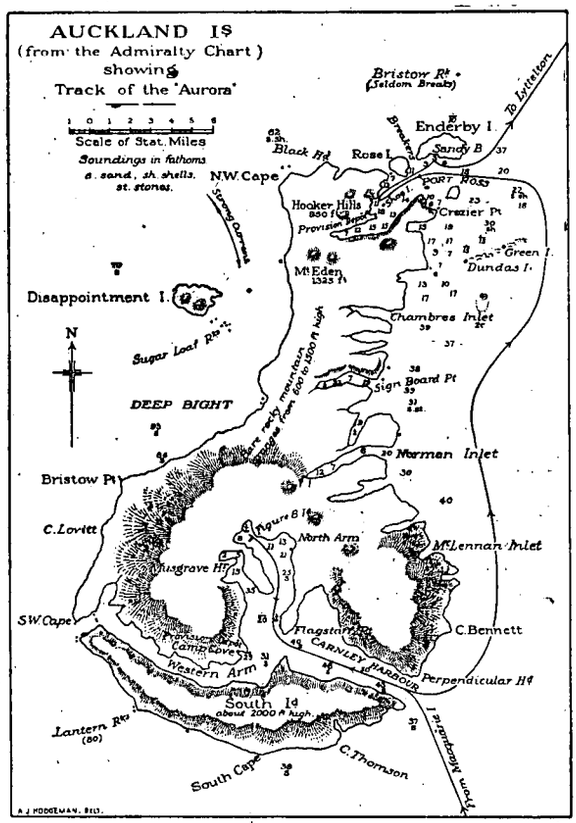

FIG. 7. Track of the *S.Y. Aurora* at the Auckland Islands.

June 21*st*.—At anchor. Fresh breeze and heavy snow squalls.

June 22*nd*.—Light to moderate westerly wind. At 8.30 a.m. the anchor was hove in and the vessel departed for the Auckland Islands, distant 340 miles, on a course N. 54° E. As the vessel steamed to the north, a line of soundings was taken.

June 23*rd*.—Moderate north-west gale and a high sea. Noon position: 52° 41′ S. and 162° 38′ E. During the heavy weather on the way to the Auckland Islands two different species of fish were washed on board. Numbers of Albatrosses followed the ship.

June 24*th*.—Moderate westerly gale. At 9.30 a.m. Adams Island was in sight. Birds were about in great numbers, including Arctic Terns and Cape Pigeons; the latter disappeared on near approach to the land. When south of Adams Island a hawk (*Nesierax australis*) came off the land and attempted to alight on the rigging, but the swaying of the vessel was too great to permit even a bird to do so.

At 5.20 p.m. the vessel was anchored in Carnley Harbour off Figure of Eight Island, in 19 fathoms with 75 fathoms of chain out.

June 25*th*.—Westerly gale and drizzling rain. At 8.50 a.m. the vessel was got under way and proceeded to the top of the Harbour in search of a better anchorage. Anchor was dropped in 9½ fathoms at 10.20 a.m. at the western side of Figure of Eight Island (Plate XXIII, Fig. 1). At 12.50 p.m. Waite and others left in the launch to dredge, returning with a fair catch at 3.15 p.m.

June 26*th*.—At anchor. The westerly wind moderated, but drizzling rain continued most of the day. Davis led a party to Camp Cove on a visit of inspection to find depots established by the New Zealand Government for use of castaways (Plate XXIII, Fig. 2).

June 27*th*.—At anchor. Squally north-westerly to southerly winds, with considerable drizzling rain. Waite and his assistants spent the day collecting on Figure of Eight Island (Plate XXIII, Fig. 3).

June 28*th*.—At anchor. Squally weather from west to south-west with hail and rain. Captain Davis and party visited various points around the bay making a plan of the anchorage, and collecting.

June 29*th*.—Moderate gale from the south-west to south with snow and rain. At 4 a.m. the anchor was weighed and the ship proceeded down Carnley Harbour to sea where they met a big swell, the vessel rolling heavily. They entered Port Ross at 2.30 p.m. and shortly afterwards anchored in 12½ fathoms in Erebus Cove, just west of Shoe Island.

June 30*th*.—At anchor. Waite and party spent the day ashore collecting. Davis visited the depot for castaways at Erebus Cove.

July 1*st*.—Strong squally westerly wind with occasional showers of rain. During the morning the ship was found to be dragging anchor considerably. At 3 p.m. the anchor was weighed and the vessel proceeded to a new anchorage at Terror Cove.

July 2*nd*.—Light breezes from west-south-west. Waite and party spent the day collecting ashore. Captain Davis visited Observation Point and photographed the cairn marking the spot where Captain J. C. Ross set up his observatory in 1840 (Plate XXIII, Fig. 4). In the afternoon Rose Island was visited.

During the day Waite captured six specimens of the flightless duck *Nesonetta aucklandica*. This is an endermic bird which lives among the kelp and along the shore of the Auckland Islands.

July 3*rd*.—Calm weather. During the morning a visit was paid to Enderby Island.

July 4*th*.—A fresh north-west wind with falling barometer. Overcast, misty and continuous rain during most of the day. Captain Davis's report states: "The anchorage occupied during the last few days off Johnson's Point has proved excellent as it is well sheltered and the anchor has held well."

July 5*th*.—Light winds from the west, overcast and occasional misty rain. At 9 a.m. the anchor was weighed and they proceeded to Enderby Island. At 10 a.m. the anchor was dropped at Sandy Bay in 10 fathoms. Waite's party spent the rest of the day ashore. Mr. Waite recorded in his diary:

"While pigs are found on the main island, the only introduced animals met with on the islets are cattle, goats and rabbits. The latter may be truly said to swarm on Enderby Island, and we availed ourselves of the opportunity to obtain a supply to provide the ship with fresh meat; the only food, innocent of tin, we had had since leaving the Australian coast six weeks previously. Though we saw many thousands of rabbits, I noticed two only of the colour of the wild rabbit. Two or three black ones were seen, all the

others being silver-grey, in some of which the white and in others the black hairs preponderated. Of the examples obtained two were interesting in having the tips of the ears and the end of the tail buff; in all the head was of the darkest colour being nearly black in some of the grey specimens.

"There is a splendid example of columnar basalt at Rose Island where the columns rise in an unbroken series to 80 feet or more in height. The bases of these rocks are either continued seaward as a mosaic or weathered out into deep caves into which the sea pounds, to be shot, as spray, high into the air.

"In some places, notably at Shoe Island, the turf is riddled in all directions with the burrows of various kinds of petrels. This undermining allows the wind play beneath the tussocks, with the result that they lose their rootings, and in consequence large areas are laid bare, possibly never to be revegetated."

July 6th.—A moderate westerly gale, and occasional showers of rain. At 9.55 a.m. anchor was weighed and they proceeded down Ross Harbour to sea. When about 5 miles distant from the Island (bearing to Dundas Island, S. 75° W. (mag.) and to North-East Cape, N. 61° W. (mag.)), a sounding in 40 fathoms was made. Here Captain Davis lowered the trawl but it fouled an obstruction on the bottom and was hauled up empty and badly torn. They then proceeded on their course to New Zealand. The sea increased considerably and the vessel rolled heavily.

July 7th.—In the morning a light south-west wind and heavy south-west swell. Noon position: 49° 17′ S. and 167° 36′ E.; depth by sounding 398 fathoms. The wind went into the north-west in the afternoon. At 4.10 p.m. a sounding revealed a depth of 380 fathoms; there the position by dead reckoning based on noon observations was 49° 2′ S. and 167° 49′ E.

July 8th.—The wind went into the north-east blowing fresh in the evening. Noon position: 48° 0′ S. and 169° 18′ E., sounding 380 fathoms. Again at 4.45 p.m. the ship was stopped for sounding (Plate XXII, Fig. 2); depth, 375 fathoms; position by star observation: 47° 16′ S. and 169° 7′ E.

July 9th.—Fine weather. Noon position: 47° 16′ S. and 169° 52′ E.; a sounding gave 350 fathoms. At this spot Captain Davis lowered the trawl but it got hitched up; consequently no result. They continued on course at 3 p.m. and came in sight of the Nuggets Point light at 10.20 p.m., the latter was abeam by 11.18 p.m.

July 10th.—Light west-south-west wind. The vessel arrived at Taioroa Head, off Port Chalmers, at 9.30 a.m. where Primmer (photographer) was landed by the pilot cutter. The voyage was then continued to the north.

July 11th.—The ship arrived at Lyttleton Harbour where Mr. Waite was landed with his collections.

A period of four weeks was then spent in harbour at Lyttleton. On August 6th at 8 a.m. the *Aurora* departed on her voyage to Melbourne, arriving at the wharf, Williamstown, at 11.30 a.m. on August 17th.

The vessel remained at Williamstown docks undergoing overhaul and repairs until November 2nd when she departed for Port Kembla for coal. Port Kembla was reached at 6 a.m. on November 6th. The vessel was coaled, and departed south at 7 p.m. on November 10th.

THE SECOND SUB-ANTARCTIC CRUISE.

November 12th.—At 4.30 p.m. the *Aurora* left the wharf at Hobart for a second sub-Antarctic cruise which was to include a call at Macquarie Island. The dredging and sounding gear had all been overhauled and replacements made. Captain Davis proposed to conduct a regular programme of soundings. T. T. Flynn, professor of zoology at the University of Hobart, accompanied the ship as biologist; with him went an assistant, Mr. Denny.

November 13th.—The weather very clear; light north-east breeze and a long south-west swell. A sounding of 658 fathoms was obtained at 8 a.m. when in 44° 3′ S. and 147° 36′ E. Cape Pigeons and a couple of Albatrosses followed ship. The noon position was 44° 21′ S. and 147° 35′ E.; sounding 1,470 fathoms;

the water temperature at 858 fathoms was 37° F. Unfortunately, the bottom thermometer and the driver were lost due to parting of the sounding wire. At 1.40 p.m. another sounding was taken, the ship having drifted south-west about 2 miles; mud bottom at 1,475 fathoms (position 44° 20½′ S. and 147° 33′ E.). At 3.15 p.m. Captain Davis commenced lowering the trawl, some 2,000 fathoms of wire had been paid out by 4 p.m. by which hour it was blowing fresh from the north-east. At 5.10 p.m. a start was made to haul up the trawl, and it arrived on board empty at 9.45 p.m.

November 14th.—Sky overcast and some rain with light to fresh wind from various quarters during the day. At 8 a.m. a sounding of 2,083 fathoms on mud was made (45° 26′ S. and 147° 26′ E.). A further sounding was made at 6 p.m. finding 1,940 fathoms on mud. The vessel proceeded south. The barometer continued falling rapidly during the day.

November 15th.—South-south-westerly breeze in early morning. At 5.10 p.m. a sounding was made in 792 fathoms on hard (rock ?) bottom. A second sounding made in the hope of securing a sample of the bottom gave the depth as 794 fathoms. The position of these soundings was 46° 48′ S. and 147° 29′ E. 10 a.m.: sounding recorded 660 fathoms (47° 2′ S. and 147° 31½′ E.). The noon position observed was 47° 7½′ S. and 147° 31′ E. 2 p.m.: sounded in 700 fathoms on hard bottom (rock specimen obtained) in 47° 14′ S. and 147° 31′ E. The wind increased, the ship rolling and pitching into a south-west gale and shipping some heavy seas. In the late evening hours, plunging into a westerly gale, with a very high west-south-west sea, Davis headed the vessel to the south-west keeping the sea on the bow; the ship rolled and pitched violently.

November 16th.—The westerly gale continued. The noon position was 48° 1′ S. and 146° 49′ E. Under the 4 p.m. entry in his log, Davis remarked: "For the last 18 hours both sea and swell have, without any apparent reason, been extraordinarily confused." Very few birds were seen about the ship during the day. The gale continued and at midnight "ship rolling and labouring very heavily."

November 17th.—The south-west gale continued but the wind gradually abated. At 11.40 a.m. floating kelp was passed. Noon position: 48° 38′ S. and 146° 24′ E. At 4 p.m. a sounding of 1,570 fathoms was obtained but the sea was running so high that it was difficult to tell just when the driver had reached the bottom.

November 18th.—Overcast, constant fine rain, light westerly winds, and a high sea. Pieces of floating kelp were passed at 8.20 a.m. The noon position was 49° 36′ S. and 149° 12′ E. At 7 p.m. a sounding was attempted but had not reached bottom in 2,605 fathoms; the wire parted when winding in. At midnight a south-west wind was blowing with high south-west swell; misty weather with occasional drizzling rain.

November 19th.—Misty rain continued almost without a break during the early morning hours, but the weather improved somewhat as the day advanced. At 9 a.m. a sounding found bottom at 2,595 fathoms in 50° 27½′ S. and 151° 29′ E.; the weights failed to disengage, resulting in the loss of a driver and some wire. Penguins were observed about the ship, which was then about 350 miles north-west of Macquarie Island. The noon observed position was 50° 36′ S. and 151° 43′ E.

November 20th.—Dull and overcast with southerly breeze. At 9 a.m. the ship was stopped in 51° 40′ S. and 155° 3½′ E. for soundings, finding bottom at 10.15 a.m. at a depth of 2,570 fathoms. The noon position was 51° 50′ S. and 155° 17′ E. During the afternoon and evening the ship rolled heavily to a long south-south-west swell which became high and confused later in the evening.

November 21st.—Light southerly breeze, dull and cloudy. The swell subsided gradually. At 6 a.m. the ship was stopped for sounding in 53° 8′ S. and 157° 0½′ E. and by 6.35 a.m. the bottom was got at 2,460 fathoms. Noon position: 53° 26½′ S. and 157° 39′ E. Progress was again stopped for sounding

at 1 p.m. and bottom got by 1.40 p.m. at 2,540 fathoms; the driver was lost owing to the wire parting. At 6.35 p.m. Macquarie Island was observed bearing south-east (mag.). The ship was again stopped for sounding at 7 p.m. in 53° 46′ S. and 158° 47′ E.; bottom was reached by 7.30 p.m. at 2,405 fathoms. At 8.15 p.m. the trawl was lowered while continuing to steam slowly ahead; by 10 p.m. 1,900 fathoms of cable had been paid out and the engines were then stopped.

November 22nd.—At 3.15 a.m. the trawl dynamometer registered 8 tons; a commencement was then made to haul it in. The weather at the time was dull and cloudy with a gentle north-west breeze and a smooth sea. By 7.30 a.m. the trawl was heaved on board with the net badly torn and the iron-work bent. Most of the catch had been lost, only one fish and some gorgonia coral were recovered.

At 8 a.m. a sounding found only 636 fathoms on a rock bottom; position, 53° 34′ S. and 159° 4′ E. Thus while the ship had drifted, with engines stopped, a distance of 12 miles, the bottom had shoaled from 1,405 to 636 fathoms. At 8 a.m. the voyage was resumed at full speed making due south, bringing the Island into view slightly on the starboard bow at 8.30 a.m. At 10 a.m. a sounding in 53° 44′ S. and 159° 3′ E. found bottom at 570 fathoms. Noon position: 53° 58′ S. and 159° 5′ E. At 1 p.m. the ship was stopped for sounding in 54° 4′ S. and 159° 5′ E.; bottom was met at 1,750 fathoms but the driver was lost owing to the wire parting. At 6.15 p.m. the Judge and Clerk Rocks were abeam distant 1 mile. At 7.35 p.m. anchor was dropped in 13 fathoms in North-East Bay. Members of the Expedition's Island Party came off to the ship and remained aboard till 9.30 p.m.

November 23rd.—At anchor, Macquarie Island. A gentle north-by-west breeze and overcast and raining throughout the night. Communication between ship and shore was maintained during the day.

November 24th.—The anchor was heaved up at 10 a.m. and with Blake, of the shore party, aboard to co-operate in a sounding programme in the shallow coastal waters, Captain Davis took the ship around the north end to the west side of the Island. The position of these soundings was fixed by sights to known points on Blake's map of the Island. At 6.30 p.m. the ship arrived back at the anchorage at North-East Bay.

November 25th.—At 10 a.m. after landing Blake and taking aboard Professor Flynn and Mr. Denny who had spent the night ashore, the anchor was weighed and ship steamed down the east side of the Island taking frequent soundings. When some distance south of the Nuggets, the vessel was headed away from the land on a south-east course, arriving at noon in 54° 34½′ S., 159° 2′ E.; this sounding (1,548 fathoms) was at a point only 3 miles distant from the Island, illustrating the steepness of the shelving sea-floor. At 2 p.m., when in 54° 34½′ S., 159° 12′ E., at 10 miles from the nearest point of the coast, the depth exceeds 2,745 fathoms, for the bottom was not reached when that length of wire (all there was on the drum) was run out. The ship was then directed north to continue sounding between the Island and the Judge and Clerk Rocks. The general direction of the Judge and Clerk reef was observed to be south-south-east to north-north-east (true). At 7 a.m. the programme of soundings was completed and a course set for the Auckland Islands.

November 26th.—Dull and cloudy weather with a very light southerly breeze. At 8 a.m. sounding made in 53° 35′ S., 160° 57′ E., gave a depth of 1,855 fathoms on hard bottom. Noon observed position: 53° 23′ S., 161° 26′ E. A sounding in 53° 18½′ S., 161° 35′ E. at 1 p.m. gave 2,100 fathoms on hard bottom. There was a moderate west-north-west breeze during the evening.

November 27th.—A strong south-west wind worked up accompanied by rain and hail and a rising sea. Noon observed position: 51° 51½′ S., 164° 40′ E.; a sounding gave bottom at 2,430 fathoms. At 4 p.m. porpoises were observed following the ship. Adams Island was sighted at 7.45 p.m. and the course altered to pass to the southward.

November 28th.—At 4 a.m. there was still a fresh south-west breeze with considerable sea. A sounding at 5 a.m. in 50° 56½′ S., 166° 29′ E., gave 250 fathoms on rock; this was 18 miles distant from South Cape which lay N. 65° W. (true). At 10 a.m., in 50° 44′ S., 166° 54½′ E., depth was 198 fathoms. Here the bucket dredge was lowered but came up empty. The noon position was 50° 43′ S., 166° 58′ E.; the depth was 215 fathoms. At 8 p.m. in 50° 1′ S., 167° 12′ E., a sounding gave 81 fathoms. A strong south-west breeze continued and the sky remained dull and overcast. At 8.10 p.m. the course was altered to take the ship to the west.

November 29th.—A gale from the south-by-west with high and increasing sea. At noon a very high sea was running and vessel shipped heavy waters at times. Noon position: 49° 48′ S., 165° 4′ E.

November 30th.—Dull and cloudy with occasional misty rain; the sea confused and moderating. The noon position was 49° 50′ S., 163° 32½′ E.; a sounding gave 1,965 fathoms on a hard bottom. The weather moderated rapidly in the late evening.

December 1st.—Captain Davis decided to return to the area of comparatively shallow soundings south of Tasmania which he had located on the outward voyage. The course was set thereto. Light westerly weather and some misty rain with a moderate south-west swell prevailed during most of the day. The noon position was 49° 28½′ S., 160° 27½′ E. At 4 p.m. in 49° 23½′ S., 159° 56′E., a sounding was taken, and by 4.30 p.m. the bottom was reached in 2,610 fathoms. During the evening the weather was very fine and the sea smooth. Porpoises sported around the ship.

December 2nd.—Weather dull and cloudy. Late in the day a strong south-west wind developed. Noon position: 49° 2′ S., 156° 53′ E. There was a notable absence of birds during the day.

December 3rd.—South-westerly weather with frequent rain squalls most of the day; the ship pitching and rolling quickly to a considerable south-westerly swell. The ship's speed had to be reduced on account of the sea running. Noon observed position: 48° 35½′ S., 154° 40′ E. A few Storm Petrels were seen during the afternoon.

December 4th.—Light westerly weather and a south-west swell. Several pairs of Mollymawks and a large Wandering Albatross followed the ship during the morning. Noon observed position: 48° 25′ S., 152° 5′ E. The ship was stopped for sounding at 4 p.m. in 48° 17′ S., 151° 42′ E.; bottom was got at 4.35 p.m. in 2,700 fathoms.

December 5th.—Fresh westerly weather with long and heavy swell from the west-north-west. Noon observed position: 48° 22′ S., 149° 53′ E. At 6 p.m. the ship stopped for sounding in 48° 19½′ S., 149° 19′ E.; got bottom at 1,076 fathoms.

December 6th.—Moderate to light westerly weather. At 5 a.m. a sounding in 48° 16½′ S., 147° 56′ E., gave a depth of 1,300 fathoms. Noon observed position: 47° 57½′ S., 147° 41′ E. A sounding at the noon position gave 835 fathoms on hard bottom. At 4 p.m. the ship was rolling to a considerable beam sea. Stopped for sounding at 4.30 p.m. when in 47° 40½′ S., 147° 32′ E., finding a hard bottom at 735 fathoms. At 7.30 p.m. Captain Davis again sounded in 47° 30′ S., 147° 29′ E., finding 710 fathoms on a hard bottom. At 9 p.m. the course was altered to make east (true) and speed reduced to half.

December 7th.—Early in the day much heavy rain and a north-north-west wind. At 10 a.m. a stop was made for sounding in 47° 27½′ S., 148° 52½′ E., finding bottom at 645 fathoms. At noon a high beam sea was running and the ship rolled heavily. Noon position: 47° 27½′ S., 149° 17½′ E., finding 918 fathoms on a hard bottom. At 2.35 p.m. the ship's head was turned to north (true) proceeding at half speed. A moderate north-west gale continued throughout the rest of the day with the ship rolling heavily to a confused swell. The aurora polaris was observed in the sky to the southward at midnight.

December 8th.—The weather improved in the early morning hours but a heavy west-north-west swell continued. A sounding at 8.30 a.m. in 46° 45′ S., 148° 40′ E., gave the depth as 1,490 fathoms on hard bottom. Noon observed position: 46° 46½′ S., 148° 23′ E. At 1 p.m. the ship was stopped for sounding in 46° 47′ S., 148° 17′ E., finding 935 fathoms on hard bottom. At 1.30 p.m. the ship was headed west (true) at full speed, but the course was altered at 5 p.m. to north-west-by-north (true). At 8 p.m. a sounding in 46° 38½′ S., 147° 54′ E., found 840 fathoms on a hard shelly bottom. The surface water temperature this day was rather high, averaging 53° F.

December 9th.—High westerly sea with rain squalls at intervals. At noon a moderate west-north-west gale was blowing and the ship rolled violently; the observed position was 46° 20′ S., 147° 37′ E. During the rest of the day both the westerly gale and a high sea continued. Captain Davis decided to make north to Tasmania; accordingly, the course was altered to N. 33° E. (true).

December 10th.—The westerly gale continued with high sea and rain squalls. Noon observed position: 44° 53½′ S., 148° 11′ E. Lightning, which is rarely recorded in these southern seas, was observed to the northward at midnight.

December 11th.—The vessel was laid on a course to pass Cape Pillar light at a distance of 30 miles to the east. A heavy south-west sea was still running. The high land of Tasman Peninsula was visible at daylight. Noon position: 43° 13′ S., 148° 32′ E. A sounding at 2.30 p.m. in 43° 4½′ S., 148° 24′ E., found 1,100 fathoms. After 2 p.m. the swell gradually disappeared as the ship was then under lee of the land. At 4.30 p.m. a stop was made for sounding in 42° 53′ S. and 148° 37′ E. finding 675 fathoms. The vessel continued north to a point 11 miles east of Maria Island (42° 40½′ S., 148° 25½′ E.) where the depth was ascertained to be 75 fathoms on a bottom rich in polyzoa. Captain Davis then proceeded out to sea, arriving at 8 p.m. in 42° 38½′ S., 148° 37′ E., some 20 miles east of Maria Island; there a sounding was taken finding 1,180 fathoms on globigerina ooze. The ship then lay-to awaiting daylight for dredging operations.

December 12th.—At 5.30 a.m. the ship was in 42° 38½′ S., 148° 41′ E., where a sounding gave 1,320 fathoms on globigerina ooze. The trawl was put over the side at 7.15 a.m. and a start made to pay out the wire. There was a calm and smooth sea, with a surface temperature of 61·8° F. (air 60° F.). Paying out ceased at 8.30 a.m. when a length of 2,000 fathoms of cable was over the side. At 10.15 a.m. a start was made to haul up the trawl, bringing it to surface at 2.40 p.m. The net was found empty, the end having fouled around the cable. During the morning a good catch was secured in the tow-net. The noon sounding gave 1,300 fathoms on globigerina ooze in 42° 44′ S., 148° 41′ E. At 3.15 p.m. the vessel got under way, and steamed in towards Isle des Phoques, taking two soundings on the way, namely, 68 fathoms in 42° 35′ S., 148° 25½′ E., and 65 fathoms in 42° 34′ S., 148° 24½′ E.

At 7 p.m. Captain Davis again trawled in 64 fathoms (42° 39′ S., 148° 20¼′ E.). The trawl came on board again with a full haul at 8 p.m. Another sounding made as soon as the trawl was on board gave 62 fathoms (42° 40′ S., 148° 20¼′ E.). As the weather was fine and clear and the sea calm, Captain Davis decided to return to the position of the 1,320 fathoms sounding and there trawl again.

December 13th.—5.30 a.m. having reached the above position the trawl was put over the side. The ship steamed slowly ahead while the cable was being paid out. At 10.15 a.m. they started to heave in; at this time a sounding showed 1,270 fathoms (position 42° 48′ S., 148° 40¾′ E.). At 2.15 p.m. the trawl came on board with a large and interesting catch. Again at 7.30 p.m. a stop was made for sounding in 43° 28′ S., 148° 39½′ E.; bottom was met at 1,980 fathoms on globigerina ooze. At 8 p.m. a course was set for Hobart.

December 14th.—Arrived at King's Pier at 12.30 p.m. Professor Flynn and Mr. Denny landed.

This sub-Antarctic cruise had succeeded in securing a large number of soundings in a region of the ocean hitherto devoid of such data. An outstanding feature of this part of the programme was the discovery of a deep-sea rise of considerable extent lying to the south of Tasmania and separated from the latter by deep water. This we have distinguished by the title of " Mill Rise " in honour of Dr. Hugh Robert Mill, the able historian of Antarctic exploration.

Attempts to trawl in deep water in the rough sub-Antarctic seas had met with almost no success, but when in suitable weather, Captain Davis trawled off the coast of Tasmania, good results were achieved.

SECOND ANTARCTIC VOYAGE.

HOBART TO COMMONWEALTH BAY.

The interval after return from the second Antarctic cruise to December 26th, was spent in refitting the *Aurora* for the impending voyage to the relief of the two land stations established in Antarctica. Coal and stores were on board by December 25th.

December 26th.—In addition to the regular ship's officers and crew there were embarked this day the following :—

J. Waterschoot van der Gracht, an able Dutch artist whose mission was to portray the coastal features of the newly discovered Antarctic lands.

James Davis, a whaling master, at that time lately retired and residing in Hobart. His duty was to report upon the kinds of whales met with on the voyage.

S. N. Jeffryes, a wireless operator who it was thought could do useful work by establishing a wireless receiving set on the *Aurora*, and improve the operation of the land station at the Main Antarctic Base.

C. C. Eitel, who acted as secretary and purser of the Expedition under direction of the Expedition Advisory Committee.

At 10 a.m. the *Aurora* left King's Pier and proceeded on her voyage. On the way down the Derwent twenty-one sledge dogs were picked up from the Quarantine Station. These had been presented to the Expedition by Roald Amundsen in March, 1912, when the *Fram* put into Hobart on return from his successful South Polar dash. These dogs were a fine lot. It was anticipated that they might be required for operations in the Antarctic before our land bases could be relieved and, as it happened, they did turn out to be very useful in connection with the enforced continuance of the Main Base Station throughout the second year.

December 27th.—Westerly weather prevailed and the wind and sea increased as the day progressed. A good deal of water was taken on board, which harassed the dogs tethered on the deck. The noon observed position was 44° 22′ S. and 146° 26′ E. A Wandering Albatross followed the ship in the afternoon and Storm Petrels were about.

December 28th.—The ship this day made poor progress heading into a high head sea, on a course S. 45° W. The ship pitched and rolled violently and took much water on deck. A strong westerly gale continued. Noon observed position : 45° 10′ S. and 145° 39′ E. A large piece of kelp was passed at midday. The midnight surface-water temperature was 54° F.

December 29th.—The gale gradually moderated but a high sea prevailed and the vessel took heavy water aboard at times. Very few birds were seen either this morning or during the preceding day. Noon observed position : 47° 12½′ S. and 145° 30′ E. At 11.30 p.m. Captain Davis sounded in 47° 21½′ S. and 148° 32′ E.; depth 1,670 fathoms. A pair of Wandering Albatrosses followed the ship during the afternoon. At 4.20 p.m. a school of Blach-fish swam close alongside the vessel for about half an hour.

December 30th.—The westerly gale and high sea continued; the vessel shipped much water. At 9.15 a.m. the ship was let off her course to the west on account of the very high sea running. There were requent rain and hail squalls. At noon the position was 48° 45′ S. and 145° 17′ E. Several pieces of kelp were passed during the afternoon. At 4 p.m. there was a high confused sea and fierce squalls, with rain; water was shipped fore and aft almost continuously.

December 31*st.*—A course was made to about south-south-west (true), with the sea as much as possible kept on the starboard bow. The vessel made only about 1 knot of headway. During the night some of the weather rails of the forecastle head were washed away. The noon observed position was 49° 47′S. and 144° 52′ E. The wind and sea then moderated rapidly. At 12.30 p.m. floating kelp was passed. The vessel was stopped for sounding at 4 p.m. in 49° 58½′ S. and 144° 40′ E.; depth 2,020 fathoms. The surface water temperature at midnight was 46° F.

January 1*st.*—The ship continued making S. 15° W. against strong westerly winds and a considerable beam sea. A sounding at 9 a.m. gave 2,170 fathoms (position 51° 16′ S. and 144° 17′ E.); but on hauling up, the wire parted, thus losing the driver. Noon observed position: 51° 24′ S. and 144° 15′ E. No birds had appeared about the ship during the last 24 hours. Floating kelp was passed at 1.45 p.m. A midnight surface-water temperature of 43·8° F. was recorded.

January 2*nd.*—Strong westerly weather continued with a high sea on the quarter; the ship rolling heavily at times. Noon observed position: 53° 18′ S., 146° 36′ E. At 12.45 p.m. large pieces of floating kelp were passed. Two large Albatrosses followed the ship during the afternoon. A sounding made at 4.50 p.m. when in 53° 43′ S., 147° 10′ E., found the depth to be 1,850 fathoms; the wire parted, losing the driver. A lot of kelp was passed later in the afternoon. A strong north-west gale continued during the evening with a very high and confused sea and very fierce squalls.

January 3*rd.*—The wind commenced to moderate rapidly in the early morning hours. Porpoises came alongside the ship at 3.15 p.m. and several pieces of kelp were passed at 11 a.m. Noon observed position: 54° 27′ S., 146° 36′ E. More kelp was passed in the afternoon. At 4.20 p.m. when in 54° 46′ S., 146° 55′ E., a sounding gave the depth as 1,850 fathoms; again the driver was lost owing to the wire parting. Penguins were seen in the vicinity of the vessel when sounding. Between 11 p.m. and midnight a very beautiful display of aurora polaris was witnessed. The midnight air temperature was 37° F. and the surface water temperature 40·5° F. The weather was fine and clear, with a gentle westerly breeze.

January 4*th.*—During the early morning hours the ship continued making good progress due south (Plate XXIV, Figs. 1 & 2). Gentle westerly breezes prevailed but there was considerable west-south-west swell. The barometer at 4 a.m. was 28·95 inches. The noon observed position: 56° 8′ S., 146° 36′ E. At 1 p.m. Davis sounded in 56° 13′ S., 146° 35′ E., the depth recorded being 1,670 fathoms.

January 5*th.*—Moderate to light westerly weather and an easy west-south-west swell. Auroral lights were faintly visible at times after midnight. At 9.8 a.m. the ship was stopped for sounding in 57° 25½′ S., 146° 33′ E.; depth 1,900 fathoms. Porpoises playing around the ship during the morning. Floating kelp was passed during both the morning and afternoon. The noon observed position was 57° 34½′ S., 146° 34′ E. At 8 p.m. Wilson Petrels were observed. A sounding taken at 9 p.m. in 58° 12′ S., 146° 47′ E., gave a depth of 1,900 fathoms.

January 6*th.*—Frequent snow squalls and wind gradually increasing during the day to a fresh south-west gale. The noon observed position was 59° 8′ S. and 146° 50′ E. Pieces of floating kelp were passed in the afternoon and late in the evening. The wind moderated in the evening.

January 7*th.*—A light westerly wind prevailed in the early morning hours accompanied by drizzling rain and snow. A sounding taken at 8.30 a.m. when in 59° 59′ S and 146° 54′ E. recorded a depth of 2,230 fathoms. Between 8.30 a.m. and 2 p.m. the engines were stopped for repairs. Noon position: 60° 1′ S. and 146° 54′ E.

January 8*th.*—The first Antarctic Petrel of the cruise was seen early today. Now the directive force of the compass was observed to be becoming very poor. Light variable winds were experienced during the day, mostly from east and south-east.

The noon observed position was 61° 53½′ S. and 146° 39′ E.; a sounding taken here gave 2,250 fathoms. The 4 p.m. observation recorded a couple of Antarctic Petrels and a few Mollymawks still following the ship. At 7.30 p.m. a floating cask was sighted; this was found to have been originally an oil cask but was empty when found.

January 9th.—A light moderate southerly wind prevailed during most of the day; the sky remained overcast and there was much rain and snow. The ship made a course south-west by south (true). A pair of Wandering Albatrosses and several Mollymawks followed the ship in the early morning. At 9 a.m. a sounding in 63° 6′ S. and 146° 41′ E. found bottom at 2,260 fathoms.

Noon observed position: 63° 12′ S. and 146° 41′ E. At 10 p.m. Captain Davis sounded in 63° 39′ S. and 146° 49′ E.; bottom at 2,150 fathoms. Whales were reported spouting to the east of the ship at 10.20 p.m. The midnight air temperature was 37·5° F. and the surface water temperature 36° F.

January 10th.—The vessel continued pushing her way south against strong southerly winds. The 6 a.m. observations record numerous birds, including a Wandering Albatross, Mollymawks, Cape Pigeons and several species of Petrels; also Finner Whales were seen blowing. The noon observed position was 64° 8′ S. and 146° 40′ E. At 1 p.m. the ship was stopped for sounding in 64° 8′ S. and 146° 40′ E.; bottom at 2,100 fathoms. During the afternoon much floating kelp was passed and a great many Blue Billies were about. A small piece of drift-ice was passed at 5.45 p.m., and at 8 p.m. three icebergs were in sight to the south-south-east. There were several snow squalls during the evening. At midnight several icebergs were in sight.

January 11th.—This was a day of light southerly winds with dull and cloudy weather. Whales were observed in the early morning hours. The 4 a.m. observations record Cape Pigeons and Nellies.

At 5 a.m. a sounding was made in 64° 52′ S., 146° 48′ E.; bottom at 1,950 fathoms. Blue Whales were seen spouting at 6 a.m. and icebergs were in sight. The first Snow Petrels observed this cruise were noted at 9 a.m. At 11 a.m. a Blue Whale came close to the ship. The noon observed position was 65° 20′ S., 146° 48′ E., where a sounding gave bottom at 1,625 fathoms. Between 10.30 a.m. and 3 p.m. the ship traversed an area of small drift-ice and light pack-ice. Snow Petrels and Blue Whales were recorded at 1 p.m.; also a seal was seen basking on drift-ice and a small earth-stained berg was passed. Numbers of Antarctic, Snow and Wilson Petrels were about. At 5·19 p.m. a stop was made for sounding in 65° 35½′ S., 146° 2′ E., finding bottom at 1,480 fathoms. Several bergs and a little drift-ice were in sight at 8 p.m. The midnight observations record the presence of Snow Petrels and Cape Pigeons.

January 12th.—From midnight on, a course to south-west (true) was made. At 3.30 a.m. Black-fish were spouting close to the ship, and Antarctic Petrels were in sight.

There was fine cloudless weather and smooth seas at 4 a.m. when a sounding gave the depth as 350 fathoms on glacial mud and stones. Black-fish were again around the ship while it was stopped for sounding. Captain Davis made a special note in the log, drawing attention to the change in ice conditions as compared with the previous year when the vessel was in this same spot; then there was massive barrier-ice but this year no pack-ice or barrier-ice was visible from aloft.

At 6 a.m. a sounding was made in 66° 1′ S., 111° 19′ E., getting a glacial mud bottom at 184 fathoms. Adelie Penguins were observed resting on drift-ice while Killer and Finner Whales were sighted. Captain Davis here remarked: "The former (1912 cruise) position of the barrier (shelf-ice) has now been completely sailed over with no sign of it to be seen." At 7 a.m. scattered drift-ice was entered. A sounding at 8 a.m. in 66° 11′ S., 144° 19′ E., found bottom at 224 fathoms, but the bottom sample was lost owing to the wire carrying away. A course was now laid for Cape Denison, but by 8.30 a.m. the drift-ice was so thick that the vessel was headed to the north-west.

A sounding at 10 a.m. in 66° 12′ S., 143° 59′ E., found a hard bottom at 230 fathoms. Finner Whales and Penguins were about the ship during the morning. Noon observed position: 66° 14′ S., 143° 37′ E. At 1 p.m. in 66° 16½′ S., 143° 28′ E., a sounding was made reaching bottom at 320 fathoms. The observations record an easterly wind freshening rapidly and the ship passing through heavy drifting floes. An Emperor Penguin was observed resting on a piece of floe-ice. During the afternoon a strong east-south-east wind prevailed with snow and sleet squalls. Groups of Adelie Penguins on ice rafts passed by at intervals. Land was sighted from the crow's nest at 7.30 p.m. At 8 p.m. the ship had reached open water south of the drift-ice. By this time a southerly squally gale was blowing with considerable south-east sea and swell; the sky was overcast at 9 p.m. with the land plainly visible to the southward. At 10.30 p.m. the vessel was arriving under the lee of the land and making towards the Main Base at Cape Denison; the wind was then less violent but more squally.

January 13th.—In the very early morning hours Captain Davis recorded: "Approaching the Main Base, taking continuous soundings; no bottom at 50 fathoms outside the Mackellar Islets. On passing close to the westward of the Islets, depths of 20 to 30 fathoms were met with, then no bottom at 40 fathoms until right up close to the mainland where the anchor was dropped, where it shelves up rapidly. As the ship got closer to the land, the wind dropped almost to a calm with frequent fierce squalls lasting about a minute; in these squalls there were observed a number of little cyclones of flying scud, turning round very rapidly anti-clockwise and covering an area of perhaps 7 to 8 yards. There is a good deal more bare rock visible this year than last and, on approaching the land, deep "sastrugi" were plainly visible on the higher slopes.

"1.50 a.m.: dropped the starboard anchor in 25 fathoms and paid out cable to 90 fathoms. At 6 a.m. a very fierce squall struck the ship and the relieving tackle on the anchor parted, allowing the chain to run out to the end, when the end lashing also parted, so the anchor and chain were both lost.

"The port anchor was then got out and the vessel steamed back to a position about ½ mile to westward of the former anchorage. There anchor was dropped in 10 fathoms. During the morning fierce gales of wind periodically blew off the land with almost calm intervals. During one of these latter the vessel swung around and drifted in to the full length of the anchor chain towards the ice cliffs. At 300 ft. from the cliffs the depth was 17½ fathoms and at 100 ft. from the cliff 5 fathoms.

"At 2.20 p.m. the motor launch left for the shore to contact with the shore party and deliver mail, returning to the ship at 3.55 p.m. Two other trips ashore were made later in the day, taking fresh food and bringing off cases containing scientific collections."

RELIEVING OPERATIONS AT THE MAIN BASE.

January 14th.—At anchor. No communication with the shore, for a gale from the south-south-east continued all day.

January 15th.—After 6 a.m. the gale subsided. The launch went ashore at 8 a.m., returning at 9 a.m. with cases of specimens. At 3.45 p.m. the mate and two A.B.'s went ashore to assist the shore party to stay the wireless mast; they returned at 8.30 p.m.

January 16th.—Wind prevented communication with the shore during the morning. Large masses of ice broke from the cliffs and drifted out to sea with the wind. At 4.30 p.m. a sledge party was observed coming down the land-ice slopes, returning to the Base; later they were found to be Madigan's party (Madigan, McLean and Correll). At 5.30 p.m. the weather allowed one trip of the launch to the shore for the purpose of bringing off surplus stores and ice for replenishing the fresh-water tanks.

January 17th.—Squally weather, but several trips to the shore were made in the motor launch. As there were still two sledge parties missing and overdue, Captain Davis sent ashore for Madigan and Bage, who came aboard for a consultation as to the prospects and the best action to be taken under the circumstances.

My instructions to all sledging parties had been to return to the Base Station by January 15th. Also in a letter of instructions to Captain Davis left at the Main Base for handing to him on arrival, I had mentioned January 15th as the date at which all sledge parties were to be returned, and anticipated embarking immediately thereafter. In the event of my own party being delayed, Captain Davis was instructed to await my arrival, but failing my return by the end of January, he was to wait no longer because it would then be certain that some serious accident must have befallen my own party and further delay would endanger the relief of our Western Base Party under Wild. It was also provided that should my own party fail to return before the *Aurora* should have to depart west to relieve Wild's men, Captain Davis was to leave a small party in occupation at Cape Denison, who would maintain the Station for a second year and make such search for the missing party as was deemed practicable.

The result of the consultation on board the *Aurora* on January 17th was a decision to take immediate steps to prepare the Cape Denison Station for a second year's occupation should such be necessary. It was also decided to rebuild the wireless masts, in order to secure greater height; thus it was hoped that wireless communication which had never been established during the first year of occupation, could be effected and maintained should a second year's occupation be found necessary.

The dogs were transferred to the shore. Thenceforth for some days the Mate with some of the sailors went ashore each day directing and assisting in the re-erection of the wireless masts which had been blown down by the hurricanes of the last winter.

January 18th.—At 1 a.m. Bickerton's Western Sledging Party returned to the Base. A strong south-south-east wind moderated at 9 a.m., after which communication was maintained with the shore during the day.

Serial temperatures between the surface and bottom were taken from the *Aurora*. In the evening some time was spent dragging for the lost anchor and chain.

January 19th.—At anchor. From midnight to 10 a.m. a strong south-south-east wind prevailed, but only light breezes during the rest of the day. Captain Davis spent most of the time endeavouring to pick up the lost anchor and chain. The ship's port anchor and a kedge anchor were used in these attempts to locate and engage the lost cable, but without success. In this work the uneven rocky bottom was responsible for breaking a fluke off the kedge anchor and for breaking the drum of the windlass used for trawling and raising the anchors.

January 20th.—At anchor. A strong south-south-east wind again set in from midnight till 10 a.m., falling off thereafter. At 1 p.m. four of the Land Party men set out inland to recover the motor sledge which had accompanied the Western Sledge Party (Bickerton's) and had broken down 10 miles from the Base. They returned at 10 p.m. with the motor sledge and reported having seen nothing of my own party which was now the only field party not returned to the Base.

January 21st.—At anchor. The south-south-east wind again prevailed until about 10 a.m., when it calmed down. Communication was then maintained with the shore for the rest of the day.

January 22nd.—At anchor. The usual strong south-south-east wind continued during early morning hours, moderating at 10 a.m. Unusually high and low tides were recorded. One of the stranded bergs in the bay floated out to sea during the night. The tide was so low in the morning that the motor-boat was unable to get alongside the ice landing until 3 p.m. Barometer: 29·35 in. At 11 p.m. several icebergs were seen to be drifting into the bay.

January 23rd.—At anchor. The south-easterly night breeze was more energetic than usual and continued till 4 p.m. at which time it had moderated sufficiently for the launch to contact with the shore. Drift snow was seen flying over the land-ice. At 11.30 a.m. a party from the Base Station set out to make a short search inland for any trace of the missing party.

January 24th.—At anchor. The weather remained good until 3 p.m., when all further communication with the shore was cut off by a rising south-south-east gale. At 12.30 p.m. the search party returned, having found the landscape at 10 miles inland blotted out by dense drifting snow. A full gale from the south-south-east was in force by midnight.

January 25th.—At anchor. Furious squalls. Air thick with drifting snow and spray. At 9 a.m. the weather moderated a little and another search party (McLean, Hurley and Hodgeman) set out from the Base Station. At noon a squally wind of full gale force was blowing, but by 2.45 p.m. had moderated enough for Captain Davis, Madigan and the Chief Engineer to go ashore to make final arrangements for the continuance of occupation of the land station through another year, should the missing party not return: a possibility that now appeared a probability. Captain Davis had already selected Madigan to be in command of such a party should it be required. The wireless operator, Jeffryes, who had come down with the ship, was anxious to spend a season in Antarctica and was selected to remain as wireless operator. From other volunteers, Captain Davis had selected Bickerton, Bage, McLean and Hodgeman.

By 4.30 p.m. the gale had returned and the launch was unable to get back to the ship, marooning Captain Davis and Chief Engineer Gillies ashore. At 8 p.m. during a squall of hurricane violence the anchor cable parted at the 60-fathom shackle. Chief Officer Fletcher stood the vessel out to sea and cruised off and on throughout the night in the face of a strong south-south-east gale.

January 26th.—By 6 a.m. the weather had moderated considerably and the ship was brought in towards the anchorage. Already the spare bower anchor had been bent on to the remaining 60 fathoms of chain. At 6.45 a.m. this new anchor was dropped in the same spot as previously occupied. The gale continued but moderated considerably about 11 a.m., when Captain Davis and Gillies came off in the launch. No further communication with the shore was possible during the day. At 9 p.m. a slight northerly swell was noted and icebergs were observed setting into the bay against the wind.

January 27th.—At anchor. A violent gale continued through the early morning hours, moderating after 6.30 a.m. The motor launch was lowered at 8 a.m. and all hands kept busy taking food stores ashore and sufficient coal to maintain the station for another year. At 11.20 a.m. a sudden fierce squall from the south-south-east caused the anchor cable to part near the anchor shackle, leaving the ship with three lengths of cable and two bits, making rather over 60 fathoms in all, and with no other anchor excepting one kedge. Captain Davis got the ship under way and stood off awaiting better weather. By 4 p.m. the wind had dropped to a light north-easterly with some snow and occasional fierce squalls.

January 28th.—The day opened with light south-south-easterly weather. The ship steamed into the anchorage. The kedge anchor was bent on to the cable and at 8.10 a.m. was let go in 20 fathoms; however, it dragged until 8.50 a.m. when it gripped with 58 fathoms of cable out. Several trips with stores were made to the shore. At 10 a.m. the anchor commenced dragging; it was heaved up and one fluke was found to have been broken off. At 3.50 p.m. the launch was taken ashore where it was to remain whilst the ship was engaged upon a cruise along the coast to the east to make a search for the missing party. The weather remained good during the rest of the day. The ship was allowed to drift in Commonwealth Bay during the night.

January 29th.—A moderate south-south-east gale blowing; clear sky gradually becoming overcast as the day progressed. At 7 a.m. the ship was got under way and proceeded eastward from Cape Denison for the purpose of examining the coast for traces of the missing sledge party. This search was in accordance with instructions left by me for Captain Davis in the event of my party not returning to Winter Quarters according to schedule.

During this and ensuing days the Dutch artist, van der Gracht, made a valuable series of coloured crayon drawings, faithfully recording the detail of the coastal cliffs.

Noon position: 66° 53′ S., 143° 8′ E. The ship steamed along the coast during the afternoon, travelling at various speeds, and making various courses, passing numbers of islands and taking numbers of soundings varying from 20 fathoms upwards. Throughout the voyage a sharp lookout was kept for a

possible party on the shore. At 11 p.m. the ship arrived off the western point of a bay bounded on its eastern side by the shelf-ice tongue subsequently named after Dr. Mertz—the Mertz Glacier Tongue. Some Penguins and numbers of Antarctic and Snow Petrels were observed during the day.

January 30th.—A course was made across the bay—Buchanan Bay. The shelf-ice of the glacier tongue was reached at 3.30 a.m., when the ship was directed along it to the south-south-west. After 4 a.m. there were occasional snow squalls. A sharp lookout from aloft was kept for signs of the missing party, and detonators were fired at intervals to attract attention.

The noon position was about 67° 8′S. and 144° 45′E., located close to the ice wall; a sounding gave the depths as 340 fathoms on a hard bottom. At 1.30 p.m. the head of the bay was reached without observing any signs of the missing party. The ship was then turned about and steamed to the north-north-east along the ice wall, arriving at the northern tip of the Mertz Glacier Tongue at 11 p.m., when further progress to the east and north was blocked by heavy pack-ice.

January 31st.—The ship steamed back to the south-south-west along the ice wall until 7.30 a.m. Then Captain Davis decided to return to Cape Denison; accordingly a course was set to the west at full speed. A fresh to strong south-east gale continued to blow all day long. At 8 p.m. the vicinity of Winter Quarters at Cape Denison was reached, but the wireless mast still displayed no flag, which was the signal to be flown if the missing party had returned. Having no anchors left, the vessel spent the evening hours steaming slowly to the east and back along the coast.

February 1st.—The ship arrived back off Winter Quarters at 8 a.m., but members of the ship's party were unable to get on shore all the morning owing to the strength of the wind. So the day was spent standing in towards the coast in the face of a strong south-south-east gale.

February 2nd.—The vessel continued to steam to and fro from the anchorage waiting for the wind to moderate. By noon a full gale was blowing, with a high sea, and the air became quite thick with drifting snow and spray.

February 3rd.—A violent gale continued to rage all day, with very fierce squalls at times. The *Aurora* still continued breasting the seas off Cape Denison.

February 4th.—A terrific gale with high seas was now in force. In order to maintain her position the ship stood into the seas with engines at full speed (Plate XXV).

February 5th.—A strong gale still in progress with the barometer at 28·77 inches; the air temperature remained steady at about 25° F. The ship encased in ice still continued steaming into the wind.

February 6th.—The gale had now reached a furious pitch, with terrific squalls and a high sea. Air temperature was now 23° F. and barometer 28·77 inches. Captain Davis had the greatest difficulty in maintaining the ship close under the coast.

February 7th.—The strong gale continued with terrific squalls. The ship was maintained as close as possible under lee of the land. Visibility improved and thick snow drift could be discerned over the land. By 11 p.m. lulls in the force of the wind became frequent.

February 8th.—The weather now began to improve rapidly; squalls descending from the ice-cap became less frequent and less violent. By 9 a.m. the wind had dropped to a gentle breeze. Captain Davis hoisted the ensign for the launch to come off to the ship. During all this time it had been secured ashore. By 10 a.m. the launch was alongside with all the gear to be embarked. It was then run ashore with the last of the stores to be landed for maintenance of the shore station. Then with farewells to those remaining for a second year, the launch departed from the Boat Harbour, joined the ship at 11 a.m., and was hoisted aboard. Captain Davis then headed the *Aurora* to the north-west at full speed, intent on reaching Queen Mary Land for the relief of Wild's party before the close of the season.

At noon as the ship steamed north, the sky was cloudless and almost a calm prevailed. At 8.10 p.m., Hannam, who had installed on the *Aurora* a wireless receiving set, picked up a message despatched from the Cape Denison station to the effect that Dr. Mawson, the sole survivor of the missing sledge party, had arrived at the Base Station and requested Captain Davis to return to Cape Denison for the relief of the party.*

On receipt of the message Captain Davis immediately turned the ship about and hastened back to Cape Denison. Unfortunately, a southerly wind had arisen and snow began to fall from a heavily overcast sky.

February 9th.—Captain Davis's log records that by 8 a.m. the ship was approaching Cape Denison, in the face of a steadily increasing strong southerly breeze. By noon, a fresh south-south-east gale was blowing under a heavily overcast sky. The pilot jack was observed flying from the wireless mast ashore. At 12.30 p.m. the ship stood off the Base Station, signalling for instructions, but no response† was received from the shore party.

The ship thereafter standing well out in the bay steamed to and fro, hoping for moderation of the wind so that contact could be made with the shore.

That evening a fresh south by east gale was blowing. Past experience of the weather at Cape Denison indicated that it might continue for days on end before there should be an opportunity for the shore party to come off to the ship. In view of this prospect of prolonged delay, Captain Davis discussed the situation with the more responsible members of those on board. It was then and there agreed that the emergency demanded abandonment of further efforts to pick up those still at the Main Base, as they had adequate supplies for a second year, and that all efforts should be concentrated on relieving the Western Base Party. Accordingly, at 6.30 p.m. the ship was once more headed north (Plate XXVI).

COMMONWEALTH BAY TO THE WESTERN BASE STATION.

February 10th.—At 4 a.m. the vessel was passing numbers of bergs and a little drift-ice. Half an hour later heavy pack lay ahead and to the westward: the ship's course was altered to the north-east, along the eastern edge of it. Blue Whales, Snow Petrels and seals were seen about.

At 9.30 a.m. the pack was observed to be trending to east-north-east. At 10 a.m. the ship was in 65° 59½′ S. and 142° 53′ E. By 10.5 a.m. they pushed into the pack making to the north. At 11 a.m. Finner Whales were observed spouting in open water about 1½ miles ahead of the ship.

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* I had instructed Jeffryes, the wireless operator of the Base Party, to send out the above message in the hope that it would be picked up on board the *Aurora*. Late in the evening, as the southerly wind returned, the initial despatch was followed by a later message, namely that further attempts to relieve our party at the Cape Denison station were subject to the consideration that the delay occasioned thereby should not unduly endanger the prospects of relieving the Western Base Party under Wild. We of the shore party learned later that this qualifying message was not picked up by the ship.

It will be noted that at that time I was unaware of the vagaries of the pack-ice in the region, where Captain Davis had landed Wild's party the previous year. I was loath to recall the vessel to Cape Denison unless Captain Davis, who had had experience of navigating in that locality, should be of the opinion that some further delay would not gravely endanger the prospect of relieving Wild's party.

As a matter of fact, the *Aurora* had already stood by at Cape Denison awaiting my return for more than a week after the expiration of the date which, in my instructions (left at Winter Quarters for Captain Davis to act upon in the eventuality of my non-return), I had mentioned as the limiting date for his departure west to succour our comrades of the Western Base Party. Also on arrival at the Hut, I had learnt of Captain Davis's anxiety in regard to the relief of the Western Base Party; he had indicated that almost insurmountable difficulties might be met with in pushing through the pack to the relief of the station. Furthermore, the station had insufficient food stocks for a second year. Thus it was that I left to him the decision as to whether further delay was compatible with the safety of Wild's party.—D.M.

†Wireless messages sent from the shore were evidently not received.

Noon position: 65° 53′ S. and 142° 48′ E. Weather overcast with a light east-by-south breeze. At 12.50 p.m. the ship cleared the heavy pack. Numbers of whales, including Finners, Humpbacks and Killers, were observed spouting in the looser pack. At 1.15 p.m. the ship had reached open water and was making true north at full speed; however, a very strong ice-blink was then in view to the north-west. Shortly after this Davis recorded as follows:—

"2 p.m.: observed under the ice-blink a tremendous berg stretching right across the horizon from under north-west around to north-by-west. 3.30 p.m.: the southern end of the berg abeam. This is evidently what was taken for a 'barrier' ice formation last year (met on Jan. 3rd, 1912) but which we missed when cruising south over the same ground this year; it has drifted some 25 miles west-north-west of its former position; we are now on the western side of it, which completes the circle showing it to be a berg of many miles in size."

At 5.30 p.m. snow and mist set in. By 9.30 p.m. the northern end of the "barrier" berg was abeam, thus making the eastern side some 35 miles in length. Thereafter the ship was headed around more to the west.

February 11th.—The ship continued north-west past scattered bergs. 3 a.m. (daylight already): open water extended all around but a strong blink appeared over the "barrier" berg to the south-west. The ship's course was now west-north-west (true). 7.30 a.m.: the course was altered to west (true), heading into a south-west gale. Noon observed position: 64° 23′ S., 140° 53′ E.

Occasional bergs were passed. Sooty Albatrosses were about the ship all day long; also two Wandering Albatrosses were in view for a time. Between 10 p.m. and midnight the aurora polaris was visible on the northern horizon. Air temperature 31°F. at midnight.

February 12th.—Steaming west into a heavy swell from the west which gradually changed to north-west as the day progressed. Some Sooty Albatrosses were about the ship most of the day. Noon observed position: 64° 21′ S., 138° 39′ E. Several Mollymawks were in view during the afternoon. Occasional small bergs were lying southwards of the ship's course; practically none were seen to the north. Snow fell during the evening.

February 13th. The sky cleared in patches during the early morning. 1 a.m.: a fine auroral band was visible stretching right across the sky from north-west to south-east. 2.30 a.m.: Antarctic Petrels, Wandering Albatrosses and Mollymawks were about, also a whale was seen spouting.

Noon observed position: 64° 31½′ S., 135° 35′ E. Pack-ice was observed from aloft bearing about one point on the port bow; the ship's course was then altered to true west in order to clear the pack. The vessel proceeded west at a distance of about 3 miles to the north of the margin of the pack-ice. 3.45 p.m.: a whale reported spouting nearby. A fresh south-west by west breeze continued blowing during most of the day, accompanied by a westerly swell.

At 5 p.m. the pack edge trended slightly to the northward until 6.30 p.m., when the ship was apparently alongside the northern limit of the pack for, from aloft, the margin could be seen trending away to the south-south-west. A long line of bergs were to be seen in the pack to the south. To the north no pack was to be seen, but occasional icebergs were passed. Snow Petrels and Blue Billies were about in numbers during the late afternoon and evening.

February 14th.—3.15 a.m.: no pack was visible from aloft, but there was a slight blink to the south-west and scattered bergs were passed. 8 a.m.: no ice had been seen for several hours. A piece of floating kelp was passed. Noon observed position: 64° 33½′ S. and 131° 50′ E. Light south-south-west airs were recorded with a fine, clear and cloudless sky and a slight westerly swell. Blue Billies, Antarctic Petrels, Black-fish and Killer Whales were about during the morning.

At 1.30 p.m. the wind veered to the east and freshened. During the afternoon Cape Pigeons, Antarctic Petrels, Sooty and Wandering Albatrosses and large flocks of a black petrel type of bird (apparently Cape Hens) were observed. A large school of Blue Whales were in the vicinity of the ship for a time with a

flock of the black petrels hanging around them. 3.30 p.m.: a light breeze came in from east-by-south; the lower and upper topsails were set. At 6 p.m. Blue Whales were observed spouting all around the horizon; Cape Pigeons and Wilson Petrels were about. At midnight the ship was making about 8 knots to the westward before a strong easterly breeze. Occasional bergs were passed.

February 15th.—At 1.30 a.m. light snow began to fall from an overcast sky and the wind commenced to increase. 8 a.m.: the ship was rolling considerably to a high following sea; a fresh easterly gale was blowing accompanied by falling snow. Some sail was then taken in and speed reduced. Noon: dead reckoning position 64° 39′ S., 124° 52′ E. The ship passed to the south of one berg during the watch and occasional pieces of drift-ice were sighted. Dark coloured Petrels and Cape Pigeons were about, also whales occasionally spouting around the ship during the afternoon. At midnight a moderate gale was still blowing, now coming from the east-by-north, accompanied by continual falling snow. A high following sea caused the ship to roll heavily at times.

February 16th.—In the early morning hours the weather improved and additional sail was set; occasional snow squalls. At noon a strong breeze was blowing from east-by-north with considerable following sea; fine and clear weather, with cumulus clouds passing overhead. Two small icebergs were passed. The noon observed position was 64° 52′ S., 118° 8′ E.

During the afternoon a Wandering Albatross and a few dark petrels (Mutton Birds ?) were seen. At 1 p.m. the ship passed to the northward of a large berg, but no other ice was seen during the watch.

After 6 p.m. the sky became overcast and the weather generally dull and misty with falling snow. A fresh east-by-north breeze was blowing and the barometer stood at 28·77 inches. No ice came in sight during the evening watch.

February 17th.—At 3 a.m. the vessel was making west-by-north (true) at 7 knots and passed about ½ mile north of a berg. Wilson Petrels were reported about the ship at 4 a.m. Misty weather with frequent snow squalls prevailed later in the morning. Noon observed position: 64° 26½′ S., 111° 32′ E. The weather was then dull and overcast with continuous snow falling and an east-north-east breeze. No ice was seen during the forenoon watch. The weather cleared up considerably after noon. The ship passed south of two bergs during the afternoon; Antarctic Petrels and Cape Pigeons were reported. Several bergs were passed about 8 p.m.

February 18th.—A berg was sighted to the southward at 1.30 a.m. The weather was then improving, a breeze coming in gently from the east. At 4 a.m. a whale was spouting near the ship. The 8 a.m. record reports numbers of bergs in sight. By noon several icebergs only and no pack-ice were visible from aloft; the ship's observed position was then 64° 25′ S. and 105° 14′ E. Numbers of Blue Whales were in sight.

At 4 p.m. a fresh east-by-south breeze was recorded, the sky then being overcast, and passing snow squalls and mists were noted; Cape Pigeons and Antarctic Petrels were about, also some greyish birds with swallow tails (apparently Terns); Blue Whales were spouting nearby. Scattered bergs were passed during the afternoon and these became more frequent in the evening watch.

February 19th.—Fresh easterly weather continued. Numerous bergs were passed and many Antarctic Petrels, Silver-grey Petrels and Snow Petrels were seen about the ship during early morning. At 8.40 a.m. pack-ice was observed ahead and an ice-blink seen extending around to the north-east. Accordingly the ship's course, which had been slightly to the north of west, was altered to N 29° E. to clear the blink. At 10 a.m. the ship was skirting the pack (N 30° E.) and passing some very big bergs near the edge of the pack-ice. All sail was now clewed up and furled. Noon observed position: 63° 52½′ S. and 100° 6′ E.

The 12.30 a.m. record showed the pack-ice extending to the north-west-north. The margin of the pack was followed throughout the afternoon; numbers of bergs were passed; Blue Whales, Snow Petrels and Antarctic Petrels were observed. At 5 p.m. the pack was reported as trending to west-north-west. Large numbers of bergs were passed in the late evening; Blue Whales reported.

February 20th.—Between midnight and 3 a.m. Captain Davis stood the ship to the north-north-west with engines at slow; they were then passing through numbers of bergs. At 3 a.m. (daylight coming in) no pack was to be seen from aloft but a strong blink appeared to the southward and round as far as south-west-by-west. The course was altered to west (true).

Between 4 a.m. and 8 a.m. as no pack was in sight the course was gradually brought around to south-west. Large numbers of bergs were about all the time and Blue Whales spouted around the ship. At 8.50 a.m. the course was altered (south-west-by-south) to make the northern end of the "barrier" ice (Termination Tongue) met with in February, 1912. At 10 a.m. there was a very strong blink ahead. At 11.30 a.m. the ship arrived at the margin of pack-ice extending to the west. The sky was heavily overcast at noon, so that observations for position were not possible.

At 2.15 p.m. the ship entered the pack-ice at slow speed making a course towards a water-sky to the south-west. At 2.45 p.m. what was apparently the northern end of Termination Tongue was observed from aloft. By 3 p.m. the pack had become so dense and heavy that Captain Davis decided to return to the open water. At this time numbers of seals were in sight on the floating ice and both Snow Petrels and Antarctic Petrels were about in numbers.

At 4 p.m. an Emperor Penguin resting on a floe was passed. The vessel got clear of the pack at 4 p.m. and proceeded to the west-north-west along the ice margin. At 7.20 p.m. the engines were stopped and the ship allowed to drift; sky overcast and light snow falling.

February 21st.—At 3.30 a.m. with the coming of daylight the ship was got under way again, moving west and searching for a passage to the south; light east-south-east airs, and fine and clear. At 6 a.m. the ship ran into thick fog which continued till after 9 a.m. When the fog cleared the ship made south through thick drift-ice; numbers of Crab-eater Seals on the floes and Snow Petrels and Antarctic Petrels were about. Noon observed position: 63° 12′ S., 95° 9′ E.; the ship's course was altered to the southward through loose pack-ice. By 2 p.m. the pack was getting closer and the floes larger; numbers of Emperor Penguins and seals were in sight on the floes and in the water. At 4 p.m. the ship entered a lead of open water extending southward. At 7.50 p.m. they were passing between very large floes with leads of open water between them. Emperor Penguins were still in sight at 8 p.m. Auroral light was faintly visible to the northward at midnight.

February 22nd.—By 2 a.m. the floes were less packed; auroral lights visible to the southward. 4 a.m.: a fresh south-east breeze had sprung up but the weather remained fine; the ship was making south at full speed in open water belts between heavy floes. By 10 a.m. the weather was thick with falling snow; the ship was then continuing south between the floes. Noon observed position: 64° 29′ S., 95° 17′ E.

At 1 p.m. open water was reached with some scattered bergs (Plate XXVII, Fig. 1) and drift-ice about; the snow had ceased falling and the wind veered to the east; to the west there was a strong blink. At 4 p.m. bergs became more numerous. Blue Whales, seals and penguins were reported during the afternoon. By 5 p.m. the weather had become thicker again with snow squalls and a fresh east-south-east gale.

February 23rd.—No bergs were passed during the first watch. At 4.30 a.m. the Shackleton Shelf ice-barrier was sighted on the port bow, and by 8 a.m. the land to the southward was beginning to appear. At 11.10 a.m. a black flag on the cliff edge of the Shackleton Shelf came into view and at 11.15 a.m. a second flag was in sight. These had been erected by Wild's party to help the ship locate their winter quarters. At 11.20 a.m. the Western Base hut was observed abeam and the ship proceeded through broken floe towards it. The floe-ice (bay-ice) alongside the wall of the Shackleton Shelf was reached at 12.30 p.m. and ice anchors were run out.

Captain Davis found all was well at the Base, and all sledge parties returned and ready to embark (Plate XXVII, Fig. 2). The afternoon and evening was occupied getting off stores and gear; also a quantity of ice was taken on board for fresh-water supply. At 9 p.m. embarkation having been completed, the ship cast off and proceeded north at full speed.

RETURN VOYAGE TO HOBART.

February 24th.—The passage north was through open water until 4.30 a.m. when scattered bergs were passed: thereafter numerous bergs and a considerable amount of drift-ice were passed until 3.50 p.m. when loose pack-ice was entered. Fresh easterly weather prevailed with the sky partly overcast. At 10.40 p.m. a steady fall of snow set in; the ship was then making northward through heavy drift-ice.

February 25th.—Open water was reached at 7 a.m.; thereafter they proceeded at full speed ahead, passing between numbers of scattered bergs. At 11.20 a.m. a large stained berg was abeam. The noon position by dead reckoning was 63° 16′ S. and 94° 39′ E. At 1.30 p.m. another earth-stained berg was passed; the ship continued making true north at 6 knots; no birds were in sight. 8 p.m.: bergs were still very numerous and frequent light falls of snow.

February 26th.—They continued making north at full speed amongst numerous bergs. At 8 a.m. there was a fresh south-west-by-south breeze blowing and still great numbers of bergs about. Noon observed position was 60° 36′ S., 95° 30′ E. Snow showers fell at intervals until late in the afternoon. Albatrosses, Blue Billies, Wilson Petrels and Cape Hens were observed. The icebergs became fewer during the later afternoon.

February 27th.—The ship's course was now set to the north-east with over 2,000 miles to go to reach Tasmania. At 1 a.m. very fine auroral lights were observed above a heavy cloud bank to the south and south-west, extending to the zenith and fading away on the north-eastern horizon; the curtain formation visible in the zenith exhibited beautiful pale green and pink colours.

Several large Albatrosses were in sight during the morning. Occasional bergs were still being sighted. Noon observed position was 58° 14½′ S., 96° 59′ E. A sounding found bottom at 2,330 fathoms, but the sample and driver were lost.

4 p.m.: Blue Billies were in sight; the surface sea-water temperature was observed to have risen markedly to 37·4° F. (about 2° F. in last 12 hours); only one berg was now to be seen. The 8 p.m. record notes that occasional bergs were still being passed. Between 10 p.m. and midnight a few bergs were passed and auroral lights seen to the southward. The weather conditions at midnight were fine and clear with a gentle east-north-east breeze; sea smooth.

February 28th.—During the midnight to 4 a.m. watch three bergs were passed. The auroral lights continued in the south until 3 a.m. The noon report states that no berg had been seen since 4 a.m. The observed position was 56° 16′ S., 98° 56′ E. A sounding found the depth to be 2,330 fathoms but the sample and driver were lost owing to a kink in the wire. During the afternoon Cape Hens, Blue Billies and Albatrosses were in sight. At 7.45 p.m. a small piece of ice was passed; this was the last seen on the voyage back to Hobart. At midnight the ship was rolling and pitching to a northerly swell and the barometer falling rapidly.

March 1st.—The ship was making north-north-east (true). There was a moderate north-by-west breeze; sky overcast, with snow and rain falling at intervals. The wind and sea increased through the forenoon. Noon observed position: 54° 37′ S., 100° 20′ E. By 4 p.m. a moderate to fresh westerly gale was blowing. Albatrosses, Blue Billies and Cape Hens were observed.

March 2nd.—A squally west-south-west gale with rain and a high following sea. Porpoises were about the ship during the forenoon. The noon observed position was 53° 51′ S., 105° 38′ E.; at this time it was blowing a fresh gale from the south-east. Cape Hens and Albatrosses were about the ship during the afternoon.

By 8 p.m. the wind had backed into the north-west. At midnight the barometer had dropped to 8·92 inches: the air temperature was then 35° F. and the surface water temperature 39° F.

March 3rd.—The wind continued backing to north-by-east but later veered to north-west-west with much rain. Noon observed position : 52° 52½′ S., 110° 11′ E.; the ship rolling heavily to a high north-west sea; barometer 29·64 inches. At 2 p.m. the barometer started to rise rapidly. In the late evening hail squalls were encountered, and a fresh west-south-west gale was in progress, with high and increasing sea. Auroral lights were visible to the southward between 9 p.m. and 11 p.m.

March 4th.—During the early morning hours auroral lights were observed at times over a cloud-bank to the southward. The noon observed position was 52° 15′ S., 115° 40′ E. The ship continued forging ahead in a moderate westerly gale with a high following sea. Albatrosses, Cape Hens, Wilson Petrels and Blue Billies were about. Occasional snow squalls were encountered throughout the day. Faint auroral lights to the southward reported between 9 p.m. and midnight.

March 5th.—The wind moderated considerably during the early morning hours. Noon observed position : 51° 12′ S., 120° 32′ E. The wind continued to fall off during the afternoon. 2.45 p.m.: a piece of kelp floated past. By midnight the wind had fallen to a light north-west breeze. Faint auroral lights were visible at times during the evening.

March 6th.—A piece of kelp floated by at 8.45 a.m. Mollymawks, Cape Hens and Blue Billies were reported. Noon: the observed position was 49° 31′ S., 123° 39′ E. The sea had become quite smooth by midnight.

March 7th.—4 a.m.: overcast sky and a light misty rain falling; the barometer stood at 30·6 inches; Sooties and Mollymawks were about. Noon: the observed position was 48° 16′ S., 127° 47′ E. Occasional rain squalls passed over during the evening. The surface water temperature had reached 50° F. by midnight.

March 8th.—4 a.m.: north-west-by-north breeze and misty rain at times; barometer 30·47 inches, but starting to fall for the first time for six days. Wandering Albatrosses, Mollymawks and Mother Carey's Chickens were about. Noon position : 47° 17′ S., 131° 49′ E.

March 9th.—At 11.20 a.m. floating kelp was passed. Albatrosses and Blue Billies were reported. Noon position : 46° 8′ S., 135° 15′ E. 8 p.m.: weather dull and overcast; variable light airs and a smooth sea; floating kelp was seen. Porpoises were about the ship during the evening.

March 10th.—At 3 a.m. a light east-south-east breeze sprang up; the sea-water at this time was highly phosphorescent. A Wandering Albatross kept in touch with the vessel in the forenoon. Noon: the observed position was 45° 14½′ S., 138° 48′ E.

March 11th.—The wind veered to north-east. Noon : the observed position was 45° 6½′ S., 140° 40′ E. Wandering Albatrosses and Blue Billies were reported. In the evening the wind veered to the north and strengthened considerably.

March 12th.—The vessel was now making east with a fresh beam wind from the north and considerable sea; occasional rain squalls passed by. Noon : the observed position was 44° 57½′ S., 142° 13′ E. Wandering Albatrosses reported. Towards midnight the wind moderated.

March 13th.—The voyage to the east was continued into a strong north-north-east breeze; occasional rain showers. Noon: the observed position was 44° 35′ S., 144° 32′ E. At 8.5 p.m. the Maatsuyker light was in sight. The water temperature at midnight had risen to 57° F.

March 14th.—At 7.15 a.m. the ship entered Port Esperance to land Mr. Eitel, and then continued north. A fresh south-south-west breeze and heavy rain were experienced in the afternoon. 8 p.m.: off Cape Frederick Henry. At midnight auroral lights were faintly visible to the south.

March 15th.—4 a.m.: off the Iron Pot light. 7 a.m.: made fast alongside Princes Wharf, Hobart. All members of the shore parties, also Captain James Davis and Mr. Waterschoot van der Gracht, were landed. The ship was then laid up for some months.

Until September 1st, only a couple of hands were maintained on the *Aurora*. During this time Captain John K. Davis visited England on behalf of the Expedition funds. In Australia Professors T. W. E. David, of Sydney and David Orme Masson, of Melbourne, chief members of the Expedition Committee, pressed the case of the Expedition and secured additional help from the Commonwealth Government towards the cost of a third Antarctic cruise, to relieve the party still in occupation at Cape Denison and the party at Macquarie Island. Through the medium of wireless communication which had been established between Cape Denison and Macquarie Island in February, I had explained the position to Ainsworth's party and they all volunteered to maintain the Island station for another year. As their supplies were running short, Mr. Eitel (Expedition secretary) arranged with the sealer, Hatch, to take stores to Ainsworth's party. Hatch was, at the time of the return of the *Aurora*, fitting out a vessel to visit the Island in order to bring back a cargo of oil and to relieve his sealing gang. However, after the *Aurora* had been laid up for the winter, Hatch became involved in financial difficulties. His vessel was eventually despatched, with necessary stores for our party, at the expense of the Expedition fund. However, on account of heavy weather, it failed to reach Macquarie Island, arriving in New Zealand in a battered condition. At this time, Captain Davis was away in England. The failure of Hatch's vessel to reach the Island resulted in shortage of food on the Island. Fortunately, at the eleventh hour the New Zealand Government came to the rescue, despatching their lighthouse steamer, *Tutanekai*, with stores for the Expedition party and for the sealers.

THIRD ANTARCTIC VOYAGE

SOUTHWARD BOUND.

On September 1st, having returned from England, Captain Davis manned the *Aurora* with a skeleton crew. The vessel departed from Hobart on September 10th and arrived in Melbourne on the 14th. There the ship was overhauled and docked. On September 17th, J. H. Blair was signed on as Chief Officer. As on the earlier voyages, the Second and Third Officers were respectively P. Gray and C. P. De la Motte. Chief Engineer F. Gillies continued his association with the Expedition during the entire period. On November 10th, the *Aurora* left Melbourne for Hobart in preparation for the third and last Antarctic cruise. She was unfortunate in meeting a severe gale and did not reach Hobart, until November 16th. November 17th and 18th were spent at the Queen's Pier taking stores on board and otherwise preparing for the voyage south.

Hurley, Hunter and Correll of the Main Base Party during 1912, rejoined the ship on this final voyage. Hurley was anxious for further opportunities of photographing the animal life and land features of the far south. Hunter was as keen as ever to extend his biological observations. Correll was ready to assist in any way possible and came equipped with a new colour photographic process hoping to secure faithful colour renderings of Antarctic scenes.

November 19th.—Captain Davis cast off from the Queen's Pier at 10.25 a.m. and proceeded down stream heading to the first objective, Macquarie Island. The programme provided for the picking up of the Macquarie Island Party by the ship on her way south; but this did not entail the abandonment of the meteorological station at the Island. By arrangement with H. A. Hunt, Commonwealth Meteorologist, the Government was to take over the Expedition Hut and equipment on Macquarie Island with the intention of maintaining it as an observational station to be manned by a staff of three men. The Commonwealth Government party, H. Power (meteorologist), F. J. Henderson (wireless) and J. Ferguson (general assistant), had joined the *Aurora* at Hobart.

November 20th.—During the morning hours numbers of porpoises were about the ship, also several Albatrosses and a number of Blue Billies and other birds were in evidence. The observed position at noon was 44° 54′ S. and 146° 47′ E.; there a sounding of 1,700 fathoms was made. Unfortunately, the wire parted on heaving in and the driver and bottom sample were lost.

Birds in considerable numbers, including Cape Pigeons, were in sight during the afternoon. The ship headed south making about six knots.

November 21st.—With falling barometer the wind increased to a moderate west-north-west gale. Cape Pigeons, Mother Carey's Chickens, Mollymawks and Wandering Albatrosses appeared during the day. The noon observed position was 47° 6′ S., 147° 16′ E. At 4.10 p.m. when in 47° 28′ S. and 147° 37′ E., a sounding was taken finding 640 fathoms on hard rock; thus the ship was over the Mill Rise.

November 22nd.—During the early morning hours the vessel rolled heavily to a long westerly swell. As the day progressed the weather improved, ending in a gentle southerly breeze. Quantities of floating kelp were passed during the morning. Though several Blue Billies were seen there was a noticeable absence of bird life during the morning.

At noon in 49° 9′ S., 148° 1′ E. a sounding gave bottom at 2,400 fathoms. In the afternoon only two Sooties and some Mollymawks were seen.

November 23rd.—The ship's course was still to the south (Plate XXXVIII., Fig. 1). Floating kelp passed by at intervals during the day. Numbers of Albatrosses and some Mother Carey's Chickens were seen during the morning. The noon observed position was 50° 25′ S. and 148° 1′ E. At 1 p.m. the ship was stopped for sounding, and a vertical series of water temperatures and samples obtained: depth, 2,470 fathoms. Foggy weather was met from 8 a.m. onwards. The temperature of the surface sea-water was observed to be falling rapidly and reached 45° F. at midnight. At 8 p.m. the sea-water was noticeably phosphorescent.

November 24*th.*—Still making south (true) at five knots in calm weather. Penguins were heard around the ship at 4 a.m. Albatrosses and other birds were in sight. A sounding at noon in 52° 18′ S., 148° 10′ E. gave 2,180 fathoms; the driver and bottom sample were lost owing to the wire parting. At 7 p.m. a large quantity of kelp was passed.

November 25*th.*—Auroral lights were visible at intervals between midnight and dawn. Fine clear weather prevailed with gentle east-north-east breezes. Between 4 a.m. and 8 a.m. the sea surface temperature dropped 6·5° F. indicating a meeting with Antarctic surface waters. Numbers of Albatrosses and Blue Billies were in sight. At 9.15 a.m. the vessel was stopped in 54° 30′ S., 148° 13′ E. for sounding, finding bottom at 2,300 fathoms; some vertical serial temperatures and water samples were obtained with the Ekman reversing water-bottle.

At 11.20 a.m. the course, which had been southerly so far, was directed to the east to make Macquarie Island. The noon observed position was 54° 31′ S., 148° 18′ E. The surface water temperature at noon was now only 38·5° F. Misty rain developed in the evening.

November 26*th.*—The rain cleared off after 5 a.m. At noon the ship was stopped for sounding and temperature observations in 54° 35′ S., 151° 4′ E.; depth 2,220 fathoms. It was ascertained that the surface current was moving almost due east at the rate of 32 miles in 24 hours. Numbers of albatrosses followed the ship. The day ended with a moderate to fresh south-west-by-south breeze.

November 27*th.*—Floating kelp was passed at 5.30 a.m. Light snow squalls descended at intervals. At 11.30 a.m. the depth in 54° 28′S., 154° 29′E. was ascertained to be 2,340 fathoms. Numbers of Blue Billies and a few Albatrosses were about the ship during the day.

November 28*th.*—Penguins were noted in the first watch and floating kelp passed. The sea was then smooth and banks of fog about. At 7 a.m. a sounding in 54° 22′ S. and 157° 20′ E. gave bottom at 2,180 fathoms. Sounding again at 1 p.m. in 54° 22′ S. and 158° 0′ E. the bottom was found at 2,280 fathoms. At 2 p.m. Skua Gulls appeared about the ship. 3.30 p.m. a whale was observed spouting ahead. The north point of Macquarie Island was sighted at 4.20 p.m. and anchor dropped in 12 fathoms in Hasselborough Bay at 8.20 p.m. Misty rain showers and occasional falls of snow were encountered.

RELIEF OF THE MACQUARIE ISLAND PARTY.

November 29*th* was spent at anchor in Hasselborough Bay. At 6 a.m. a whale-boat was lowered and a start made to land stores for the Commonwealth Government party's occupation. The weather became less favourable as the day advanced.

November 30*th.*—At anchor. Very squally weather prevailed with a fresh south-east breeze. Loading and unloading operations were suspended on account of rough sea. Fortunately the anchor held well without dragging.

December 1*st.*—At anchor. The south-south-easterly weather continued and no communication was made with the shore. As this anchorage had proved thoroughly satisfactory, Captain Davis spent some time in fixing it exactly on the chart. The latitude of the anchorage was found to be 54° 30′ 36″ S., the longitude 158° 58′ E. At midnight the air temperature was 36·4° F. and the surface sea-water temperature 39·7° F.

December 2*nd.*—The south-easterly weather calmed somewhat during the day, to be replaced by light north-north-westerly breezes late in the evening. At 6 a.m. the whale-boat was lowered and communication with the shore maintained all day long. The landing of the Commonwealth Government meteorological party and all their gear was completed, also the Expedition collections were brought off to the ship. The sea-water temperature at midnight was reported as 40° F.

December 3rd.—The weather remained generally good, with a light north-north-westerly breeze. At 9 a.m. the anchor was weighed and the day spent sounding off the west coast and south end of the Island. At 11.40 a.m. whales were reported spouting around the ship. At 6.45 p.m. the anchor was dropped in 14 fathoms of water in Lusitania Bay. The sea-water temperature at midnight was 40° F.

December 4th.—At anchor off Lusitania Bay. Ashore were a number of barrels packed with scientific specimens collected by the Island party. These had to be taken on board. During the morning the sea was breaking so heavily on the beach that the whale-boat could not collect them, but by 4.30 p.m. the surf had moderated sufficiently to permit the barrels being retrieved. A couple of trips were made, all being on board by 7 p.m. During the day Hunter managed to secure several hauls of bottom life in the hand dredge.

December 5th.—The wind went into the north-north-east and drizzling rain continued all night. By 6 a.m. the wind was quite strong and a moderate sea running. The anchor was weighed and the vessel proceeded north towards North-East Bay, soundings being taken at intervals on the way. At 1.45 p.m. the anchor was dropped in North-East Bay. The whale-boat was then lowered and a final visit made to the meteorological party ashore. At 3.30 p.m. the whale-boat returned and was hoisted aboard. At 4 p.m. the vessel was got under way, and several lines of soundings were then run around the north end of the Island until 6.15 p.m. when a course, S. 48° W. (true), was set for Cape Denison.

HEADING TOWARDS THE MAIN BASE.

Fresh northerly winds continued all day during December 6th. The ship made to the south-south-west at six knots. At 8.45 a.m. when in 55° 43½′ S., 157° 59′ E. a sounding was taken and bottom found at 2,420 fathoms. Floating kelp was passed several times during the day. The noon position was 55° 55′ S., 157° 48′ E. A strong easterly set was encountered amounting to about 10 nautical miles in 6 hours. Mollymawks and Prions (Blue Billies) were in numbers about the ship all day long.

December 7th.—Fresh north-west to west-by-north breezes continued all day; the ship rolling heavily at times. Occasional light rain showers and some snow were experienced. The surface sea-water temperature suddenly fell several degrees between 4 a.m. and 8 a.m. The noon observed position was 58° 6′ S. and 155° 55′ E. At 4 p.m. a sounding was taken in 58° 19½′ S., 155° 39′ E.; bottom at 2,000 fathoms. Prions, Mollymawks, Sooty Albatrosses and Storm Petrels followed the ship. The midnight surface sea-water temperature was 36° F.

December 8th.—A gentle west-north-west breeze during the early morning backed to the north-east later in the day and strengthened in the evening. Much floating kelp was passed during the day. The noon observed position was 59° 28½′ S., 154° 14′ E. At 1 p.m. in 59° 30½′ S., 154° 10′ E., a sounding was taken recording 1,560 fathoms. Numbers of birds accompanied the vessel during the day including Wandering Albatrosses, Mollymawks, Prions, Storm Petrels and Cape Pigeons. Steady rain set in during the evening.

December 9th.—Thick mist and light driving rain were encountered during the early morning, with a strong north-north-east breeze. Little bird life was to be observed during the early morning hours. The weather improved in the middle of the day. The noon position was 61° 55′ S., 151° 41′ E. Numbers of Wandering Albatrosses, Mollymawks, Prions and Cape Pigeons were about. A Finner Whale was sighted.

Thick mist settled down again over the seascape during the late afternoon and evening hours. At 7 p.m. several small pieces of ice were passed. Captain Davis found the directive force of the compass becoming very poor.

December 10th.—Considerable disturbance of the steering compass was noted between 2 a.m. and 2.30 a.m. Light to moderate northerly winds prevailed during most of the day; the sky remained overcast and misty with some snow falling. Numbers of Prions were about in the early morning, but later in the day only odd Prions and Cape Pigeons, together with Mollymawks were seen. At 4 p.m. the first Antarctic

Petrel of the voyage appeared. At 5.15 a.m. a sounding was made in 63° 33′ S., and 150° 29′ E.; depth 2,100 fathoms. At this time two icebergs, the first seen on the voyage, were in sight. Thereafter occasional small bergs were passed throughout the day. The noon position was 63° 52′ S., 150° E. Some drift-ice appeared during the evening hours.

December 11th.—The ship continued on its course at five knots through thick mist and continuous falling snow during the early morning hours; light north-easterly breezes. The drift-ice became heavier and denser (Plate XXVIII, Fig. 2). At 2 a.m. a line of pack-ice was met with; the ship skirted to the west of it. Snow Petrels and Antarctic Petrels were about and occasional seals were seen on the ice. The vessel passed through thick drift-ice all the morning. Adelie Penguins were observed on the ice and a Finner Whale appeared alongside the vessel. Noon position: 64° 56′ S., 147° 17′ E.

The ship proceeded at two knots through thick drift-ice during the afternoon. Several whales were observed spouting. Snow which had been continuous commenced to clear off at 2.30 p.m. Numbers of Snow Petrels and Antarctic Petrels, also some Wilson Petrels and Cape Pigeons and one Giant Petrel, were reported about the ship during the afternoon. Also an occasional Emperor Penguin and some Adelie Penguins were sighted on the ice. Late in the afternoon several Blue Whales appeared close to the ship. A large Sea-elephant was seen on the pack-ice. Clearer water was reached at 7 p.m. when the ship was able to proceed at full speed passing through loose drift-ice; very few icebergs were sighted. Some light snow fell late in the evening.

December 12th.—The ship continued making south-west through drift-ice. At 2.30 a.m. the drift-ice became denser and an ice-blink showed to the south-east. Great numbers of Emperor Penguins were observed on the floes. Whales were both near the ship and spouting on the horizon. At 5 a.m. the vessel was pushing through loose pack-ice, with one large berg and several smaller ones in sight. At 10 a.m. a gentle south-south-east breeze was recorded with light falling snow. At 11 a.m. large ice-floes were encountered, but at 11.30 a.m. open water was again reached. There were then comparatively few birds about.

The noon position was 66° 73′ S., 145° 15′ E. At 1 p.m. the snow took off and a strong ice-blink showed to the southward. At 2 p.m. land was in sight to the south. Some loose drift-ice was encountered until 3.30 p.m. when the sea was again clear except for occasional bergs. In the early afternoon Snow Petrels and Antarctic Petrels were about the ship, Adelie and Emperor Penguins and Weddell Seals were observed on the floes, and whales spouting on all sides. At 4.30 p.m. in 66° 25′ S., 144° 50′ E., a sounding of 250 fathoms was made; at that spot the Madigan Nunatak bore S. 35° W. (true). Another sounding was taken at 8 p.m., 450 fathoms in 66° 37′ S., 144° 8½′ E. The weather was then fine and a cloudless sky with a light south-south-east breeze. Only occasional pieces of drift-ice were passed.

AT COMMONWEALTH BAY.

December 13th opened with a clear sky and a moderate south-easterly breeze. At 7 a.m. the anchor was dropped in 18 fathoms off Cape Denison. At 8 a.m. the whale-boat was lowered and Captain Davis with Hunter, Hurley, Blake and Hamilton, went ashore. At 9.30 a.m. the whale-boat returned to the ship with myself and other members of the shore party who then revelled in a breakfast of fresh food and read the mail brought down by the ship. Communication was maintained with the shore during the day. The anchorage then occupied by the *Aurora* was estimated to be 10 seconds in longitude west of the Hut.

Hunter and Hamilton spent the day ashore collecting. They found Snow Petrels very numerous in their haunts in crevices amongst the rocks: sixteen birds and eight eggs were obtained. Wilson Petrels were also observed to be fairly numerous, but their nests were hard to reach, being generally situated far back and under large rocks and in small crevices. Antarctic Petrels were observed to be flying about in numbers; also occasional Silver-grey Petrels, Cape Pigeons and Giant Petrels. A few pairs of Skuas were found to be nesting and five eggs obtained. One Weddell Seal was skinned. At midnight the air temperature was 25° F. and surface water temperature 29·7° F.

December 14*th.*—At anchor. During the early morning hours a fresh south-east gale blew off the land and moderated to a fresh breeze by noon. From 2 p.m. until 8.30 p.m. the launch plied to and from the shore bringing off collections and stores. Hunter dredged in about 45 fathoms just north of the anchorage obtaining a good catch. Five more Skua eggs were collected. After 9 p.m. the south-east wind rapidly increased in force.

December 15*th.*—At anchor. A strong south-east gale blew off the land with squalls of great violence. At 6 a.m. the anchor dragged about three cable lengths and brought up with 43 fathoms of water under the ship's stern. The anchor dragged again later. Finally at about 10 a.m. Captain Davis steamed in under the ice cliffs, picking up the anchor on the way. Eventually, at noon, the anchor was dropped in 10 fathoms of water a little east of the former position; then with 72 fathoms of cable out it held well. In the late afternoon the gale rapidly moderated.

December 16*th.*—At anchor. The wind increased again in the early morning hours but died away after noon. At 1.30 p.m. the launch was lowered and kept constantly running to and from the shore until 9.45 p.m. A patch of shoal water (4½ fathoms) was found right under the ship's stern.

Hunter obtained eleven Wilson Petrels, of which several were on the nest; also two eggs. Hunter in his log observed that " they betray their nests by their squeaking. They flutter around the rocks near the nest for a long time before entering. It is after 6 p.m. that most birds are to be seen flying about, evidently males returning after obtaining food. Like all Petrels, they vomit a nauseous oily liquid in defence." No Adelie Penguin eggs were hatched at this date. A shallow water dredging was made.

Before midnight the wind freshened from the south-south-east and became squally.

December 17*th.*—At anchor. During the early morning hours a fresh south-south-east gale blew off the land but rapidly moderated after 8.30 a.m. The motor-boat plied between the ship and the shor from 11.30 a.m. to 8 p.m. The last of the gear to come off to the ship, except personal effects, was now aboard.

Hunter caught a number of fish in the fish-trap which was lowered over the ship's side and left on the bottom. The first Adelie Penguin chick of the season was hatched this day. By midnight a fresh south-south-east breeze was again in force.

December 18*th.*—At anchor. The wind had subsided sufficiently by 10 a.m. for the boat to operate and it was kept busy most of the day bringing off ice to replenish the fresh-water tanks. With Hunter, Hurley and Hodgeman, I landed with camping gear on the larger of the Mackellar Islets, with the object of charting them. We spent the night there. The charting was done by Hodgeman and myself while Hurley photographed and Hunter observed the animal life (Plate XXIX, Fig. 1). Referring to the latter, Hunter's log book records as follows :—

" The largest island is about three-quarters of a mile long and covered with Adelie Penguin rookeries. Some of the smaller islands (more especially the Lesser Mackellar Islet) also support rookeries. We estimate that there must be about 200,000 penguins on the Islets. The majority of the birds were nesting and some of the eggs were just hatched. So numerous are the penguins that in places about the rookeries the guano is several feet deep. The penguins are more courageous when with chicks than when with eggs or by themselves and one has to fight one's way through the rookery. They also fight amongst themselves. Large numbers of birds were moving to and from the rookeries to the shore; going out after food but not stopping away for long.

" The Skuas, the usual hangers-on to the rookeries, were not very numerous; I obtained five sets of eggs. As usual their nests were close to a penguin rookery and simply consisted of a few penguin feathers gathered together; in other cases the eggs were laid merely on the bare ground. The female bird sits on the eggs while the male is away after food. When the male bird is about, it is generally perched on the rocks

a few yards away from the nest and, on the approach of anyone, it starts squawking and then flies at the intruder, squawking loudly until the intruder retires. One may sometimes approach to within a few yards of the nesting bird before it leaves its nest; it then adopts the same methods of attack as its mate. They are rank scavengers; if one starts to skin a seal there is a flock of them around in no time. They will even come within a yard or two of the scene of skinning. They will hover over a penguin rookery just out of reach of the penguins, and should an egg or young penguin be uncovered, it is goodbye so far as they are concerned.

"A few Snow Petrels were obtained and several eggs. The most valuable find was the location of Wilson Petrel nests, which were located in numbers in the crevices of the rocks. In most cases it was impossible to get at them as they were beyond reach, but I managed to get six eggs. They were very nearly all quite fresh, so that this appears to be their laying period. Numbers of birds were paired off at their nest, but with no egg yet. During part of the day one bird only is to be found on the nest, but at about 6 p.m. the other bird returns: then is the best time to search for them as they betray themselves by their squawking. From 6 p.m. to midnight they fly around the rocks squawking loudly. Just around our tent there were about fifty of these birds nesting. The nest is always well under the rocks and generally the site of an old nest. In several nests I obtained two or three eggs—all broken—of previous year's laying, together with a number of dead birds."

December 9th.—At anchor. During the morning the motor-boat worked between the ship and the shore but after lunch as the weather looked threatening, Captain Davis sent it off to the Mackellar Islets to pick up my party. Later all but three men (who were left to look after the dogs) were brought off from the Hut. A south-south-east gale with driving snow was in operation during the evening.

December 20th.—At anchor. A fresh and squally south-east-by-south gale continued all day with a confused swell coming in from the north. There was no communication with the shore during the day.

December 21st.—At anchor. The wind died away to a variable light breeze at 8 a.m. Between 9 a.m. and 6.30 p.m., the motor-boat worked between the ship and the shore bringing off ice for fresh-water. There were still three men camped ashore with the dogs. Some of the party were engaged in dredging from boats and pickling the extraordinary abundant catch.

December 22nd.—At anchor. As the day opened with a promise of good weather, I arranged for a dredging in deep water and a visit to rocks on the coast at 8 miles west of Cape Denison. Captain Davis got the ship under way at 10.30 a.m.

Soundings of 240 and 424 fathoms were taken when on the way to the rocks. The latter proved to be a rocky cape projecting from the ice-cap; it was henceforth known as Cape Hunter.

When within a couple of miles of Cape Hunter, at 12.40 p.m., in company with Madigan, McLean, Bickerton, Hodgeman, Hurley, Blake and Hamilton, I pushed off in the launch to land and investigate the rocky outcrop (Plate XXX, Figs. 1 & 2). Hunter and Bage remained on board to assist with a dredging from the *Aurora*.

The rocks, which rise to a maximum of 90 feet above the sea, were found to be steeply dipping phyllites, glacially scratched and polished and with a few erratics left lying indiscriminately over the surface. The greatest find, however, was to discover that Cape Hunter is a great Antarctic Petrel rookery. Until this moment the nesting place of these birds was unknown, except for a few nests located the previous year at Haswell Island by our Western Base Party. A few nests of Snow Petrels, Wilson Petrels and Skuas were also found at Cape Hunter; in addition there was a small rookery of Adelie Penguins. While this work was going on ashore, Davis moved the *Aurora* into deeper water and dredged in 354 fathoms. By 5.30 p.m., the dredge was on board with the best haul of bottom life made from the *Aurora* up to that date. At 8.30 p.m., the anchor was again dropped at Cape Denison.

EXODUS FROM THE MAIN BASE STATION.

The ship lay at anchor off Cape Denison during December 23rd. As a fluke of the starboard lower anchor had carried away, the latter was got on board and replaced by a spare anchor from the hold. At 1.15 p.m., the launch was lowered to bring the dogs off, twelve in all, and the last of the personal effects. Madigan and Bickerton went ashore on the last trip to lock up the Hut securely. A notice was nailed to the door inviting any who should call to make use of it and of the cases of stores left there (Plate XXIX, Fig. 2). That last trip to the shore was completed by 4 p.m., when the launch was hoisted up into the davits and lashed. All this was effected in a rising wind and falling snow. It was decided to remain at anchor until the weather should improve. At midnight a moderate south-easterly gale was blowing.

December 24th.—The wind freshened rapidly during the early morning hours. By 4 a.m., a full south-east gale was in progress with squalls of great violence. By 6.30 a.m., the land was invisible owing to driving spray and drift-snow. By 8 a.m., the wind was coming from the south-south-east with hurricane force, and squalls of terrific violence. At noon the seas were cut off almost flat by the force of the wind ; barometer 28·75 ins. At 1 p.m., the anchor gave way and the ship was driven away with the wind in a whirl of frozen spray and snow.. Nothing could be seen beyond a cable length away, so that the ship's position in relation to the Mackellar Islets and the coastline was very uncertain. Captain Davis steamed the ship into the wind while the anchor cable hanging below the bow was being got in under most difficult circumstances, for the seas were breaking regularly over the forecastle head. At the same time, great trouble was being experienced in an attempt to save the motor-launch, which, though securely lashed in the davits, was swung outboard. The short steep seas kept striking the launch from below and sweeping over it. The davits bent under the strain and the launch, crashing against the vessel with every sea, commenced to do damage to the hull of the *Aurora*; so the launch had to be cut away. It went overboard taking the forward davit and part of the bulwark with it, and was never seen again. By 4 p.m., the anchor was aboard and lashed; the stock was found to have carried away, which accounted for it dragging.

An incident of unusual interest was that, when at its height, the hurricane wind fell off to almost a calm for about ten minutes. This lull was followed by a sudden accession wind coming in temporarily from another quarter, namely, somewhat north-of-east. During the lull the short steep seas swept eerily by. Evidently, the vessel had passed through the eye of a cyclonic storm.

By this time the ship was well out to sea and was then headed east into the wind awaiting better weather. The barometer had risen slightly by 8 p.m., and the wind subsided to a moderate east-south-east gale.

December 25th.—During the early morning hours the ship headed east into an east-south-east gale making about one and a half knots per hour, passing drift-ice and bergs. Thick weather with continuous snow falling during most of the day obscured the sight of land. The usual bird life was observed hovering about the ship all day long. The wind abated considerably in the evening.

December 26th.—During the early hours, there was a gentle east-south-east breeze, but visibility was reduced by steadily falling snow. The ship was allowed to drift. Penguins and seals were in numbers about the ship. At 8.15 a.m., the ship was once more got under way and steamed to the east to make the lee of the Mertz Glacier Tongue at this time. The usual Antarctic birds were in evidence but there was a very noticeable dominance of Silver-grey Petrels.

At 2.55 p.m., land was observed, apparently Cape de la Motte. A course was then set to the south-east at full speed. The barrier wall of the Mertz Glacier Tongue came in sight at 4 p.m. At 5 p.m., there was passed a very large, crevassed and tilted berg of glacier-ice. Numbers of tabular bergs were passed during the day. Land came into view to the southward at 8.15 p.m. At midnight a fresh breeze was blowing with a choppy sea and thick mist and sleet.

OFF-SHORE MARINE INVESTIGATIONS.

The lee of the cliff face of the Mertz Glacier Tongue was reached at 5 a.m., on December 27th. Thereafter the vessel cruised up and down along the ice wall awaiting improvement in the weather. A fresh south-east-by-east wind carried on all day with mist and light snow most of the time. The meeting of the pack-ice with the north end of the Mertz Glacier Tongue (66° 51′ S., 145° 35′ E.) was found to be twelve miles to the south-west of the junction as recorded when visiting the locality 11 months previously. A sounding found 288 fathoms and a bottom temperature of —1·8° C., at this spot which was located half a mile from the ice wall of the Tongue. Abundance of birds, chiefly Silver-grey Petrels, were observed during the day.

December 28th.—The barometer steadily rose and fine weather prevailed except for a strong east-south-east breeze. The ship steamed slowly along the Mertz Glacier Tongue, (Plate XXXI). The observed noon position was 66° 55′ S., 145° 21′ E. This longitude appeared at the time to be doubtful as it put the ice face 6 miles west of the position as charted in January, 1913. The depth at noon was 288 fathoms. A vertical series of sea-water temperatures was taken here. At this spot the trawl was lowered, and a most excellent catch obtained. In the dredge, mixed up with a wonderful assortment of animal life, there was a richly diatomaceous glacial ooze, some large glaciated stones, several pieces of lignified wood and chunks of rough boulder clay.

At 3.45 p.m., another sounding was made at about 2 miles north-east of the noon position, namely 66° 55½′ S., 145° 24′ E. A longitude observation at 5.28 p.m. agreed with the morning figure; consequently today's charting of the ice wall can be accepted as accurate, more especially as the ship's chronometers had been recently checked against the Cape Denison meridian which had been fixed by wireless time signals from Melbourne. The ship was allowed to drift during the night hours.

December 29th.—A slight south-east breeze caused the ship to drift about 7 miles away from the ice wall during the early morning hours. At 6.15 a.m., the vessel was got under way and steamed in again to the face of the ice wall. At 11.10 a.m., the *Aurora* was half a mile distant from the ice face in the same spot where a sounding was taken at 7.15 p.m., on the 27th inst. Here the whale-boat was lowered and with Madigan, Hurley, Bickerton and several others making up a boat's crew, I investigated a large cave in the 120 feet high ice face of the Glacier Tongue. The cave extended in about 120 feet. We rowed into the cave and were struck with the beautiful colour effects. Looking down through the clear blue waters many shrimps (krill) about an inch in length could be observed swimming about near the surface. At noon the whale-boat was hoisted on board. The ship's position was then 66° 51′ S., 145° 35′ E. From this spot the Madigan Nunatak was in sight bearing S. 70° W. (true); also Aurora Peak, which bore S. 47° W. (true).

After noon the ship was directed north-east along the ice wall and at 1 p.m., was close to the seaward end of the Glacier Tongue, where the pack-ice was observed to be drifting around it from the east. The ship was steamed right up to this line of pack-ice from which position the extremity of the Tongue bore east-north-east; beyond this point no further continuation of the Tongue could be seen. To the north-east only scattered (though in places heavy) pack-ice, with several very large bergs could be seen. At 1.20 p.m., in this spot the ship was turned about and after steaming a quarter of a mile to the south-west, it was stopped and a sounding taken. The ship was then about 2 cables off the face of the Glacier Tongue and in 66° 49′ S. 145° 42′ E.; the depth was 240 fathoms and the bottom temperature — 1·68° C.

The afternoon was spent steaming back down the ice wall to the south-west, examining it in detail and tow-netting at various depths. The nets yielded rich hauls. The average trend of the wall of the ice-tongue was found to be S. 40° W. (true).

Several large flocks of Silver-grey Petrels were feeding near the ship during the afternoon. Antarctic Petrels, Snow Petrels and Wilson Petrels were observed in considerably less numbers. Several Finner Whales and a Blue Whale were seen spouting in the vicinity of the ship.

Important observations were made concerning the glacial nature and structure of the Mertz Glacier Tongue. These were concluded at 9.15 p.m., when its junction with the land itself had been reached. The vessel was then steamed to the north-west about 5 miles off the land.

December 30th.—The weather still held good. By 1 a.m., the vessel was off a large tilted berg, well away from the land and was then allowed to drift until 6.30 a.m. The ship was then got under way and steamed towards the largest of a fringe of islands which I had named the Way Archipelago. By 8.45 a.m., we were 1 mile distant from the Island in question which was subsequently known as Stillwell Island (Plate XXXII). I went ashore in the whale-boat with Madigan, Bage, Hurley, Correll, Blake and Hamilton. The boat was kellicked off a cove on the west side of the Island while we made a rapid reconnaissance ashore. The highest point was found to be 120 feet above sea-level. There was evidence that, though it had been over-ridden by the ice, a considerable time had elapsed since that event, for a certain amount of frost splitting and erosion had ensued, destroying the one-time smooth glaciated surface. An interesting series of metamorphic rocks were collected, all quite distinct from the types found at Cape Denison. Of great interest was the discovery that here was the chief nesting locality in this area of Silver-grey Petrels; they were nesting in great numbers. A few Snow Petrels were observed nesting, also several Skuas. Adelie Penguins had a rookery of one side of the Islet. No lichens were seen on the Island but samples of moss were secured.

At 12.30 p.m., we reluctantly departed from that interesting spot, arriving alongside the *Aurora* at 12.45 p.m.

At noon while lying about 1 mile north of the Islet, Captain Davis had found the ship's position to be 66° 54½′ S., 143° 51′ E.; there a sounding had found a hard bottom at 55 fathoms.

When skirting these islets, considerable disturbance of the ship's compasses was noted. Captain Davis at this juncture observed: "The compass error which for the last few days had been averaging about 5° W., on the near approach to the bare rocks of the Island (Stillwell Island) jumped to an average of 24° W., and had again assumed an error of 8° W. by 3 p.m."

Large grounded bergs were distributed among and beyond the fringing islets of the Way Archipelago.

The ship was now headed west to examine the coast to the west of Cape Hunter. At 6.20 p.m. when in 66° 43′ S., 143° 29′ E., a sounding found bottom at 240 fathoms. Tow-netting at various depths was undertaken in the early evening hours. At 9 p.m. quite fifty whales, apparently Finners, were observed spouting at no great distance from the vessel.

At midnight the vessel was approaching the coast to the west of Cape Denison at the point which appears to correspond with Wilkes's Point Alden. A number of small bergs grounded off the Point were passed; small, isolated and entirely snow-capped islets were to be seen close up to the ice cliffs of the coast line.

December 31st.—The south-south-easterly wind steadily freshened and by 2.45 a.m. was blowing at gale strength. As it was our intention to land upon the rocky coast in the vicinity of D'Urville's Cap de la Découverte (only a few miles ahead) the ship was turned about to put in time awaiting an improvement in the weather.

As the *Aurora* stood backwards and forwards along the coast during the morning, we found that a few miles to the west of Point Alden the ice cliff coastline is relieved by a considerable area of outcropping rock; this we concluded must be the Cap de la Découverte locality of Dumont D'Urville. The ice cliffs in that locality are not so high as at Commonwealth Bay; in some places the rising slope of the inlandice-cap terminates in cliffs only 40 feet high. Here and there patches of rock relieve the face of the ice wall.

As many islets lay off the main stretch of rocky coast and as the bottom was found to be very irregular, it was deemed inadvisable to cruise near inshore along that section. Our view of it was restricted to what could be seen from several miles off to the north-east. From that angle we were not able to define accurately the extent of the rock outcrops. It was judged that the length of rock exposure would be about 4 miles in an east and west direction. None of the rock was observed to extend to any considerable height, probably not more than 200 feet at the most. Some of the rock exposure is in the nature of rocky off-lying islets. There were observed also many islets entirely ice-capped and numerous small bergs stranded in the adjacent shoal waters.

Few birds were seen during the morning and such as were observed were almost all Cape Pigeons, which suggests that a Cape Pigeon rookery almost certainly exists in that neighbourhood.

At noon the ship was near Point Alden standing west; observations placed her in 66° 46′ S., 141° 41′ E.

At 1.25 p.m. as the wind had not abated and the barometer was falling, the outlook for getting ashore during the next few days was so unpromising that we decided to push on to new areas further to the west. The ship was headed to the north-north-west. As usual the wind was observed to moderate as soon as the ship was well clear of the land. Numbers of small bergs were passed during the afternoon; also there were reported Cape Pigeons, Silver-grey Petrels, Antarctic Petrels, a Giant Petrel, two Snow Petrels, one Wilson Petrel, and a whale.

At 4 p.m. in 66° 32′ S., 141° 39′ E. a sounding found 157 fathoms over a mud bottom. This was followed by trawling, tow-netting and a vertical series of sea-water temperatures. The shallow water tow-netting revealed an extraordinary abundance of diatoms, the nets becoming choked with a gelatinous brown mass. The trawling yielded an extremely rich catch. The south-east breeze strengthened during the evening hours.

January 1st, 1914.—We made to the north-west passing numbers of bergs throughout the first watch. At 4 a.m. a moderate east-south-east gale was blowing and the ship rolled and pitched; no pack-ice was in sight from aloft. Barometer 28·96 inches. Scattered bergs were passed during the 4 a.m. to 8 a.m. watch; at 11.30 a.m. ten large bergs were in sight all close together and another collection two miles to leeward of them. The ship was still standing on a north-north-west course.

At noon in 65° 43′ S., 140° 19′ E., a sounding reached bottom at 250 fathoms. No bergs were passed during the afternoon watch. Cape Pigeons, Wilson Petrels and large numbers of Sooty Albatrosses were in sight. Whales were observed spouting ahead of the ship at 4 p.m. At 5 p.m. in 65° 21′ S., 139° 48′ E. found 1,440 fathoms of water, which showed that the ship was north of the continental shelf. At 6.25 p.m. the ship's course was altered to west (true). Several bergs were observed distributed around the horizon at 8 p.m. During the 8 p.m. to 12 p.m. watch several large bergs were in view but no pack-ice.

January 2nd.—At 2.30 a.m. four large bergs lying close together, apparently aground, were located 3 miles to the south of the ship. At 3.30 a.m., as no signs of pack were visible, the ship's course was altered to south-south-west. 4 a.m.: passing occasional bergs; fine clear weather with light southerly airs. At 6.40 a.m. a sounding was taken in 65° 35½′ S., 137° 30′ E., finding bottom at 330 fathoms. The vessel then continued on course, but at 7.30 a.m. pack-ice was observed from aloft bearing between south-west and west. At 8 a.m. land was observed to the south and the course altered to south (true).

The course to the south lay through scattered bergs, but to the south-west there was in sight a little loose pack. The weather was clear and cloudless. At 9.45 a.m. the ship entered scattered brash-ice. At 10.5 a.m. the drift-ice was thicker; vessel stopped for sounding in 65° 53′ S., 137° 30′ E., finding bottom at 230 fathoms on glacial mud. At 10.30 a.m. the ship was pushed south for about another mile. From that location the ice-capped land to the south appeared to be about 25 miles distant and trended from somewhat south of east to somewhat north of west: to the east the land dipped below the horizon on a bearing south-east-by-south (true) and to the west on a bearing south-west-by-west. Between the ship and the land was continuous pack-ice with many grounded bergs embedded in it. Close to the ship were two small earth-stained bergs. As further progress to the south was out of the question the vessel was turned north. At noon, when in 65° 30′ S., 137° 30′ E. a trawling was made, also tow-netting was carried out at several depths. The latter proved to be very successful; diatoms were found to be extraordinarily abundant at 20 fathoms though only moderately represented at the surface. The trawl and tow-nets were aboard at 2.30 p.m. when a sounding proved 330 fathoms of water, the position then being 65° 48′ S., 137° 32′ E. A vertical series of water temperatures was also made here. At noon the only birds noticed amongst the pack-ice were Cape Pigeons and a Giant Petrel; later, when skirting the pack, numerous Snow Petrels, one Skua Gull and a Wilson Petrel were recorded. Two small whales passed near the ship.

THROUGH ICE-STREWN SEAS WEST OF ADELIE LAND.

At 3.35 p.m. on January 2nd the ship was headed north and west to clear heavy pack-ice encumbering the sea to the west. At 9 p.m. a number of large grounded bergs were abeam; the ship rounded these and then, following the trend of the pack, headed due west. At 11.40 p.m. the course was altered to west-north-west to clear heavy pack with numbers of small bergs which lay ahead. At midnight the air temperature was 27° F. and surface water 31·3° F.

January 3rd.—The day commenced with fine clear weather, gentle breezes and the sea strewn with pancake-ice. A course west-north-west and later north-north-west was made following the edge of heavy pack-ice held together by a number of big bergs. At 6.50 a.m. a sounding of 950 fathoms was taken in 64° 53′ S., 135° 35′ E. The course to the north-north-west along the pack edge was then continued until 9.45 a.m. when it turned west; later on again the vessel was headed to the west-north-west. At noon the ship was in 64° 39′ S., 134° 46′ E.; there a sounding gave the depth as 945 fathoms. During the afternoon extensive areas of brash-ice were traversed (Plate XXXIII, Fig. 1). At 5 p.m. the ship's position was found to be 64° 30′ S., 134° 0′ E.

This evening huge bergs were seen to the south. At about 8 p.m. the entire southern horizon was occupied by a high table-topped formation which had the appearance of the end of a shelf-ice formation but was doubtless only a large tabular berg.

The brash-ice became thicker and heavier as the evening progressed until at 10 p.m. speed had to be reduced and the ship headed to north-west to reach clearer water.

Few birds were in evidence this day. Some Snow Petrels and Antarctic Petrels were recorded at 4 a.m. Later only Snow Petrels and a Wilson Petrel were noted. In the afternoon three seals basking on the ice were passed; two were Crab-eaters and one a Sea-leopard. Numerous whales, mostly Blue Whales, were observed. Hunter records a fight in the late evening between a Finner Whale and Killers.

The water was so calm and clear during part of the day that a variety of forms of invertebrate marine life could be seen swimming or floating in the surface waters; some interesting examples were scooped up with a hand-net.

At midnight the pack edge was trending west-south-west ; away to the south to a height of 8 degrees above the horizon there was a bank of heavy nimbus clouds.

January 4th.—The ship continued following the pack edge in fine clear weather with a light west-south-westerly breeze. At 1 a.m. whales were observed spouting near the horizon, also Antarctic Petrels and Snow Petrels were about. At 4 a.m. the heavy cumulo-nimbus clouds, earlier observed low on the south-east horizon were now seen to be extending rapidly. About this time loose pack-ice was entered; here and there Adelie Penguins were observed resting on the ice. At 7 a.m. a sounding of 950 fathoms was obtained in 64° 25′ S., 132° 26′ E.

By 10.30 a.m. the pack was so heavy that a course was made to the north to clear it, the ship very slowly forcing a passage. Several Crab-eater Seals and a Sea-leopard were observed on the pack. Whales were seen spouting amongst the ice. At noon the pack was lighter and the ship headed to the west. The noon position was 64° 18′ S., 132° 24′ E. At 1 p.m. a whale, which appeared to be a Southern Right Whale, was spouting close alongside the ship. At 2.30 p.m. the ship was clear of the pack-ice and continued in a perfectly smooth sea with mirage distortions around the horizon. A sounding at 6 p.m. in 64° 0′ S., 132° 22′ E. found bottom at 1,810 fathoms; at this spot also a vertical series of sea-water temperatures was taken. At 8 p.m. there were a number of bergs in sight. The sky became overcast during the evening hours and at 11 p.m. a little snow commenced to fall. At midnight a gentle breeze was coming in from the east-north-east; whales were seen spouting in the vicinity.

During this day few birds were about the ship. Most of these were Snow Petrels; a Wilson Petrel was seen and late in the evening an Antarctic Petrel. Tow-nettings were made both at the surface and at 45 fathoms. The latter yielded a particularly good haul. Many specimens were got in the hand-net. We had now discovered beyond further doubt that there is abundance of small life such as crustaceans, fish larvae, pteropods, etc., in the surface waters of the pack-ice area of these seas.

January 5th.—A moderate easterly breeze was blowing and light snow falling during the early morning hours. Occasional bergs were passed. At 4 a.m. four Finner Whales were in sight. The vessel followed along the margin of fairly heavy pack-ice all the morning. The noon position was 64° 10′ S., 130° 4′ E.: here a sounding was attempted but the wire parted before bottom was reached. The Lucas machine was again ready for sounding at 1 p.m.; the position was then 64° 14′ S., 130° 1′ E. There the bottom was found at 1,550 fathoms. The ship was full speed ahead again at 1.45 p.m. At 3 p.m. a school of Humpback Whales were in the vicinity of the ship. The edge of the pack-ice was followed during the afternoon. Several small bergs outside the pack were passed and numbers were in sight within the pack. The ship's position at 5.14 p.m. was 64° 27′ S., 129° 49′ E. A striking pinnacled berg was passed in the evening. Numbers of whales were seen spouting to the westwards at 8 p.m.

At 11.45 p.m. heavy pack was entered; there was nothing to be seen to the south except close pack. The sky was overcast at midnight, with a light south-east breeze and smooth sea.

Of bird life seen during the day Snow Petrels were the most abundant; a few Antarctic Petrels, several Cape Pigeons, a Wilson Petrel and a Sooty Albatross were also recorded. There was a total absence of birds in the late afternoon. A dearth of flying birds at this period of the day was observed on other occasions of the *Aurora's* voyages in these seas. It appeared probable that they return to their rookeries at this time of the day. No seals were seen. The tow-net secured a haul of red shrimps (krill).

January 6th.—At 12.15 a.m. progress south through the pack was found to be so slow that a retreat to the north was commenced. Open water was reached half an hour later. A course along the pack edge to the west was then continued. The sky remained overcast and a moderate breeze came in from the east-south-east. At 5.20 a.m. the pack was seen to be heavy; numbers of small icebergs were passed.

At 9.45 a.m. the ship was stopped for sounding and trawling; position 64° 34½′ S., 127° 17′ E.; depth 1,700 fathoms. At 11 a.m. the trawl was passed overboard and finished paying out (2,600 fathoms of cable) at noon. Steaming dead slow ahead the trawl was trailed along the bottom. At 1.20 p.m. the vessel was found to be firmly anchored and the trawling cable stretched very taut. After relief of the tension, hauling in was commenced but it was not until 8.20 p.m. that the trawl was got on board. More than a ton of material was contained in it, consisting mainly of tenacious ooze and large erratics, with a fine assortment of marine life (Plate XXXIII, Fig. 2). During the afternoon notable catches were also secured in tow-nets operating at various depths. After the trawling was completed the ship was allowed to drift all night awaiting clearer weather. The sky was still overcast at midnight and considerable snow had fallen at intervals during the day.

Snow Petrels were about the ship during most of the day appearing in flocks of as many as twenty at a time; they were especially numerous in the 8 p.m. to midnight watch. Several Antarctic Petrels, a Silver-grey Petrel, a Cape Pigeon, several Wilson Petrels, two Giant Petrels and a Prion were seen. From time to time during the day Adelie Penguins disported themselves in the neighbourhood.

January 7th.—Black-fish passed by in the early morning hours. At 8 a.m. the sea was still smooth and the sky heavily overcast. A large tabular berg and some small ones were nearby. The ship was under way again at 9.10 a.m., following the pack edge to the west. Numbers of small bergs, mostly old and worn, were passed outside the pack. During the morning, numbers of whales were observed spouting. The noon position by dead reckoning was 64° 34′ S., 125° 55′ E. Whales were still about; the average trend of the pack edge was east to west. At 2.45 p.m. the ship passed south of a large tabular berg nearly one mile in length. Whales were observed spouting in the early afternoon. At about 5 p.m. a water sky was noted over the pack area to the south-south-west and towards this the ship was headed through the pack: Finner Whales were about. At 5.20 p.m. a very long tabular ice formation, either a shelf-ice berg

or a shelf-ice attachment to land was in sight to the south-west. Approximate bearings at 5.45 p.m. of the extreme ends of this formation then in sight were S. 65° W. (nearest end) and S. 10° E. The nearest point was judged to be about 10 miles distant. At 8 p.m. we had concluded that the tabular ice formation was a huge berg about 25 to 30 miles in length. As the pack was becoming very heavy, the ship was directed towards open water. Four Crab-eater Seals, four Sea-leopards and an Emperor Penguin were seen amongst the pack. At 9 p.m. many whales were observed spouting amongst the loose pack-ice. A few Cape Pigeons, Antarctic Petrels and Wilson Petrels were seen at intervals and Snow Petrels were recorded on a number of occasions during the day; a Sooty Albatross passed by early in the morning; a white Giant Petrel and a Skua Gull were also seen. Once again abundance of crustacean and other drifting life could be seen in the surface waters amongst the pack-ice. At midnight the sky was still heavily overcast and some snow falling.

January 8th.—At 1 a.m. the ship was heading north-west at slow speed with fairly heavy pack to the south and numbers of bergs in sight around the horizon. Snow Petrels and Cape Pigeons were about and many whales spouting. Between 3 a.m. and 4 a.m. an extension of the pack was rounded and the course altered to south-south-west, there being an appearance of open water to the southward. Fairly thick snow began to fall after 4.30 a.m. By 11.20 a.m. the weather had cleared a little: numbers of Snow Petrels were then around the ship, also flocks of Terns were observed resting on the pack-ice. At noon the observed position was 65° 2′ S., 123° 12′ E. Some advance to the south was made until 3.15 p.m. when the pack became too heavy for further progress; numbers of Crab-eater Seals and Sea-leopards lay on the pack-ice. A Crab-eater Seal was shot and hauled on board: on examination it was found to be richly infested with internal parasites. At 3.30 p.m. the ship was again headed north. Tow-netting at various depths was rewarded by useful catches. Between 8 p.m. and midnight a course was made to the south-west through loose pack and open water. The sky remained overcast and light snow fell at intervals.

January 9th.—Making a course to the south-west the ship continued in open water with only occasional drift-ice; pack-ice lay away to the south-east. The sky remained overcast and light snow fell at intervals. At 4 a.m. whale spouts were to be seen all around the horizon. At 7.30 a.m. two island-like bergs were to be seen a few miles within the pack and between them a very extensive table-topped berg or shelf-ice formation which was observed to extend to the southward as far as the eye could reach. At about 8.30 a.m. the sun appeared and a sight for position was made, placing the ship in 65° 28½′ S., 120° 59′ E.; sights to the eastern and western extremities of the tabular "berg" first observed at 7.30 a.m. were respectively S. 35° E. and S. 5° W.; a sounding in this same spot found bottom at 1,400 fathoms. The ship was then allowed to drift, towing nets at various depths from which a considerable and interesting catch was obtained.

Prions were seen during the morning; also many Snow Petrels, five Wilson Petrels, one Antarctic Petrel and a Giant Petrel. At 11 a.m. the voyage was resumed on a course west-by-south.

At noon the weather was fine and clear and a fresh easterly breeze blowing: the ship's position was ascertained to be 65° 30′ S., 120° 40′ E. During the afternoon various courses were followed in order to avoid entering pack. Scattered bergs both large and small were passed about 2.30 p.m. Pack-ice lay continuously to the southward. Thick weather set in again in the evening with much falling snow, and a moderate east-south-east breeze. The ship skirted the edge of the pack at a distance of only about one cable length; occasional bergs were passed. There was again a notable absence of bird life during the afternoon. Whales, mostly Finners, were observed at intervals throughout the day.

January 10th.—The edge of the pack was closely followed to the north-west-by-west during the early hours. The sky remained overcast but snow ceased after 2.30 a.m. In the early morning hours, great numbers of birds were about including Snow Petrels, Antarctic Petrels, Silver-grey Petrels, Cape Pigeons and Wilson Petrels. The Snow Petrels came in great flocks. At 3 a.m. a pair of Giant Petrels were sighted; also whales were spouting nearby. Between 2 a.m. and 3 a.m. on the seaward side of the pack-ice there was open water free from bergs, though numbers of small bergs were studded through the pack. At 3.15 a.m. a small capsized, water-worn berg with numbers of embedded black rocks was passed within a short distance of the ship. Snow squalls set in again at 7 a.m. At 9 a.m. when the ship was in 64° 35′ S., 117° 1′ E. a sounding found 1,350 fathoms. Tow-nets were worked at various depths to 400 fathoms during the morning hours with considerable success: many strongly phosphorescent crustaceans were obtained. A few Adelie Penguins were observed.

The noon position was 64° 34′ S., 117° 1′ E. Whales were reported spouting around the ship, at intervals during the afternoon and evening, but not so numerous as on preceding days. In a smooth sea the ship still continued during the afternoon skirting the pack and passing small bergs. Birds were reported in numbers, chiefly Snow Petrels but in addition two Silver-grey Petrels, several Wilson Petrels, several Cape Pigeons and both a dark brown and a white Giant Petrel. At 8.40 p.m. a school of Dolphins gambolled in the vicinity of the ship; these creatures were about 15 feet long and had two white patches on their sides, corresponding with an Antarctic species described by Dr. Wilson in the reports on the first Scott Expedition.

At midnight, though the sky was still overcast, there was a beautiful red sunset sky on the southern horizon.

January 11th.—The ship continued steaming about a mile distant from the edge of the pack. In the early morning hours a great number of small bergs were in sight all around the horizon, both in and out of the pack-ice, in every variety of shape; whales were seen spouting at intervals. At this time also some Silver-grey Petrels and Antarctic Petrels and Wilson Petrels were about. A beautiful day; fine weather, clear sky, smooth sea and a gentle west-south-west breeze. At 8.30 a.m. a sounding found 990 fathoms: position 64° 44½′ S., 113° 46′ E. At noon the sky was clear and a moderate westerly breeze blowing. Noon position: 64° 50½′ S., 113° 16′ E. In the early afternoon watch, numbers of small bergs were still dotted around the horizon both in and out of the pack. During this watch several whales were seen spouting and a few Silver-grey Petrels noted. In the late afternoon what appeared to be an opening to the south was followed in loose pack for several hours but eventually further progress was barred by dense pack. The ship's position at 5 p.m. was 64° 46′ S., 112° 23′ E.

A dark bar was to be seen on the southern horizon about 6 p.m.; this suggested a water-sky which would inevitably mean the lee of grounded bergs or the vicinity of land. For some hours past clouds had been developing from the west. The possibility of pushing through to the south in this locality was discussed, but as the pack was heavy it was decided to press on to the vicinity of Wilkes's Knox Land, hoping that the ice conditions there would be more favourable. The evening passed whilst steaming west, skirting the heavier pack. Numerous small bergs were in sight. Whales were reported spouting at intervals. Of birds, Snow Petrels were the most common, but an odd Antarctic Petrel was noted, also a Giant Petrel and a Skua; half a dozen Adelie Penguins were seen on the pack, also seven Terns were observed resting on the pack-ice.

January 12th.—During the first watch the trend of the margin of the pack carried us to the west-north-west. There were still a few small bergs visible around the horizon. Cape Pigeons and some Snow Petrels were in sight. A number of Finner Whales were spouting in the distance and at 3.30 a.m. one came to the surface close alongside the ship.

At 4 a.m. the sky was overcast and barometer falling; Silver-grey Petrels were noted. By 8 a.m. a moderate north-east breeze had sprung up. At 8.49 a.m. the ship's position was 64° 37′ S., 109° 6′ E.; here a sounding found bottom at 1,530 fathoms; one tow-netting at 100 fathoms was effected. The wind steadily freshened and the sea increased. The noon observed position was 64° 37′ S., 108° 50′ E. The ship continued to follow around each embayment of the pack searching for a lead to the south: still numerous small bergs were in sight. During the afternoon watch, several whales were observed. Snow Petrels were seen about 1 p.m. but later there was a notable absence of bird life; a Sooty Albatross and a Giant Petrel were the only forms noted later. By 8 p.m. a fresh easterly gale was blowing and a high easterly sea running. Captain Davis stood the ship to the north to keep clear of the ice. At midnight the log records a fresh easterly gale, misty with falling snow and a high sea. The ship rolled considerably, a complete change from the calm seas experienced for some time past. It was an anxious night working the ship in such weather with greatly reduced visibility, in waters strewn with floating ice.

January 13th.—During the first watch there were recorded a number of Antarctic Petrels, an occasional Snow Petrel and two Sooty Albatrosses; also a whale appeared close to the ship. During most of the morning hours the ship was heading west before the fresh easterly gale. Several bergs were passed but the distant view was obscured by falling snow. The weather conditions were but little better by noon, though glimpses of the sun were obtained sufficient to fix the ship's position as 64° 14′ S., 104° 35′ E.: the dogs tethered on the deck were continually wet through and thoroughly miserable.

The usual Antarctic birds were absent in the afternoon but several Sooty Albatrosses came within sight. Very few bergs came into view during the afternoon. The weather commenced to clear rapidly after 4 p.m. with a rising barometer: numerous small bergs then came into view. At 5.45 p.m. the ship came up with a line of heavy pack-ice stretching away in a north-north-east direction: the ship was then stood to the north-east to clear it until 8.30 p.m. when the pack once more swung away to the north-west; the ship followed in misty weather and passing snow squalls. The only birds recorded since early morning were several Snow Petrels, an Antarctic Petrel, a Giant Petrel and a flock of what appeared to be Cape Hens. The pack-ice as seen from the ship at 10 p.m. was very heavy, being a consolidated mass of small bergs and very heavy floe and drift-ice: a few bergs lay outside the pack edge.

At midnight the wind and sea had fallen off greatly but light snow was still falling.

January 14th.—During the first hour the ship continued along the edge of very heavy pack-ice making N. 15° W. at 4 knots. Scattered bergs were in sight in the open water outside the pack. Antarctic Petrels and Snow Petrels were recorded. The weather improved as the day advanced. At 2 a.m. the pack was getting lighter and trending to the north-west. During the previous hour Silver-grey Petrels were flying around the ship; also Wilson Petrels and Adelie Penguins were sighted and a whale noted spouting to the northward.

Between 3 a.m. and 4 a.m. the neighbouring pack was again a very heavy type; lying off it were scattered bergs and occasional pieces of drift-ice. Adelie Penguins were sighted. By 8 a.m. the wind was reduced to a light east-south-east breeze; sky overcast. At 8.40 a.m. a sounding was made in 63° 21′ S., 101° 42′ E., finding 710 fathoms on glacial mud. A course was then set true north and at 10.30 when 7 miles north of the former position in 63° 13½′ S., 101° 42′ E., a sounding proved the depth to be 870 fathoms. A trawling was made here and a vertical series of temperatures taken. The sky cleared up beautifully during the afternoon. The pack-ice lay 2 miles to the south of the ship at 4 p.m. when the trawl was being hauled up. Snow Petrels and Adelie Penguins were seen from time to time. The trawl came on board at 4.30 p.m. laden with mud, stones and animal life. Several of the erratics each weighed about six hundredweight. The net was rather badly torn resulting in the loss of some of the catch. Successful tow-nettings were made at depths down to 100 fathoms. Pink coloured pteropods were observed to be abundant in the surface waters and deeper down the tow-nettings secured numbers of large red shrimp-like crustaceans. A fish about one foot in length was observed swimming just below the surface while the ship was stopped for sounding.

In the early evening hours the pack edge was again followed to the north-west. Some very remarkably weathered, pinnacled bergs were in sight amongst the pack-ice and out of it. By 8 p.m. the sea was fairly smooth and the only wind being a light northerly breeze. Throughout the 8 p.m. to midnight watch the pack-ice was observed to be very heavy consisting in places of little else than a compact mass of small bergs. The ship passed between numbers of bergs located outside the pack.

Birds were much more numerous during the late evening than earlier in the day, particularly Adelie Penguins which were then seen in great numbers; at that time also a number of Emperor Penguins were observed on the pack-ice. Other birds seen during the afternoon and evening were many Snow Petrels and Wilson Petrels, a Skua Gull and a Giant Petrel.

January 15th.—The ship continued along the pack edge to the north-west in fine, clear weather; great numbers of Snow Petrels were in sight in the very early morning hours. At 1.40 a.m. the pack was found to trend more to the north.

At 3 a.m. many small bergs and drift-ice encumbered the sea outside the margin of the pack. The ship's course had to be altered continually to clear the projections of the pack. At 3.30 a.m. great numbers of Terns were passed, feeding along the margin of the pack. At this time also Antarctic birds of all descriptions were in evidence in great numbers. At 4 a.m. much scattered heavy floe-ice was encountered. The barometer was then falling rapidly and a fresh east-by-south wind had sprung up. Between 6 and 8 a.m. numbers of small weathered bergs and much drift-ice were passed; Terns, Antarctic Petrels, Snow Petrels, Silver-grey Petrels and Wilson Petrels were about during the watch.

At 8.30 a.m. when in 62° 47′ S., 99° 20′ E., a sounding was taken, which gave bottom at 2,250 fathoms. The weights failed to disengage and were brought up with the driver, arriving on deck at 10.20 a.m. During the time that the ship was stopped for sounding, a large Blue Whale kept swimming under and around the ship.

The noon observed position was 62° 46′ S., 98° 56′ E. Numbers of small bergs were in sight both inside and outside the pack. Some of the bergs passed during the morning and evening were very much earth-stained. Numbers of Cape Pigeons and Silver-grey Petrels were seen resting on the water; a flock of Antarctic Petrels gave colour to the higher slopes of an iceberg on which they were resting.

By 4 p.m. a fresh east-north-east breeze had set in accompanied by occasional showers. Terns were again seen on the pack-ice. In the late afternoon numbers of Adelie Penguins were in evidence and some Emperor Penguins were seen on the pack. Wilson Petrels in numbers and other birds including a dark brown Giant Petrel were recorded.

In the late evening the ship's course along the pack was to the west-south-west; whales were seen spouting occasionally and many birds were in sight. At midnight the sea was smooth and the wind had fallen to a gentle breeze, still coming from the east-north-east.

January 16th.—The early morning hours were spent following the pack-ice to the west, passing scattered off-lying bergs. A few Snow Petrels were in sight. At 2 a.m. light snow commenced to fall and continued until after 8 a.m. Seals were reported in the water around the ship about 6 a.m. At 6.45 a.m. a sounding was taken close to the edge of the pack-ice finding 1,660 fathoms; position 62° 58′ S., 96° 2′ E. At this time there were a few large bergs scattered over the open water to the north. At 8 a.m. whales were observed spouting to seaward; Emperor and Adelie Penguins were seen on the pack-ice and immense flocks of Terns, certainly amounting to several thousands in number, were passed resting on the edge of the pack-ice. One of the Terns was shot and secured as a specimen; the stomach was found to be full of red euphausia. At 9.23 a.m. a school of Killer Whales were disporting themselves along the edge of the pack.

This morning the margin of the pack showed excellently the effect of the grinding of the particles of ice by the swell. Large Blue Whales were about in numbers, at least forty were counted at one time. It was calm at the time and their resounding blasts could be heard at least a couple of miles away.

At 10.30 a.m. the ship was headed into the pack with the object of icing ship. There were quite a number of Sea-leopards and Crab-eater Seals basking on the ice. The seals were in groups of as many as six. Two Crab-eaters were shot for specimens; one was a female measuring 8 ft. in length, the other a male 7 ft. 7 in. long. Both were scarred, evidence of the attacks of Killer Whales or Sea-leopards. Hunter found no parasites on them and the stomachs and intestines were empty. Hunter in his log remarked: "What do these seals feed on? Their stomachs are always empty!"

The ship's position by observation at noon was 62° 59′ S., 95° 47′ E.; she was then about 2 miles within the margin of fairly heavy pack-ice. At 1 p.m. the vessel was made fast to a moderately large floe and icing ship commenced. Quite a number of Adelie Penguins were about on the pack-ice, many of them young white-throats. Several specimens of white-throats were secured. Numerous Snow Petrels, Wilson Petrels and a Skua were also seen. The fish-trap and the closing type of plankton nets were let down amongst the pack-ice and interesting catches obtained.

Observation showed that the ship, whilst anchored to the pack, drifted 1 mile to the west between 1 p.m. and 4 p.m.

By 8.30 p.m. both fresh-water tanks were full and much ice heaped on the deck for replenishing the boilers: the ship was then headed to the north-west towards open water which was reached at 10.30 p.m. Many whales were seen spouting in the open water. A Giant Petrel hovered around the ship for a time.

January 17th.—The voyage to the west along the pack edge was continued, searching for a passage south to the neighbourhood of the Expedition's Western Base at Queen Mary Land. The weather was then calm but overcast. At 1 a.m. numbers of Humpback Whales were about, and flocks of Antarctic Petrels and Snow Petrels were seen resting on icebergs.

During the early morning hours long tongues of pack-ice and streamers of loose drift were encountered trailing north and north-west from the general body. Small bergs came frequently into sight both inside and outside the pack. At 4 a.m., Cape Pigeons and Wilson Petrels were plentiful, and flocks of Terns were observed. At 5 a.m., numbers of whales were reported; the sky was then clearing and sun showing. Unusual numbers of Crab-eater Seals were noted on the pack-ice at about 7 a.m.

At noon the northern limit of the pack-ice in this region was reached; further to the west it receded to the south. At this point there were lots of scattered bergs and loose drift about. Noon observed position 62° 21′ S., 95° 9′ E.

During the early afternoon Cape Pigeons, Wilson Petrels, Terns and a Prion came within sight. At 4 p.m., in 62° 33½′ S., 94° 34′ E., a sounding found 1,990 fathoms of water on diatomaceous glacial mud. Whales were seen from time to time all day long.

Numbers of large bergs were seen this day, many of them wonderfully carved. Some time was spent in examining and photographing icebergs. Many bergs with dirt bands were noted. When passing one berg a great fall of ice took place from it with a resounding roar and followed by a great sea wave.

Late in the evening whales and a few Antarctic birds of all kinds were about. At 10.30 p.m., the pack edge which had receded sharply to the south since noon, once again turned west and south-west.

January 18th.—Areas of heavy pack-ice alternating with looser pack headed the ship off in a general south-west direction. Many bergs both large and small were associated with the pack. The noon position was 63° 40½′ S., 92° 59′E. Birds were plentifully in evidence all day long, including Antarctic Petrels, Snow Petrels, Cape Pigeons, Silver-grey Petrels, Wilson Petrels; flocks of Terns were distributed along the pack edge and amongst loose drift-ice; one Giant Petrel and several Prions were noted. Numbers of whales were recorded in every watch. Late in the evening a strong south-east-by-east breeze developed.

January 19th.—During the first watch the ship's course was south-west-by-south, through scattered pack-ice and later heavier pack. Dark nimbus clouds appeared low on the southern horizon indicating the probability of open water. Few bergs were to be seen and very little bird life. At 8 a.m., the ship was making south, in open water but more ice was encountered at 9.30 a.m. About this time two Finner Whales disported themselves alongside the vessel for some time. A few Snow Petrels and Wilson Petrels were about.

EXPLORATION OF THE DAVIS SEA.

The observed noon position on January 19th was 64° 59′ S., 90° 8′ E. A few bergs were in sight after noon. Belts of loose pack and almost ice-free water alternated. Some penguins were sighted on the drift-ice. At 8.50 p.m., open water which extended around the horizon from west-south-west to south-east was entered. Seals were in evidence basking on the ice and whales spouted at intervals. At 10.15 p.m., the ship was headed east towards the ice-capped island situated to the north-west of the Expedition's Western Base Hut—this we have named Drygalski Island.

January 20th.—The ship continued heading east into a fresh easterly breeze and choppy sea. Though not itself within sight, the ice-capped land to the south caused a strong ice-blink in that direction. At 1.30 a.m., a mass of grounded bergs to the southward were passed; also a few scattered bergs were within sight in the open water to the north. Occasional snow squalls passed by in the early morning hours. At this time birds were few, only Snow Petrels about. At 2 a.m., a Finner Whale came alongside the ship. At 4 a.m., there was open water everywhere and only several bergs to be seen; at that time we were passing 20 miles north of the winter quarters of the "Gauss." After 5 a.m., there was a general clearance in the weather.

At 8.30 a.m., a sounding was taken in 65° 47′ S., 90° 16′ E., finding 290 fathoms on a mud bottom. At noon the ship's observed position was 65° 47′ S., 90° 39′ E., here a sounding recorded the depth as 300 fathoms. The vessel was then steaming into a fresh east-by-south breeze, the sky lightly overcast but weather generally clear. There had been an obvious lack of birds since midnight, only Snow Petrels were in sight.

At 1 p.m., Drygalski Island was sighted ahead, bearing N. 85° E. (true). The mainland to the south also came into view at this time. Throughout the afternoon watch there was open water to the horizon with a few bergs in sight.

At 4 p.m., when in 65° 48′ S., 91° 21′ E. a sounding was taken finding bottom at 280 fathoms. At this spot bearings to each end of the Island were S. 89° E., and N. 76° E., respectively. The approximate distance from the Island at time of sounding was 27 miles. The surface outline of the Island was seen to be that of a low dome terminated at the sea face by cliffs. A course, N. 79° E., (true), was set direct towards the Island.

At 7.30 p.m., using the Kelvin machine, the depth was ascertained to be greater than 100 fathoms. At 7.40 p.m., when the distance to the Island was then about 9 miles, the bearings to each end were respectively N. 64° E. and S. 70° E. By 8 p.m., the sky was clear and the sea smooth; a sounding at that time found the depth to be only 54 fathoms. The ship's position at 8 p.m., was 65° 45′ S., 91° 59′ E. The direct course to the Island was maintained at slow speed, sounding at frequent intervals by the Kelvin machine. Thus the depth at 8.25 p.m., was 54 fathoms, at 8.50 p.m., it was 58 fathoms; at 9 p.m., 56 fathoms. At 9.30 p.m., the vessel was stopped and left to drift for the night. In the late evening numbers of bergs and some pack-ice were in sight to the north and north-east. Few birds were sighted during the afternoon and evening; they were mostly Silver-grey Petrels, some Wilson Petrels and Snow Petrels.

January 21*st*.—During the early morning hours the ship was allowed to drift before a moderate east-south-east breeze. Dark snow clouds gradually worked up from the east, and by 2.30 a.m., snow showers passed over. A few Silver-grey Petrels and Cape Pigeons were sighted, also some seals in the water. At 4 a.m., the ship was about 5 miles distant from the Island.

At 6.25 a.m., tow-nets, which had been down whilst the ship was drifting, were got on board and the ship steamed in towards the north end of the Island, preparatory to trawling. The Kelvin machine was manned and soundings taken at intervals. The first several soundings recorded only that the water exceeded 100 fathoms in depth. Then at 7.15 a.m., when about 3 miles from the Island, bottom was found at 50 fathoms. The ship was then stopped and the trawl heaved over; a total of 75 fathoms of wire was paid out. The trawl was on board with a very rich catch at 8.30 a.m.

At 9.30 a.m., the ship was got under way at 3 knots and headed on a course N. 47° E., to clear the north end of the Island. Soundings with the Kelvin machine were taken at short intervals illustrating the very level nature of the bottom, the depth varying very little from 58 fathoms. At 10.35 a.m., further progress was arrested by pack-ice which invested the north end of the Island. The vessel was then one mile distant from the nearest point of the Island and 3½ miles from the north end. The ship was put about and headed south (true) at 3 knots, still taking soundings at frequent intervals. The height of the ice cliffs bounding the Island was determined as 125 feet and the height of the Island to the top of the ice-dome was found to be 1,200 feet or somewhat more. At 11.15 a.m., the speed was increased to 4 knots. At noon the observed position was 65° 46′ S., 92° 13′ E. At that time the ship was about 1 mile off the nearest part of the Island and the ends of the Island bore S. 56° E., and N. 23° E., respectively. The depth of the submarine platform from which Drygalski Island rises had been found to be remarkably uniform, but the noon sounding was 95 fathoms showing a deepening to the south.

Some Adelie Penguins were seen in the water during the morning. Killer Whales were in the vicinity of the ship at noon.

At 1 p.m., after making 5 miles due south since the noon observations, the bearing to the limits of the Island were N. 74° E., and N. 11° E., respectively. At 1.30 p.m., a Finner Whale swam close by the ship. The mainland was then clearly visible, also some large bergs could be seen located some miles to the south. Elsewhere all was open water. At 2 p.m., when 10 miles due south of the noon position, a sounding was taken with the Lucas machine finding 400 fathoms; the position was 65° 56′ S., 92° 12′ E. At this spot the bearings to the limits of the Island were N. 50° E., and N. 7° E., respectively. A few Snow Petrels and Cape Pigeons were about during this watch.

At 4 p.m., the ship was abreast of the northernmost of a line of icebergs, closely spaced, stretching to the south. At 4.20 p.m., when in 66° 7′ S., 92° 12′ E., a sounding found bottom at 425 fathoms. The angle subtended by Drygalski Island at this distance indicates a diameter of 10·5 miles. Continuing south, a great number of bergs were in sight all around the horizon to the south, east and west. Streams of drift-ice passed by occasionally. At 6.30 p.m., in 66° 18′ S., 92° 13′ E., a sounding taken recorded 505 fathoms. The course was then resumed (now south-by-east) towards the land at 5½ knots. The ship was then passing between great numbers of bergs and large pieces of drifting floes of bay-ice.

At 7.30 p.m., an Island discovered the previous season by our Western Base Party and named Haswell Island, in honour of Professor W. A. Haswell, of Sydney University, who was a member of our Antarctic Committee, came into view. A number of other rocky islets in the vicinity of Haswell Island also showed up. At this time Drygalski Island bore N. 7° E., and Haswell Island S. 64° E.

At 8 p.m., Penguins and Snow Petrels were about and fast bay-ice in sight to the south between the open water and the mainland. At 8.10 p.m., a sounding was taken in 66° 27′ S., 92° 19′ E., finding 233 fathoms of water. The ship's course was then directed eastwards along the margin of the bay-ice towards Haswell Island. By 10.20 p.m., the ship had reached the nearest point of approach to Haswell Island, but it was estimated to be still 10 miles or more east-south-east from the ship, separated by fast bay-ice. An isolated islet lying west of, and separated from the main group of islets which includes Haswell Island, was much nearer the ship, and only about 5 miles distant (Adams Island). The ship's position was 66° 28½′ S., 92° 27′ E.; the depth was found to be 210 fathoms. There the ship was made fast to the floe for the night.

As the bay-ice was cracked and evidently about to break up and as the ship was menaced by drift-ice which came between her and open water, it was deemed unwise to dispatch a party over the bay-ice to visit the islets. There was plenty of interest near at hand, however, for seals and penguins, both Adelie and Emperors, were distributed about on the bay-ice. A number of Emperor Penguins were obtained for specimens. The seals were mainly the Weddell variety but there were a few Crab-eaters along the margin of the bay-ice. The real trophy, however, was the discovery of a specimen of the rare Ross Seal. This was a male in a moulting condition. With the aid of glasses we could discern groups of Weddell Seals around mounded blow-holes scattered at intervals over the bay-ice; evidently in this locality they maintain existence on and under the fast bay-ice throughout the year.

As the ship lay against the bay-ice, Silver-grey Petrels and Wilson Petrels circled around interestedly, and one Skua Gull arrived searching for carrion.

January 22nd.—During the early morning hours the bay-ice began to disintegrate, large pieces constantly drifting out to sea. The weather was dull and overcast with occasional light falls of sago-snow. Killer Whales appeared around the ship at 9 a.m. On hauling up the fish-trap which had been down all night it was found to contain four good sized fish (*Notothenidae*) one of which had bunches of leeches in each gill.

At 10 a.m. all hands were employed icing ship to obtain fresh-water for the boilers. At noon the ship's position anchored to the bay-ice was reckoned to be 66° 28½′ S., 92° 42′ E. The compass bearing to Haswell Island was S. 6° E. and to the other out-lying islet S. 48° W. (in connection with these bearings the compass error was found to be about 65° W.)*

During the morning our investigation of the bay-ice and its inhabitants succeeded in locating and securing three more ma e and two female Ross Seals. Hunter found a single ectoparasite on one of the males, and McLean, examining their interiors, found nematodes, small tape-worms and a larger species of tape-worm on the alimentary tract. From the Emperor Penguins secured for skins I collected six specimens of mallophaga.

A small variety of whale with a medium sized fin spent some time sounding in the vicinity of the ship at noon. Birds other than Penguins seen during the morning were Silver-grey Petrels, Wilson Petrels and Skua Gulls.

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* Captain Davis placed the larger island 4 miles and the smaller one 3 miles distant from the ship.

By 2 p.m. icing ship was completed and the ice anchors broken out; the vessel was headed to the north, at first working a devious passage amongst numbers of bergs. At 4.48 p.m. the ship's observed position was 66° 17′ S., 92° 34′ E.; at this same time the bearing of each side of Drygalski Island was N. 40° E. and N. 12° W. respectively.

At 5.25 p.m. the observed position was 66° 13′ S., 92° 34′ E.; at the same time the bearings to Drygalski Island were: eastern point on north (true), western point N. 17° W. The bearing to Haswell Island was S. 27° E.

There had been a gentle east-by-north breeze earlier in the afternoon with smooth sea and the sky partially covered with strato-cumulus clouds; but after 6 p.m. the wind and sea increased. Silver-grey Petrels appeared in numbers in the evening. Great numbers of bergs were passed at 6 p.m. but by 8 p.m. they were mostly left to the southward. A course N. 45° E. was then being made. At 9.34 p.m. Drygalski Island was abeam bearing N. 35° W. At 11 p.m. when in 65° 58′ S., 93° 10′ E. a sounding of 360 fathoms was made. By midnight the sky was overcast and a strong east-north-east breeze blowing.

January 23rd.—In the early morning hours the wind and sea began to increase rapidly. By 4 a.m. a fresh gale from the east had raised a high sea. Captain Davis decided to head south-east towards an area of large bergs where shelter might be got in their lee. The ship was able to make only about 1 mile per hour headway.

A pair of Giant Petrels were seen during the morning. The strong gale and high sea continued all day, the ship groping its way to the south-east, pitching heavily, and shipping sprays and occasionally heavy water forward. Later in the day thick mist and snow set in, reducing visibility. By midnight the storm was at full gale strength and the ship was surrounded by bergs, making navigation very difficult.

January 24th.—The gale continued unabated. Captain Davis and the ships officers were taxed to the utmost to prevent disaster. Every few minutes the dim outlines of great bergs loomed through the driving snow and sleet, whilst the ship was almost unmanageable at times, owing to the force of the wind and the high seas running. At 1 a.m. the ship just managed to crawl past the weather face of a berg, without more damage than carrying away some of the rigging when the spars scraped the wall of ice.

At 9.30 a.m. the martingale carried away having struck some floating ice. This affected the staying of the foremast and as the ship was plunging violently something had to be done immediately. To effect this the ship was put about whilst relieving gear was being rigged on the bowsprit and jiboom. By 11.30 a.m. repairs were completed and the ship again headed into the wind.

At 4.40 p.m. the sun showed dimly; a longitude determination was made which placed the ship only about 10 miles west of the large grounded berg met with in 1912. This berg which was some 17 miles in length, was situated west of the Western Base Hut. As this would afford great shelter every effort was made to reach it.

During the evening the storm continued as a full gale with squalls of hurricane force. Gradually the effect of the grounded berg was felt in the lessening seas. By 11 p.m. the lee of this berg had been reached. Thereafter the gale continued without seriously troubling the ship, to the immense relief of everybody, more especially the ship's officers, for the ordeal of the two days past had been a severe strain upon them. Captain Davis had been on duty all the time and by his good seamanship backed by the ship's officers and others and by the help of Providence we had kept afloat.

A few Snow Petrels, Silver-grey Petrels and one Giant Petrel were the only birds seen during the day.

January 25th.—All day long the gale continued with snow falling periodically and a continuous sheet of drifting snow blowing off the great iceberg. The ship was kept close under the lee of the ice wall, steaming slowly backwards and forwards along its length. During the gale no accurate fix of the ship's position had been possible and there was some uncertainty as to whether the vessel was actually under the lee of the grounded berg or of the Shackleton Shelf. However, the sky cleared enough during the afternoon of this day to allow of a good longitude determination which gave 94° 22′ E., demonstrating that the ice wall at hand was that of the grounded berg.

During the day a few Silver-grey Petrels, Antarctic Petrels and Cape Pigeons were sighted and in the evening some Snow Petrels. Several whales were spouting near the ship in the morning. Seals were reported in the evening watch.

January 26th.—The ship remained all day under the lee of the berg as the gale was still blowing. The wind in the evening, became a gentle east-south-east breeze by 8 p.m. The ship steamed at slow speed up and down behind the berg. The noon position was ascertained as 66° 0′ S., 94° 22′ E. At 1.30 p.m. when at the north end of the sheltering berg, another large berg was in sight immediately to the west in the same latitude. As this corresponded with one observed in that same position in February, 1912, Captain Davis concluded that it was actually the same berg and therefore must be grounded. Occasional Snow Petrels and Silver-greys were observed during the day.

Bickerton and Hodgeman were occupied most of the day repairing the broken martingale. All other land party men who could be spared from scientific work, chiefly skinning and pickling zoological trophies, were engaged shifting coal in the hold. During the course of the Expedition, at all times when members of land parties were on board the ship, the established procedure was for them to act when required as auxiliaries to the regular officers and crew, undertaking any job from that of helmsman to fireman.

At 5.24 p.m. when a quarter of a mile west of the berg a good observation for position was made, namely, 66° 7′ S., 94° 23′ E. The ship then continued slowly south, still in the lee of the berg, arriving at the southern end at 8.40 p.m.; there in 66° 17′ S., 94° 20′ E. a sounding found 204 fathoms over a mud bottom. The southern end of the berg was frozen into bay-ice which continued unbroken to the land visible far to the south. Emperor Penguins, Adelie Penguins and many seals were in sight resting on the bay-ice.

As the depth was such that it was desirable to secure a haul of the bottom life at this place, I decided upon a trawling but as Captain Davis wished to defer operations until the morning the night hours were spent steaming at dead slow trailing a large tow-net at a depth below the surface.

January 27th.—Good weather at last; a clear sky and light south-easterly breeze. At 8.30 a.m. the large tow-net was hauled aboard and found to contain a quantity of crustaceans (krill), some small fish and jelly-fish. A sounding proved the depth to be 145 fathoms on rock bottom; position 66° 10′ S., 94° 20′ E.

The trawl was put over and with it rather much wire (300 fathoms) for a rock bottom and then instead of drifting, the vessel was steamed at slow. The cable jagged and tugged as the trawl was torn to pieces on the bottom. There was very little left of it when hauled up later. A sounding now disclosed the depth to be only 112 fathoms; position 66° 8′ S., 94° 17′ E. As we were very anxious to secure a sample of the life from a rock bottom at this depth, a small 30-inch bag dredge was lowered. This time only 140 fathoms of cable was paid out, and the ship merely left to drift for a very short while. When hauled up the dredge was found to be completely full of a rich haul, over seventy-five species of major forms of life being contained in it; lace corals were the dominant feature.

Tow nettings were made at the surface and at 75 fathoms. The result was an extremely rich haul of diatoms and small crustaceans.

The noon observed position was 66° 8′ S., 94° 17′ E. After trawling, the course was set to the north along the face of the berg. Penguins were observed in the water and Crab-eater Seals on passing floes. Killer Whales were encountered towards the northern end of the berg.

The north point of the berg was found to be in latitude 65° 54′ S. When this was reached at 3.10 p.m. a course was set for the Shackleton Shelf. On account of the heavy annual snow-fall, there seemed to be little hope of locating the Hut abandoned by Wild's party the year before. In the first twelve months it had been almost entirely buried by snow. It was decided therefore not to waste time searching for the Hut but to concentrate on delineating the outline, and studying the nature of the Shackleton Shelf.

The Shackleton Shelf was first sighted from aloft at 4 p.m. There was then perfectly open water on every hand, no bergs or pack-ice being visible excepting the berg recently left behind. At 4.45 p.m. the observed position was 65° 54′ S., 94° 41′ E.; we continued to make east (true) at 6½ knots. At 5.30 p.m. the Shackleton Shelf became visible from the deck. At 8.35 p.m., when 1 mile off the shelf-ice face in

65° 53′ S., 95° 18′ E., the depth by sounding was found to be 328 fathoms. A vertical series of sea water temperatures was taken here. The ice wall of the shelf-ice here was estimated at 80 feet high. Seals, penguins and whales were swimming in the vicinity of the ship at different times in the late afternoon. Snow Petrels were seen in some numbers in the evening.

At 9.30 p.m. there was a light shower of snow in tiny six-rayed stars. At midnight we were steaming at half speed northward along the ice wall of the shelf; there was a light easterly breeze and the sky overcast.

January 28th.—The course northward was continued at half speed until 6 a.m. when the vessel was stopped and left to drift. During all this time the ice wall had trended due north. Occasional showers of snow had fallen. A school of Killer Whales, some Weddell Seals, some Snow Petrels and several Antarctic Petrels and Wilson Petrels had been observed. At 7.48 a.m. in 65° 31′ S., 95° 18′ E. a sounding of 225 fathoms was taken.

At 8 a.m. the course northward along the ice wall was continued, the trend being north-north-east. At 10.5 a.m. in 65° 19½′ S., 95° 27′ E. a sounding of 240 fathoms was taken. Killer Whales were about the ship at this time. At 11.30 a.m. a new Monegasque trawl having been bent on to the dredging cable, it was streamed whilst steaming at slow speed northward along the ice face. It was on board again at 1.10 p.m. with a good haul rich in fish and ophiuroids. Unfortunately, a rare stalked crinoid fell out of the dredge into the sea and was lost.

The noon observed position was 65° 18½′ S., 95° 27′ E. During the early afternoon patches of drift ice were occasionally met. Killer Whales, Snow Petrels, Antarctic Petrels, Wilson Petrels and a Giant Petrel were about. The shelf-ice ahead could be seen to take a turn to the east. At 4 p.m. a school of Killer Whales passed by. Shortly afterwards a Crab-eater Seal and a Giant Petrel were sighted on a passing floe. At 4.40 p.m. the ship was headed round to east-north-east following the shelf-ice. At 5.30 p.m. in 65° 8′ S., 95° 43′ E. a sounding of 252 fathoms was taken. We then continued around to the eastward following the shelf-ice wall. At 7.40 p.m. a sounding in 65° 7′ S., 96° 3′ E. found 320 fathoms. The height of the ice wall noticeably diminished as we proceeded along to the east. In this area belts of open water alternated with areas of drift-ice and loose pack. At 8.20 p.m. the ice face, which was then estimated to be only 35 feet high, took a turn to the north-east-by-east. At 9 p.m. we had reached the head of an embayment. The shelf-ice formation which we had been following all day could be seen stretching to the east-north-east. Other high ice formations lay to the north and to the north-north-east. Uniting these several otherwise detached masses was thick old bay-ice from 6 feet to 12 feet thick above sea-level. This was constituted of consolidated pack-ice built up by accumulated snow falls, but still showing hillocks and irregularities where there had been heavier elements of the original pack. The bad light and mistiness limited vision to a comparatively short radius.

At 9 p.m. the engines were stopped and the ship allowed to drift to leeward. Numbers of seals were asleep on the thick bay-ice. Several that we approached closely were seen to be Sea-leopards. Small companies of Finner Whales were sighted on several occasions during the day. At midnight the wind was coming in gently from the east-north-east, sky heavily overcast and light snow falling.

January 29th.—The ship was allowed to drift all night. There was a gentle east-north-east breeze and fairly continuous snow after 12.30 a.m. until 9 a.m. when the weather cleared somewhat. At 9.10 a.m. the ship was got under way and steamed in towards the thick bay-ice met with the previous night. A sounding of 325 fathoms was taken in 65° 6′ S., 96° 13′ E. At 9.55 a.m. the trawl was streamed whilst the ship steamed slowly out of the bay. The catch in the trawl was largely ooze but there was also an interesting assortment of creatures amongst which fish figured notably.

The noon observed position was 65° 5′ S., 96° 8′ E. Snow began to fall again in the afternoon, most of which was spent in drifting slowly west, towing a large open net at a depth of about 50 fathoms.

Snow Petrels, Antarctic Petrels and Emperor Penguins were about the ship during the day. A school of Killer Whales passed by at 3.30 p.m. There was much snow and mist about 4 p.m. but by 5 p.m. it had begun to take off. Late in the afternoon the ship was steamed up to the thick bay-ice at the head of

the bay, where at 6.30 p.m. she was made fast with ice anchors awaiting an improvement in the weather. The ship's position was fixed by observations as 64° 58′ S., 96° 13′ E.; here a sounding established the depth as 350 fathoms.

Several groups of Emperor Penguins, each of about 20 birds, were standing about on the thick bay-ice, some near the ice-front, others half a mile or more back from the sea. Nearly all these birds were in good condition and only a few moulting. There were a few Adelies about also. Snow Petrels, a Wilson Petrel, a Giant Petrel and a Skua visited the ship during the evening. We witnessed a very interesting chase of three Crab-eater Seals by a fine 12 ft. long Sea-leopard; this hunt remained in sight for about an hour. The Leopard did its best to catch one of the Crab-eaters, chasing them around the ship as she lay head on to the bay-ice. The Crab-eaters were terrified. Time after time they huddled together in very shallow water on an eroded ledge on the seaward face of the bay-ice. Then, upon the Sea-leopard again locating and approaching them, they would bolt, escaping by diving down under the bay-ice, disappearing from view for a time. There is no doubt that these animals do prey on the other seals. Many of the scars so common on Crab-eater Seals are probably due to the Sea-leopards; others are no doubt caused by Killer Whales.

The Shackleton Shelf apparently terminated just south of the ship. The high ice formations to the north and to the east, forming the embayment occupied by thick bay-ice, were of quite unusual form. These may have been great grounded bergs curiously weathered or, what seemed more likely, formations accumulated on consolidated pack (incorporating bergs) of many year's standing, in part grounded or else centred around rock pinnacles. Some hummocky masses located well to the east suggested ice-encased islets but the existence of such, though suspected, was not definitely ascertained.

To the east a black patch on undulating ice against one of these masses suggested an outcrop of rock. However, when examined through a powerful telescope this proved to be a mass of Emperor Penguins. They were observed standing about over a considerable area and the mob appeared to extend behind a snow rise. So the total area occupied by birds may have been much greater than that within view. I judged that there was not less than half an acre of birds in sight and that the distance away was probably about 10 miles. I was convinced that we had discovered another rookery of these royal birds. In the distance, still further east, to the left of the Penguins as seen from the crow's nest was another black patch which may have been rock, though possibly Penguins still further away.

I set out with Madigan and Hodgeman to walk east across the thick bay-ice to investigate the island-like ice formations and the Emperor Penguins. But we found that these objects were further away than was at first apparent. After we had walked a couple of miles, snow began to fall and we had reluctantly to return to the ship, without finally settling the doubtful questions. It appeared likely, however, that one or more of the ice formations then in view is actually an island.

With the fish-trap lowered to the bottom (350 fathoms) beneath the bows, the ship remained tied up to the ice all night.

January 30th.—The snow ceased later, and there was a steady improvement in the weather, as the day advanced. Killer Whales, seals, Antarctic Petrels and Wilson Petrels were about during the early morning hours; also Emperor Penguins, Adelies and Skuas were on the bay-ice.

At 8.30 a.m. the fish-trap was hauled up and found to contain one queer shaped fish and some crustaceans. At 9.20 a.m. we cast off and proceeded north-west along the face of the high ice formation which lay to the north of the thick bay-ice. As we progressed the trend of the ice-face turned more to the north. At 10.30 a.m. when about one-third of a mile distant from the ice-face, a huge section, many thousands of tons in weight, broke away abeam of the ship just at the moment of our passing by. The disruption, the roar and the commotion of the water were sights and sounds that held us spellbound.

Great numbers of immense grounded bergs were encountered thickly distributed over the waters traversed during the morning. By 11.15 a.m. the ice cliffs abeam were trending to the north-north-east. The noon position was 64° 53′ S., 95° 59′ E.; we were then close in under the ice cliff where a sounding found 370 fathoms of water on a mud bottom.

Killer Whales were about during the early afternoon; also Snow Petrels and one Giant Petrel made their appearance; numbers of Crab-eater Seals and some Sea-leopards basking on ice rafts were passed.

At 2.45 p.m. the ship was stopped for sounding (110 fathoms) in 64° 42′ S., 96° 10′ E. Masses of grounded bergs were about and through these a passage was found making about east-north-east. At 7 p.m. we were following a face of fast bay-ice, and off-lying bergs were becoming much fewer. Further progress to the east was halted at 10.40 p.m. by fast bay-ice; to this the ship was anchored for the night. The position at this point was 64° 44′ S., 97° 29′ E.; a sounding made here gave the depth as 358 fathoms. At this time the light was poor, limiting vision; all that could be seen was a wide stretch of very low bay-ice with occasional bergs frozen fast in it, bounded on the north and north-east by what appeared to be an immense berg. Emperor and Adelie Penguins and seals were distributed over this bay-ice.

January 31*st*.—The weather remained good with only a light breeze from the south-south-east. At 9 a.m. Hurley, Madigan, Bickerton and Blake were left on the bay-ice to photograph seals and to secure skins whilst the ship steamed out into the bay for a dredging. The haul was only a small one, apparently owing to the fact that the bottom deepened as the ship proceeded out into the bay and the length of rope paid out was scarcely sufficient to get the best results.

The noon position was 64° 40′ S., 97° 22′ E. At 12.30 p.m. those on the bay-ice were picked up. They had found the seals to be all Weddells; numerous Emperor Penguins and some Adelies had come under their notice. The ship then steamed northward along the ice-face. At 3 p.m. a sounding of 110 fathoms was made in 64° 33½′ S., 97° 21′ E. The trawl was then lowered to the bottom, the ship continuing slowly on its course along the ice-wall face. Again closely packed bergs were encountered. The trawl was hoisted up empty at 4.40 p.m. apparently it had not touched bottom.

At 4.49 p.m. the ship's position was observed to be 64° 32½′ S., 97° 20′ E. and a sounding gave the depth as 107 fathoms, on a hard, apparently, rock bottom. The trawl was again lowered and at 6.50 p.m. was brought on board with a very large haul, the large net bag being entirely full. Another sounding at 6.10 p.m. found a bottom at 103 fathoms, thus there is a large area thereabouts of a very uniform depth. A vertical series of water temperatures was taken here.

In the evening a moderate easterly breeze sprang up and light snow fell from an overcast sky. The ship was allowed to drift slowly to westward. Snow Petrels were observed from time to time during the day and in the evening some Wilson Petrels and a Giant Petrel were seen.

February 1*st*.—The ship remained drifting off "Termination Tongue," as this northernmost extension beyond the Shackleton Shelf had been named by Captain Davis when he first discovered it in February, 1912. Squally wind and occasional snow showers were encountered this morning.

At 6.20 a.m. the depth was found to be 130 fathoms. The ship had by then drifted considerably to the west of the "barrier" face and was in 64° 26½′ S., 97° 6′ E. The journey north was then resumed. Numbers of bergs were still about. At about 11 a.m. the "barrier" face was observed to trend away to the east-south-east being lost to sight behind thickly studded bergs.

At noon the ship was alongside bay-ice attached to Termination Tongue near its southern end; the position was 64° 26′ S., 97° 45′ E.

From this point the "barrier" formation of further south (the Shackleton Shelf and attachments) could be seen to terminate, turning away to the south and east at a point about 2½ miles from the ship on a bearing S. 55° E. At the same time the wall of Termination Tongue could be seen to run away in a south-east-by-east direction as far as the eye could reach. The estimated distance, as far as could be judged, of the disappearing point being 15 miles between the bearings of the two "barrier" faces. Even with the aid of a powerful telescope nothing could be seen between the two faces but flat bay-ice with occasional bergs frozen into it. A sounding at the noon position gave 214 fathoms. There were quite a number of Weddell Seals and Emperor Penguins in sight on the bay-ice.

At 12.5 p.m. the ship was headed N. 54° W. along the face of Termination Tongue. Snow Petrels, Antarctic Petrels and Penguins were about. At 5.17 p.m. the ship's position was 64° 8½′ S., 97° 3′ E. As the evening approached the weather became dull and there was some snow falling. At 7.30 p.m. the last

visible point of Termination Tongue was about ¾ mile away on a bearing N. 43° W.; the ship's position was then 64° 0′ S., 96° 55′ E. The depth was found to be 1,355 fathoms. The vessel was allowed to drift in misty weather. Several Crab-eater Seals and one Sea-leopard were sighted on floes during the evening. At 11.20 p.m. we got under way and steamed slowly south, keeping in touch with the wall of Termination Tongue. The birds sighted were two Giant Petrels and five Terns.

February 2nd.—The mean of several star observations at 12.12 a.m. when in dead reckoning lat. 64° 2′ S., placed the ship in 97° 2½′ E. The nearest point of the " barrier " ice wall of Termination Tongue was then 1½ miles distant and the last visible north point of the Tongue bore N. 36° W. (true).

During the early morning hours there was a moderate south-west-by-south breeze blowing. The ship steamed slowly south and then back north again. At 8 a.m. the speed was increased to full, making a N. 20° W. course. Very soon a little pack came in sight.

At noon there was a fresh south-south-west breeze, fine clear weather, and blue sky. The ship's position by observation was 63° 56′ S., 96° 40′ E. The nearest point of Termination Tongue was about 2 miles distant. The bearing of the north end of Termination Tongue was N. 16° W. and the last visible southern point S. 55° E. The drift-ice encountered after noon was so closely packed that speed had to be reduced to a half. Heavy pack-ice lay to the west. At 1.30 p.m. the ship was gradually forcing its way through a barrage of huge floes. Adelie Penguins and Weddell Seals were about. Good open water was eventually reached alongside the " barrier." All around the northern end of the Tongue was a fringe of fast ice sometimes standing out from the " barrier " as much as a quarter of a mile; this was heaped and irregular, composed of pack consolidated under heavy lateral pressure.

When the ship was off the north-west point of the Tongue a strong current was observed to be sweeping around in a north-north-east direction : it was obvious and rapid, carrying small pieces of ice with it. This was probably a back swirl actuated by a steady set to the west from east around the end of the Tongue. At 4 p.m. when just off the end of the Tongue a sounding of 1,170 fathoms was obtained in 63° 47′ S., 96° 58′ E.

At 4.30 p.m. a course was set down the east side of the Tongue. After proceeding for some distance down open lanes amongst the pack it was deemed unwise to risk being caught on the exposed side of Termination Tongue. Accordingly at 5.40 p.m. the ship was turned about to retrace its track back into the Davis Sea. However, the pack had closed up considerably making progress very slow. Thick weather with snow falling in large flakes set in at 7 p.m. Very few birds were seen this day, only Snow Petrels. Of seals only several Crab-eaters were reported.

February 3rd.—In thick weather with frequent snow showers the ship remained drifting until 4.10 a.m., when she was got under way, continuing the return journey to the west around the end of Termination Tongue. During the early morning hours, between snow showers, the Tongue had been within sight. The ship was amongst scattered pack with very heavy pack all round to the east, north and north-west. To the south-west the ice-blink was less marked, Seals and Penguins were about; also numbers of Snow Petrels and a few Wilson Petrels.

At 8 a.m., the ship was within 3 miles of the north-west corner of Termination Tongue and heading for it. Very heavy pack had been encountered, some of the floes standing 10 feet out of the water. The pack slackened as we approached the north-west corner of the Tongue, which latter was abeam at 11 a.m. A course was then set towards a more open area in the south-by-west.

The noon position by dead reckoning was 63° 54½′ S., 95° 35′ E. There was at that time a gentle south-east breeze but misty and overcast. Clearer water was reached at 1 p.m., when the main pack lay to the west, with fairly clear water to the south and to the east, in which latter direction could be seen the wall of Termination Tongue. Whales were spouting all round the horizon; numbers of Snow Petrels and Cape Pigeons were about. Tow-nettings were conducted both at the surface and at 10 fathoms. The catch in the former case was very poor, but the latter yielded a very rich haul of diatoms and copepods.

At 4 p.m., the sky had cleared and a light southerly breeze was blowing. We were now in quite easy water but the belt of heavy pack to the west barred our escape from the Davis Sea. In search of a passage northwards through the pack we were driven in a general south-westerly direction. At 5.15 p.m., the position was 64° 20½′ S., 96° 35′ E. During this watch many whales were seen, and Crab-eater Seals in great numbers floated by on passing floes; Antarctic Petrels and numbers of Snow Petrels and some Silver-grey Petrels were about.

Late in the evening several large bergs were passed. Auroral lights were visible at 11 p.m. The midnight observations record Emperor Penguins, white-throat Adelie Penguins and some seals all floating by on ice rafts; also Terns circled around the crow's nest uttering their peculiar cry.

February 4th.—The vessel continued making south and west as the ice permitted. Scattered pack lay all around with some belts of heavy pack. At 3 a.m., gorgeous sunrise tints appeared in the sky; a light south-west breeze, with clear but cloudy weather. At 4 a.m., Snow Petrels, Terns, Wilson Petrels and a Giant Petrel were sighted during the watch. At 5 a.m., several large bergs were passed. At 9 a.m., some sleet and snow fell.

The pack had become so scattered that at 9.30 a.m. the ship was stood to the north into the pack, hoping to force a passage through, but by 10.45 a.m. progress was held up by heavy pack, and the attempt was abandoned. A search for an opening through the pack was again resumed in a south-westerly direction. Snow Petrels and Antarctic Petrels were seen during the watch.

The noon position was 64° 41′ S., 94° 4′ E. The ship was headed off to the south-south-east, at intervals passing bergs some of which were very old and worn. Very large pieces of drifting bay-ice went past. On these rafts of ice were young Adelie Penguins and occasionally Emperor Penguins, also numbers of Crab-eater Seals but rarely a Weddell Seal or a Sea-leopard. A Giant Petrel, some Wilson Petrels, and Terns were sighted. Seven Adelie Penguins were sighted on a snow slope near the top of a berg.

A noticeable feature of this inside (southern) margin of the pack encircling the Davis Sea is that the ice masses are heavier and more solid than those of the northern margin where in summer time they are disintegrating.

The ship's position at 5.21 p.m. was 65° 6′ S., 94° 10′ E. A school of Killer Whales passed by. At 8 p.m., the edge of loose pack was followed to the west; occasional bergs were passed. At this time no flying birds were visible but numbers of seals and penguins were to be seen on the ice; Finner Whales were in sight; at midnight there was a strong water-sky to the west and north-west. Large bergs were distributed at intervals through the pack encountered this afternoon.

February 5th.—During the early hours a course was being made at slow speed to the south and south-west along the edge of scattered pack-ice. A school of Finner Whales was passed and Crab-eater Seals were plentiful on the drift-ice. A general absence of birds was noted. A water-sky low on the western horizon gave promise of a passage to the north side of the pack. At 2 a.m., there was no sign of Drygalski Island though the ship was but 20 miles off it.

At 6.45 a.m., Drygalski Island came into view bearing S. 20° W. (true), and from the north end of it could be seen a long line of bergs extended to the north to meet the pack. At 10 a.m., the mainland was faintly visible to the south-east. Finner Whales and Penguins were again observed in the forenoon.

The noon observed position was 65° 45′ S., 91° 43′ E.; and from there, bearings to the ends of Drygalski Island were S. 75° E., and N. 72° E., respectively. A sounding made here gave the depth as 265 fathoms on a mud bottom. The ship remained drifting while repairs to the engines were being effected. At 1 p.m., whales were spouting around the ship, and several Wilson Petrels were about. The air was quite calm during the afternoon but the ship was observed to be drifting a little to the east-south-east towards the Island. At 4.40 p.m., when in 65° 46½′ S., 91° 47′ E., a sounding gave 265 fathoms. A tow-net working between the surface and 50 fathoms obtained a very rich catch of diatoms; also a pyrosma and a salp.

HOMEWARD BOUND.

At 5 p.m., on February 5th, engine repairs having been completed, a course was set to N. 64° W., through scattered ice. Wilson Petrels, Snow Petrels and Antarctic Petrels were about.

At 7 p.m., loose pack was entered with the intention of pushing through to the north side of the pack, for the absence of any hard blink to the west-north-west indicated that it was negotiable in that direction. Emperor Penguins, Adelie Penguins (mainly white-throats), Crab-eater Seals and some Sea-leopards were passed. Bergs both large and small were distributed through the pack. At 11 p.m., the ship was stopped in loose pack and allowed to drift awaiting daylight. Surface sea-water temperature at midnight was 29·5° F.

February 6th.—Clear weather but with overcast sky and with a light breeze from the south-east. We got under way at 2 a.m. and continued pushing through to the westward. Belts of heavy pack were encountered at intervals during the early morning hours. Penguins, seals and Snow Petrels, Antarctic Petrels and Wilson Petrels were about. The vessel continued pushing through heavy pack, during the forenoon, making about one mile per hour. The noon observed position was 65° 19½′ S., 90° 16′ E.

By 4 p.m. the pack was loose and a little ahead, to the north-north-west, it was seen to be quite open and scattered. Blue Whales were blowing at intervals through this scattered pack. Whilst negotiating the pack during the day Hunter recorded sighting " a dozen Emperors and about as many Adelies; also several Antarctics, numerous Snows (a flock of twenty on one piece of ice) and several Wilsons. Also numerous Crab-eaters and a few Sea-leopards. The Crab-eaters were often in pairs but the Leopards invariably singly. The Crab-eaters were silvery-white but quite a number were quite dark brown dorsally passing to silvery-white ventrally."

The ship's position at 5 p.m. was 65° 13′ S., 89° 56′ E. We were then in brash-ice near the margin of the pack. By 6 p.m. we were clear of all ice and steaming north in open water. In the open water north of the pack a number of birds were seen during the evenings, including Antarctic, Wilson and Snow Petrels, also Cape Pigeons, several Prions and a Giant Petrel. Only two icebergs were passed during the evening hours.

Though at an earlier stage in the voyage we had had hopes of getting as far west as Enderby Land to verify Biscoe's landfall, now, on account of the depletion of our coal supply, we decided reluctantly to end our explorations and make for Australia. The surface sea-water temperature at midnight was 33·6° F.

February 7th.—The ship continued on a northerly course at 6 knots with a moderate south-west-by-south breeze. During the morning a few Antarctic Petrels, some Wilson Petrels, numerous Snow Petrels and Cape Pigeons and flocks of Mutton Birds were sighted. Occasional small bergs were within sight near the horizon. Finner Whales were in evidence during the morning. The observed noon position was 63° 28½′ S., 90° 22′ E. Mutton Birds, Cape Pigeons, occasional Wilson Petrels and several Cape Hens were recorded during the afternoon. At 6 p.m. a sounding of 2,120 fathoms was made in 62° 55½′ S., 90° 28′ E. Tow-netting at the surface yielded a yellow mass, mainly diatoms: at 25 fathoms the tow-net captured copepods, radiolaria and diatoms. The surface sea-water temperature at midnight was 35·1° F. Several small bergs were visible around the horizon.

February 8th.—Making N. 8° E. at 6 knots. Several bergs were visible around the horizon at daylight. Cape Pigeons and Mutton Birds were about. A squally fresh south-west-by-west wind and misty rain and snow, becoming clearer later in the day.

During the morning a good many large and some small bergs were passed. The observed noon position was 61° 24½′ S., 90° 57′ E. Many birds about including Cape Pigeons, numerous Cape Hens, Wilson Petrels, Prions, a few Mutton Birds, a couple of Sooty Albatrosses and a fine Snowy Albatross.

Scattered bergs (Plate XXXIV, Fig. 1) and a good deal of small ice were passed during the afternoon. The wind backed into the north-west-by-north during the afternoon; as a consequence all square sail was made fast at 5 p.m. A great number of bergs were passed during the first watch. Several whales of a small type were reported.

February 9th.—The day commenced with a fresh north-north-west breeze which later backed into north-east-by-north; overcast and at times thick mist and rain. A moderate number of bergs were in sight all day long. The noon position was 59° 35′ S., 90° 58′ E. Birds were not so numerous to-day; there were recorded Prions, Cape Hens, Wilson Petrels and a Sooty Albatross.

February 10th.—The day commenced with a north-east-by-east gale and steady rain. Icebergs were still about. The noon position was 58° 56½′ S., 93° 15′ E. The birds recorded by Hunter are "two large Snowy Albatrosses, numerous Prions, a Skua, a few Mutton Birds, a Mother Carey's Chicken, several Wilson Petrels, Cape Hens, Cape Pigeons and several brown Petrels (wings dark brown above and virtually white below)." Icebergs were constantly appearing on the horizon. At 11.45 p.m. there were seven bergs in sight. A tow-netting secured a rich haul of diatoms.

February 11th.—Ship making to the north-east, and later to the north-north-east-by-north, rolling heavily to a long north-west swell. Several bergs were in sight at daybreak, and others were passed later in the morning. Albatrosses of all kinds, including Wanderers, Mollymawks, and Sooties were following the ship at 8 a.m. Also at various times during the morning Cape Hens, Storm Petrels and Wilson Petrels were sighted.

The observed noon position was 57° 40′ S., 95° 16′ E. There was a distinctly warmer feeling in the atmosphere to-day. Bergs were continually in sight; at 3 p.m. twenty-four bergs could be seen. Cape Hens, Wilson Petrels, Prions and two brown Petrels were about the ship during the afternoon. Seven icebergs and several small pieces of ice were passed on the 8 p.m. to 12 p.m. watch. A piece of floating kelp was passed to-day. Wireless messages from ships in Australian waters were picked up to-night.

February 12th.—The ship headed to the N. 6° E. with a strong south-west breeze behind. Several small pieces of ice passed in the 12 a.m. to 4 a.m. watch but none were met later in the day except one small berg in sight at noon. This was the last ice seen on the voyage. A great number of birds followed the ship today including Wanderers, Black-browed and Sooty Albatrosses, also Wilson Petrels, Storm Petrels, Cape Hens, Prions, an unidentified Petrel, and a Cape Pigeon.

The observed noon position was 56° 17′ S., 95° 27′ E. At 4 p.m. the sea-water temperature was found to have risen notably (38·6° F.). A sounding of 2,190 fathoms was made at 4 p.m. when in 48° 45′ S., 96° 11′ E. During the evening the wind freshened and backed to the north-west, accompanied by frequent rain squalls and a high westerly sea. Several pieces of floating kelp were passed. Whilst sounding, two lots of tow-nets were lost by the line fouling the propeller.

February 13th.—A strong north-westerly gale blew all day long with rain, snow and hail squalls. By noon the surface sea-water temperature had risen to 40° F. Numbers of birds followed the ship all day. Hunter recorded several Wandering Albatrosses, three Black-browed Albatrosses, several Storm Petrels, two Wilson Petrels, numerous Prions of two kinds and numerous Cape Hens and Grey-backed Petrels.

The noon position by observation was 53° 5′ S., 98° 44′ E. The ship was making 8 knots with all sail set.

February 14th.—A fresh westerly gale continued all day but moderated somewhat by the evening; occasional hail squalls and some showers of rain at intervals and a very high sea running. Dolphins were seen during the morning; Hunter records that one of these (piebald, white band in front and behind the fore flipper) swam alongside and dived under the vessel during most of the morning; also that the First Mate reported having seen a similar one yesterday.

There were plenty of birds in sight today, Hunter's list including numerous Grey-backed Petrels, several Wilson Petrels, several Wanderers and Black-browed Albatrosses, one Sooty Albatross and numerous Prions (of two kinds, mainly *P. banksii*); also odd Cape Hens and Cape Pigeons were about.

The observed noon position was 51° 25′ S., 103° 35′ E. Auroral lights were visible in the south-south-east at 9.30 p.m.

February 15*th.*—The weather had moderated considerably to a fresh westerly breeze with frequent rain showers. Four Dolphins, similar to those seen yesterday, were alongside this morning.

Fewer birds were about to-day; mostly Grey-backed Petrels with a few Prions, a Wilson Petrel, a Cape Hen and two Black-browed Albatrosses.

The noon observed position was 49° 48′ S., 107° 6′ E. The ship proceeded under sail alone for six hours during the afternoon whilst the engines were being repaired. A whale spouting in the distance was noted after noon. A sounding of 1,780 fathoms was taken at 4.13 p.m. in lat. 49° 28′ S., long. 107° 39′ E. Wireless signals were strong to-night.

February 16*th.*—A south-westerly gale continued most of the day, the ship with all sails set making good headway. There was a marked rise in the surface water temperature to-day, it being 47° F. by 4 p.m., so evidently the northern limit of the Antarctic surface water is located about here. The air temperature was observed to be much more genial to-day.

The noon observed position was 48° 5′ S., 110° 9′ E. More birds than usual were about. There were plenty of Grey-backed Petrels, several Cape Hens and Mother Carey's Chickens, numbers of Prions, some Black-browed Albatrosses, a Sooty Albatross and a Wanderer. Wireless signals were very strong to-night.

February 17*th.*—A fresh to strong west-south-west gale and sea, causing the ship to roll a good deal at times. Lots of floating kelp was passed at intervals during the day. A further rapid rise in sea-water temperature noted to-day to 51° F.: weather slightly misty and atmosphere very damp. Great numbers of birds about this day but of the same species as recorded yesterday. The observed noon position was 46° 8½′ S., 113° 44′ E.

February 18*th.*—The wind fell off considerably. Birds were numerous about the ship. Hunter recorded plenty of Grey-backed Petrels, a few Prions, a Skua Gull, a Cape Pigeon, two Mother Carey's Chickens, numerous Black-browed Albatrosses, a Sooty and six Wandering Albatrosses. The noon observed position was 44° 19′ S., 117° 0′ E. At 3 p.m. a sounding of 2,600 fathoms was taken in 44° 10′ S., 117° 20′ E. The wireless signals of shipping in Australian waters were heard tonight and henceforth regularly.

February 19*th.*—The day began with calm weather but ended with a strong north-west-by-west breeze blowing; fine clear weather. The noon position was 43° 5′ S., 119° 31′ E., The ship was now heading for Cape Borda with a view to making Adelaide the first port of call.

The birds sighted to-day were Sooty, Black-browed and Wandering Albatrosses; also Grey-backed Petrels and a few Mother Carey's Chickens.

February 20*th.*—Fresh south-south-west weather continued with rain squalls at intervals. The noon position was 41° 24′ S., 122° 58′ E. Several Black-browed and Wandering Albatrosses were in sight most of the day; also there were a few Grey-backed Petrels about and an odd Mutton Bird and Mother Carey's Chicken.

February 21*st.*—A good steady fresh west-south-west breeze continued all day: fine clear weather with blue sky. The noon position was 40° 4′ S., 125° 51′ E. A fine four-masted barque in full sail, the *Archibald Russell* from Buenos Aires bound for Cape Borda, overtook and passed the *Aurora* in the early afternoon. We exchanged signals.

Few birds were in sight to-day; they included a Sooty, some Black-browed and some Wandering Albatrosses, several Mutton Birds and an odd large Grey-backed Petrel and Mother Carey's Chicken. Rain squalls in the late evening.

February 22*nd.*—A strong south-westerly sailing breeze continued all day. Frequent rain showers fell in the early morning hours. The ship rolled a good deal owing to her now very light state, as the coal supply, which had been our main ballast, was now nearly all consumed. The noon position was 38° 33′ S., 129° 20′ E., distant 385 miles from Cape Borda. The birds in sight today were principally a pair of Wandering Albatrosses and several of the Black-browed variety.

February 23rd.—Good weather with a gentle westerly breeze. The noon position was 37° 13′ S., 132° 10′ E.; distant 231 miles from Cape Borda. Soon after noon the s.s. *New Field* overtook and passed us. Again birds not very numerous, Black-browed and Wandering Albatrosses being the most obvious. The sea water was notably phosphorescent in the evening. A final concert was this night held in the ward-room.

February 24*th*.—The day commenced with a gentle southerly breeze which later went into the south-south-east; weather cloudy with some rain showers. The large trawl was got ready for a final trawling. At 8 a.m. a piece of timber floated by.

A sounding of 1,800 fathoms on globigerina ooze was recorded at 8.50 a.m. in 35° 56′ S., 134° 14′ E. At 11 a.m. the trawl was streamed, reaching bottom at noon with 2,600 fathoms of wire out. The noon position was 35° 55′ S., 134° 18′ E.

At 2 p.m. a commencement was made to haul in the trawl, and it arrived on deck at 7 p.m. with a small but interesting haul. There were few birds about this day; they included several Wandering Albatrosses and Black-browed Albatrosses and some Mutton Birds. A Wandering Albatross was caught on a line whilst dredging operations were in progress.

February 25*th*.—In good weather we continued at slow speed on a course to pass 10 miles clear of Cape Borda. A few birds were about, the same as yesterday in respect to species. The high land near Cape Borda came in sight at 12.15 p.m. At 5.40 p.m. the Cape Borda lighthouse was abeam, 9 miles distant.

February 26*th*.—We continued up St. Vincent's Gulf in good weather. At 3.10 p.m. the *Aurora* had arrived off the Semaphore. There the Harbour authorities, several friends and press representatives came alongside in a tender (Plate XXXIV, Fig. 2). I went ashore in a special tender with the Hon. John Lewis, the President of the South Australian Branch of the Royal Geographical Society of Australia. Captain Davis steamed the *Aurora* up the river to Port Adelaide, arriving at the wharf at 5.45 p.m.

The following day, members of the land party staff disbanded for their respective destinations. On February 28th Captain Davis departed, taking the *Aurora* to Hobart where she arrived on March 9th. The officers and crew were then paid off and the ship anchored in the Derwent River where she remained until late in the year, when she was acquired by Sir Ernest Shackleton to transport the Ross Sea party his British Trans-Antarctic Expedition.*

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* Captain Stenhouse of the Shackleton Expedition attempted to winter the vessel in McMurdo Sound the following year, but it broke away in a gale in the middle of winter (1915) and drifted in the pack-ice for about nine months suffering considerable damage. Breaking out of the pack the following summer, at a point north-west of the Balleny Islands, the *Aurora*, fitted with a jury rudder, safely reached New Zealand under Captain Stenhouse's able handling.

The Australian and New Zealand Governments then jointly shared the cost of repairing the vessel and in the summer of 1916-1917 despatched her south in command of Captain J. K. Davis to repatriate the survivors of the party marooned at McMurdo Sound. On the return of the *Aurora* to New Zealand, she was sold by Sir Ernest Shackleton to a trading concern, Messrs. W. P. Grace & Co., of New York. Shortly afterwards, on June 20th, she sailed from Newcastle (N.S.W.) for Iquique, intending to call at Wellington (N.Z.) for water and stores. Nothing further was heard of the ship or crew beyond the fact that on December 5th, 1917, the Master of the *Coombar* of the North Coast Steam Navigation Co. Ltd., picked up a lifebuoy in lat. 31° 22′ S., longt. 153° 6′ E., the under side of which was covered with small barnacles but the lettering "*S.Y. Aurora*" was quite distinct; and with the lettering "I.T.A.E." (Imperial Trans-Antarctic Expedition) underneath. As the raider *Wolf* had laid minefields in the neighbourhood of New Zealand in June, 1917, it is probable that the *Aurora* was sunk by a mine.

OPERATIONS AND EXPLORATIONS OF THE MAIN BASE PARTY

WORK AT THE MAIN BASE STATION.

ESTABLISHING THE MAIN BASE STATION.

At 10 p.m., after the departure of the *Aurora* on the evening of January 19th, 1911, the Party of eighteen souls, who were to man the Main Base Station, stepped ashore from the whale-boat at the Boat Harbour, Cape Denison. For the next few days our entire efforts were directed to the erection of a living hut. This was in the form of one large square room, 24 feet by 24 feet, surrounded on three sides by an enclosed verandah, (Text Figs. 8 & 9). The structure was designed to be erected with the unprotected side facing north away from the direction of prevailing winds. The roof, pyramidal in form, extended down to within 5 feet of the ground, being terminated by the external walls of the verandah enclosure. The long pyramidal roof bounded by low vertical walls on the three windward sides was calculated to give great stability. The enclosed verandah was designed to be used as a store and would help to insulate the living-room within. Entrance to the Hut was by a door on the lee side. The only windows were in the roof, one in each of the pyramidal faces; this situation was selected for it was a certainty that the building would be more or less buried under snow for at least most of the year.

The hut timbers had been cut to size in Australia so that the work of putting the structure together was greatly facilitated. Unfortunately, the tongued and grooved boards which were to form the roof and walling outside, and the inside lining and flooring had suffered some damage during the voyage south as deck cargo. However, drafts and leakage resulting from faulty joints were very effectively offset by a course of heavy tarred paper inserted under the lining boards of the walls and under the floor.

The site chosen was a rocky platform quite close to the water-front at the head of the Boat Harbour. The building was erected on wooden stumps frozen securely into holes let into the rock. Erratics from the adjacent moraine were then piled in between the stumps, filling all the space below the floor.

By January 25th the building was up and the roof on but there yet remained to be completed a good deal of inside fitting and finishing, (Plate XXXV). An old sail was laid over the roof on the weather side and secured by cover battens. As rain is unknown on the Antarctic mainland, the simple wooden roof of tongued and grooved boards was adequate. Finally, steel wire cables were passed over the roof and firmly secured to the underlying rock formation.

Thus, it is to be observed, every precaution was taken to ensure that the Hut would resist winds of hurricane force.

As soon as the construction of the main living-room was well advanced, Webb, with some assistance, was released to proceed with the erection of two buildings needed for the magnetic programme, namely, an Absolute House and a Magnetograph House. The Meteorological Screen and several meteorological recording instruments were also installed.

The location of the Hut and of the various scientific instruments and observing posts at Cape Denison are shown in map-plate 1 (frontispiece). Text figures 10 and 11 supply further detail of the relative positions of certain items.

The living Hut building as outlined by figures 8 and 9 was originally designed to accommodate twelve men. Materials for a second hut, essentially like the first but smaller, designed to accommodate a subsidiary party of six men, had also been landed at Cape Denison. This was originally provided as living-quarters for a third Antarctic land base. However, when I decided to abandon the idea of a third

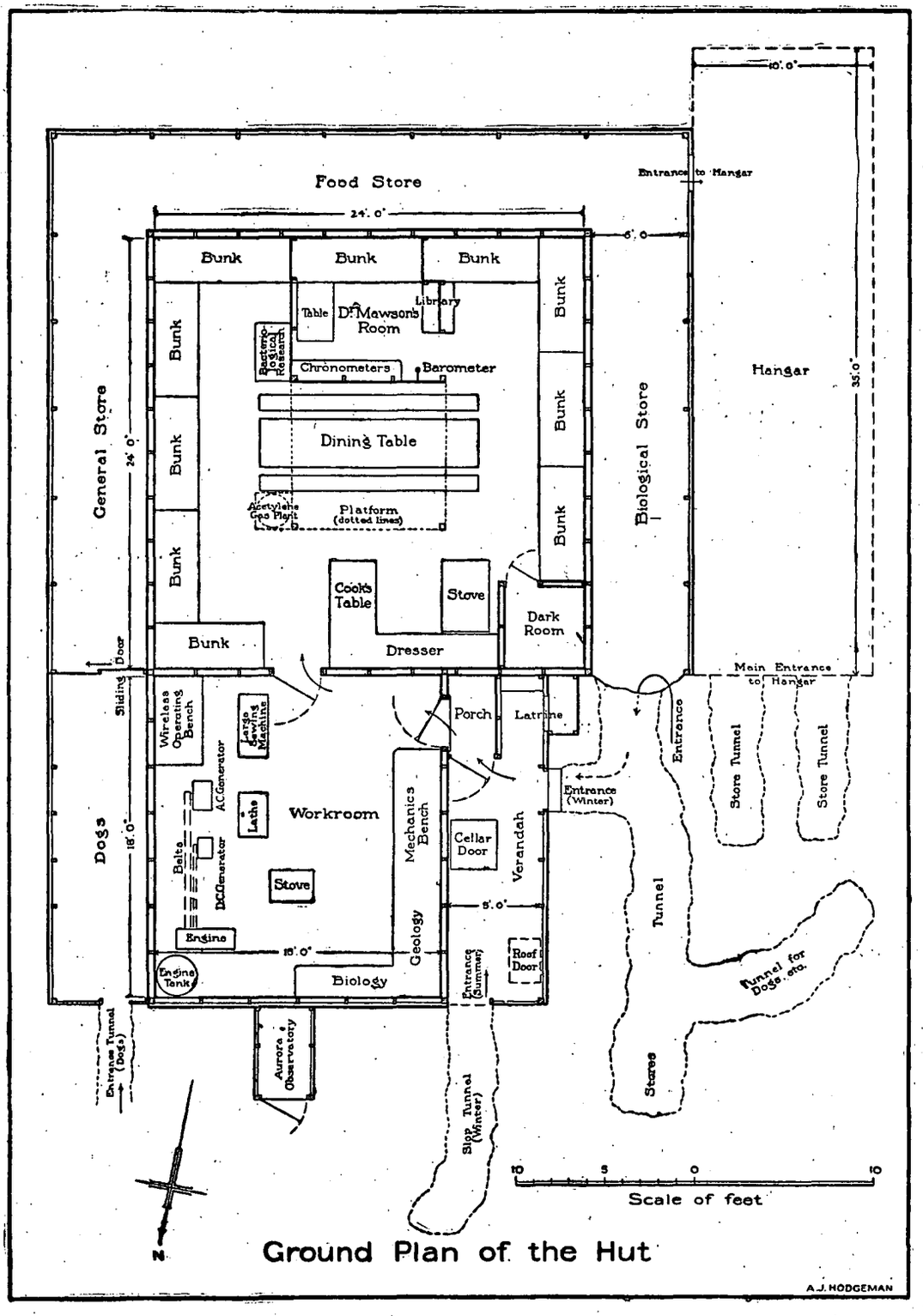

FIG. 8. The Main Base Hut at Cape Denison.

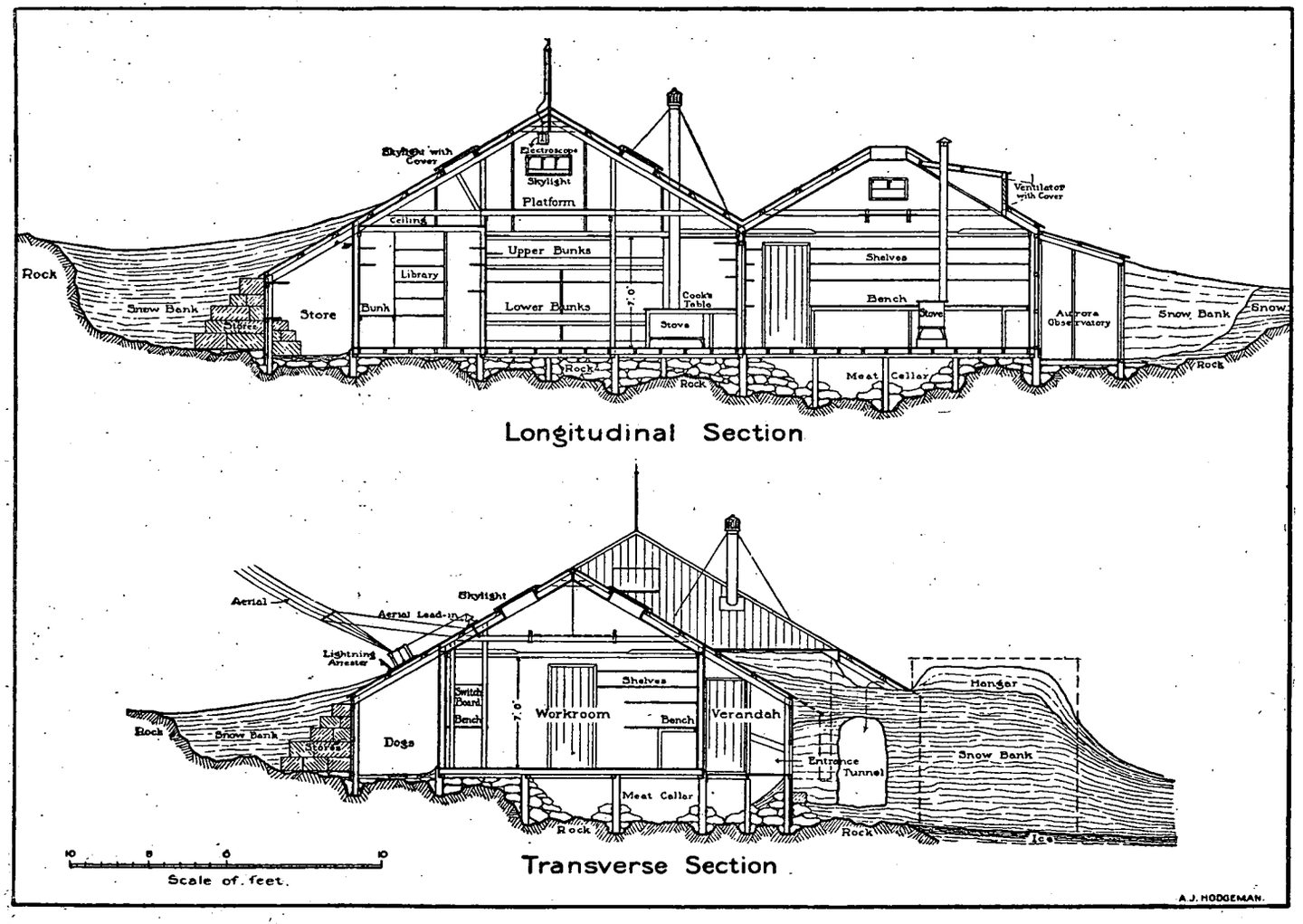

FIG. 9. The Main Base Hut at Cape Denison.

Antarctic base and to amalgamate the weakest of the land parties with that of the Main Base, the material for the construction of this hut was put ashore at Cape Denison. As soon as the main building was completed the erection of the smaller structure was commenced. It was built in the lee of the main hut and equipped as a workshop and ante-room to the living-quarters.

By the end of January we were well installed in the living-room and regular meteorological and biological observations had begun. On February 4th the roof of the workshop was completed. By February 13th the hut for absolute magnetic derterminations was completed and the erection of the Magnetograph House commenced.

On February 5th fish-traps were laid and some dredgings made from the whale-boat. An unusual occurrence was the landing of a large young male Sea-elephant at our very door; this happened on February 11th.

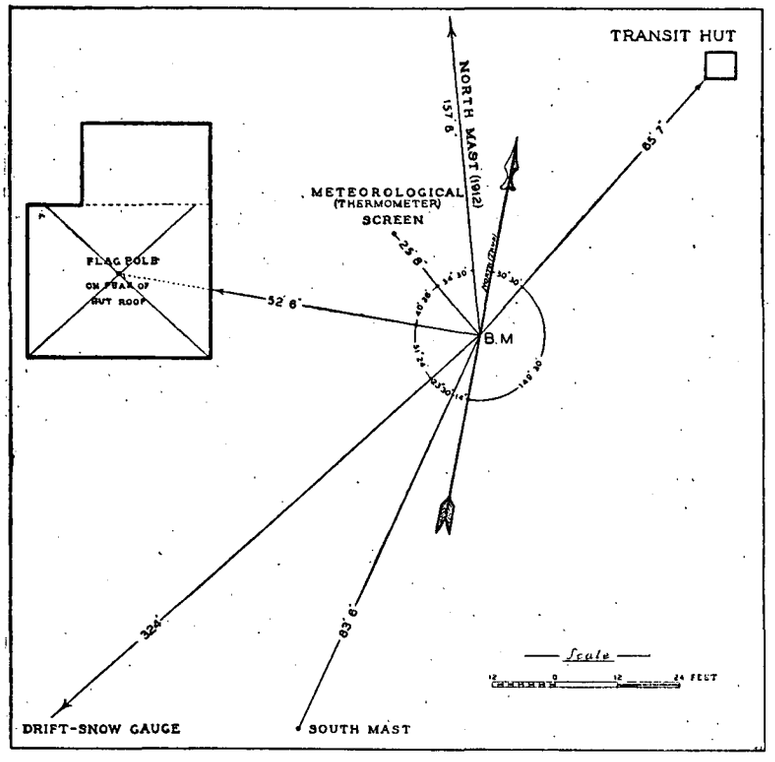

FIG. 10. The lay-out at the Hut.

About the middle of February, while most of the men were still engaged on constructions connected with the scientific programme, some of the party commenced preparations for sledging. The dogs were still in very poor condition after the voyage south. To make matters worse the weather had been unexpectedly bad ever since arrival at Cape Denison and exposure in high winds and driving snow had not allowed the dogs to recuperate as rapidly as we should have liked.

I decided to make a short reconnaissance inland, but there was much delay in starting out owing to bad weather. However, on the afternoon of February 28th, the blizzard, which had continued for some days, began to subside. It was evident that completely open water lay to the north, for a considerable swell came from that direction, causing waves to break over the ice-foot all along our coast, a most unusual event. Numbers of Weddell Seals lay slumbering on the water-front; around the Boat Harbour alone, as many as 165 were counted at one time. (Plate XL, Figs. 1 and 2).

Wind and drift continued throughout the night but there was an improvement during the afternoon of February 29th. Late on that afternoon, Bage, Madigan and I, assisted by several others, moved our sledge to the south up the steep ice slopes in the face of a disagreeable head wind and drifting snow. Having negotiated the steepest part of the ascent, the sledge was anchored at a little over one mile from the Hut to

which we returned for the night. The following day we picked up the sledge and advanced against wind and drift to a distance of nearly 5½ miles due south, where the elevation was 1,475 feet. There a flag-pole was erected and a drift-proof box containing a thermograph was mounted on legs frozen into the glacier ice.

The following day, as the weather continued to be unpropitious, the sledge was anchored and we returned down wind to the Hut, intending to set out again as soon as the weather should improve. Though the coastal ice slopes to the east and to the west of our track were much crevassed, we had demonstrated by this short excursion that a good sledging track to the interior lay to the south of Cape Denison, and we needed only an improvement in the weather to extend rapidly our knowledge of the surrounding area. There was yet an uncertainty as to whether the land we were on was but an island or was actually part of a great continental mass. Consequently, there was felt to be great need to extend the exploration of the region as quickly as possible. Map-plate VI covers portions of King George Land and Adelie Land adjacent to Winter Quarters at Cape Denison.

Gales of wind with thick drifting snow continued during the ensuing days rendering outdoor occupations difficult. Efforts were made to provide shelter for the dogs, but such kennels as were provided soon became filled with drift-snow. (Plate XLI, Fig. 1).

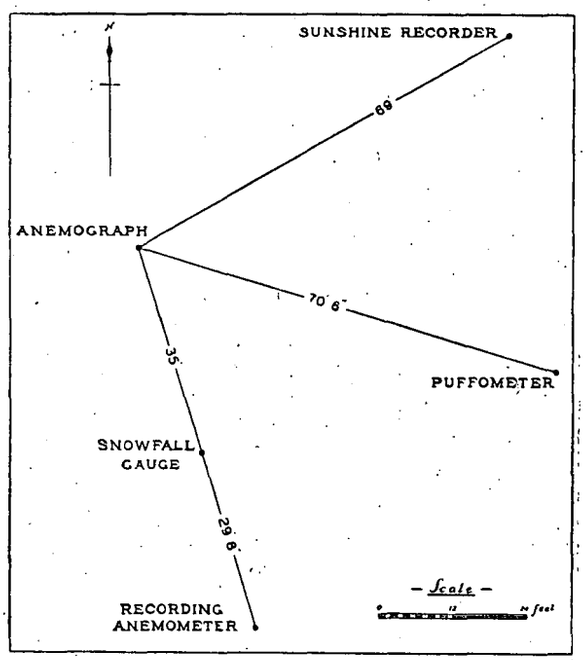

FIG. 11. The lay-out on Anemometer Hill.

Even at the beginning of March, Wilson Petrels and Snow Petrels were still seen (and some caught) at their nests under rock ledges. Weddell Seals were abundant on the shore but the ranks of the Adelie Penguins were rapidly thinning.

At this time steps were taken to secure a large stock of seal and penguin meat as a winter supply for ourselves and for the dogs. Far from improving, the weather grew steadily worse. On March 5th the wind had increased to hurricane force. A velocity of over 80 miles per hour was recorded during several hours that night. I was on night watch and had to crawl on hands and knees to read the instruments in the Meteorological Screen. In the face of this wind it was quite an effort to get a slab of seal blubber for the stove from the depot, about 20 yards from the door of the hut. Before the blubber was safely inside I was knocked over eight times and quite exhausted.

Great difficulty was experienced with drifting snow blocking the verandahs, the vestibule entrance to the Hut and even the stove chimney, (Plate XXXVI, Figs. 1 & 2).

On March 6th part of the east side verandah was partitioned off as a shelter for the dogs. Thenceforth they were untethered and allowed free ingress and egress to this haven. On this day one of the dogs, " Gadget ", delivered two pups, one of which, " Blizzard ", lived and was destined to take part in sledging operations the following summer.

In the face of the excessive winds which we were now beginning to realise were a feature of the locality we were well pleased that such care had been taken in the design and erection of the Hut. With the object of giving further protection to the structure, a vast array of boxes containing stores had been stacked up to the roof level around the walls of the three weather sides. Drift snow then consolidated and buried all until only the roof of the Hut showed. (Plate XLIII, Fig. 1).

Whenever the wind fell off to 30 miles per hour or less the work of completion of the Magnetograph House and of the erection of the " wireless " masts was continued. The Magnetograph House was completed on March 14th and Webb then commenced to erect therein the delicate magnetic recording instruments.

The dog Caruso was discovered with its neck badly and mysteriously cut. The gash extended over one foot in length. The wound was carefully treated and stitched, but the dog never recovered owing to infection of the wound. After lingering for several weeks it had to be destroyed. Pavlova gave birth to seven pups, two of which lived.

During the blizzard on March 12th the whale-boat, which had been securely moored in the Boat Harbour, was lost; when the drift cleared away no vestige of the boat could be seen nor was any part of it ever recovered. Everything in the neighbourhood of the Hut had to be very firmly secured, else the southerly wind would be certain to sweep it into the sea. In this manner we suffered several losses including a sledge.

Already by March 12th so vast a volume of snow had drifted past the Hut that it became a matter of great importance to obtain some estimate of the amount flowing by. With the experience gained on Shackleton's 1907–09 Expedition in attempting to record drift-snow, I designed a form of drift-gauge which gave promise of useful results. Bage and Hannam carried out the construction, and in due course it was installed in the open on the ice surface to the south-west of the Hut. It acted quite well and by means of it a useful estimate of the quantity of drift-snow passing the Hut was obtained.

By March 14th penguins were very scarce; there remained only a few young ones. Many of these had large masses of ice attached to them, the result of temporary burial in snow drifts during blizzards.

After several days of very high winds an improvement occurred on March 18th when, in the afternoon, for a short period the wind fell off to 30 miles per hour. We took advantage of this lull to push on with urgent out-door work. Some of the men were busy on the erection of the " wireless " masts; several were engaged completing the Magnetograph House; myself and others commenced the erection of a hangar for the air-tractor or " bus " as we styled the aeroplane then shorn of its wings.

The west side of the living-hut was selected as a site for the hangar. The hut wall served for one side, whilst the other side and back were constructed of cases of stores. These walls were composite; there was an outside course of boxes stacked with lids facing out and an inside course built with lids facing in; thus arranged the contents of the boxes could be withdrawn at any time without disturbing the wall itself. Between these two courses of boxes a foot or more of rammed snow formed a solid core to the wall. The timbers of the original packing case of the aeroplane provided the roof, while the front of the hangar on the lee side was closed by a sheet of canvas held in place by a wall of snow blocks.

Within a few days after construction the whole structure was well frozen together and buried beneath drifts of hard-packed snow.

On the evening of the 18th, after only a few hours' respite, the usual strong wind descended upon us again. This continued in a violent mood during the night and the following morning. About noon, however, the wind rapidly subsided and we were treated to a still afternoon with occasional willy-waws and squalls coming from all directions but principally from the north. During the whole afternoon a curious noise could be heard which, at the time, I likened to the incessant breaking of heavy surf on a distant beach. It also at imes resembled the noise of wind blowing through trees. Investigation of this phenomenon disclosed that

the raging blizzard wind was still blowing at no great height above whilst we were in a weird dead-air zone below. We found that a fierce surface wind descending the ice slopes to the south of the Hut launched out from the ice slopes as a horizontal air current which continued north at a height of several hundred feet over the Hut and the sea. For some distance down the ice slopes above the level at which the wind took off overhead, the air flow was subject to great pulsing gusts.

That afternoon during the progress of this phenomenon, when it was quite calm around Cape Denison, I could plainly see, on the slopes of the ice-cap above Cape Hunter 10 miles away to the west of us, thick drifting snow obscuring the glacier surface down to a level of about 600 feet above sea-level.

At about 7.30 p.m., the overhead noise increased greatly, followed a little later by the south wind skimming the tops of the neighbouring rocky hills. A little later still, gusts swept the Hut and by 8.30 p.m., we were again submerged in the incessant southerly gale.

We were to learn that, at Cape Denison throughout most of the year, such lulls are the only relief punctuating the otherwise continuous roaring flow of air from the Plateau.

During the day (the 19th) several Giant Petrels were busy gorging themselves on offal from seal carcases on the sea-front; also seven Snow Petrels flew over the Hut. A few moulting penguins were still to be seen. (Plate XXXVIII, Fig. 2).

On March 20th Webb had completed the setting up of the Magnetograph instruments and had a trial run of all elements. There was now little prospect of useful sledging weather before the next summer, and it became obvious that our operations would be restricted to the near vicinity of the Hut. So we determined to spare no effort to make the scientific record of the locality as complete as possible.

The duties of every member of the staff were defined and posted on a roster. Everybody shared in some degree in the general work such as cooking, night watch, etc., but the greater share fell upon those not in charge of any specially important scientific programme.

AUTUMN GALES.

A fierce wind on the morning of the 21st became gusty. The gusts developed a cyclonic character. They showed a gyroscopic motion clearly defined as they swept north over the sea. Some of the gusts lifted the sea in spray to a height of 25 feet or more. Then, as frequently occurred at Cape Denison when the plateau wind became gusty, it took off altogether for several hours in the afternoon but returned suddenly in great force just before 8 p.m. The mercury column of the barometer housed inside the Hut dropped suddenly when the wind arrived. Such sudden movements of the barometer were recorded quite frequently. The diminution of the air pressure in the Hut, thus demonstrated, was ascribed to the suction of the wind howling past the only entrance; elsewhere the Hut was fairly well sealed up by accumulations of hard-packed snow.

Dr. McLean, who was on duty as night watch, found great difficulty in reading the instruments at the Meteorological Screen. In one hour of the early morning of the 23rd it blew 86 miles in the hour and of course the gusts were of much higher velocity than this mean figure. During his night watch of the 22nd–23rd, McLean reported St. Elmo's fire on the metal tips of the nephoscope.

The hurricane wind continued during the 23rd, becoming more gusty as the day advanced. Though the high wind continued, the drift diminished sufficiently for us to witness the battle between wind and water along the sea front. Hurley and I carefully worked our way around to the lee of the rocks to the west of the Boat Harbour. From there the view was awe-inspiring. The water was being picked up in sheets during the gusts and whisked up into the air as frozen spindrift. For 100 feet above the sea surface the air was laden with this fine ice-dust. At times, in cyclonic gusts, it was carried up to 200 or even 300 feet. Every loose movable object about Winter Quarters was carried off by the wind; even some quite heavy items were picked up and thrown about in a most unexpected fashion.

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On the 24th the wind fell off to only 45 miles per hour and we all felt a rise in spirits at the pleasant change. The auroral lights appeared in some form or another every night now, so long as the sky was sufficiently clear to allow of observation. There were still a few penguins about and some seals came ashore on this day.

On the 26th Hannam had completed the installation in the work-shop, of his petrol engine, electric generator and transformer; for several hours we were treated to the luxury of electric light. Normally the living-room and workshop were lit with acetylene gas produced in a generator housed on an overhead platform in the living-room of the Hut where it could be kept thawed out. (Plate XLII, Fig. 1.)

The wind continued on the 27th but became so densely laden with drifting snow that objects only two yards away were quite obscured. Madigan, who was on night watch, reported remarkable manifestations of St. Elmo's fire; all pointed objects outside around the Hut glowed, even one's fingertips and nose terminated in a pale luminous glow.

Though limiting outdoor operations, the blizzard wind did not seriously affect indoor work. Laseron and Hunter, assisted in some measure by others, cleaned and preserved seal skins and bird skins. McLean conducted regular observations on the condition of the blood and general health of members of the party, also methodically cultured and studied bacteria and moulds. Madigan with some assistance from Hodgeman daily attended the meteorological instruments and kept the record. Webb, with assistance as necessary, enthusiastically conducted an elaborate magnetic programme, necessitating long visits to the distant Magnetic Huts at all hours of the day and night in foul weather and fouler; his was undoubtedly the most unenviable job of all and he conducted it most meritoriously. Stillwell made the best of the opportunities presented for collecting rock specimens and making geological observations in the vicinity of Cape Denison. Bage's special charges were first the Tide-Gauge and later transit observations combined with wireless time signals to determine the exact longitude of Cape Denison. Hannam did his best to advance the cause of wireless communication but so far we had not been able to complete the erection of the masts and aerial.

Ninnis and Mertz had charge of the dogs. Whetter and Close quarried ice from the glacier each day for domestic purposes, maintained the coal supply in the Hut from the nearby depot, and assisted in various scientific programmes. Hurley's main occupation was that of photographer. Murphy was storeman and Correll mechanician. So, though we were hut-bound, there was a steadily mounting record of data.

On the 29th investigations into the cause of the St. Elmo's fire established almost beyond doubt that our manifestations at Cape Denison were linked up with the electrified condition of the flying snow particles.

During the months of February and March, when the turmoil of the wind was not overwhelming, loud booming noises were of frequent occurrence, marking breakaways of large masses of ice from the cliffs around Commonwealth Bay. Small bergs and brash-ice streamed away to the north under the flail of the wind.

The last day of March was a " pea-souper " as we styled hurricanes murky with drift-snow. The wind was blowing at about 80 miles per hour in the morning when Madigan and Hodgeman set out to attend to the meteorological instruments located about 150 yards from the Hut. Madigan returned without Hodgeman and there was great anxiety for the latter's safety. All hands set out to comb the neighbourhood, some of them roped together so that they could approach near to the water-front with some safety. On occasions like this it was of course a matter of crawling along the ground trying to identify one's location by the feel of objects met on the way. Vision was restricted to less than an arm's length. An ice mask quickly formed on the face.

None of the searchers were able to locate Hodgeman, but he himself providentially found the Hut after an absence of $2\frac{1}{2}$ hours. We were glad to find him alive, for we had feared that he had been swept out to sea.

At midday on April 3rd the weather improved again and a short spell of outdoor work was possible. While on the sea-front near Lands End (the western extremity of our rocky terrain) Hurley and McLean observed a Sea-leopard tearing and eating large pieces of flesh from the side of a Weddell Seal. With the better weather in the late afternoon, a number of Adelie Penguins came ashore and were captured for their skins and for food.

Heavy drift continued throughout the 5th and on the morning of the 6th. Towards noon on the 6th the wind became gusty, then followed calm spells and puffs until all was a dead calm by 12.30 p.m. Some northerly wind (a reversal of direction) followed with plentiful willy-waws of the cyclonic kind. These latter wandered about in every direction; as they travelled over the land a column of snow was lifted from the ground—when over the sea, condensed water vapour and spray outlined the revolving core of these disturbances.

A great change had come over the neighbourhood of the Hut since the last calm spell. The former landscape was found to be hidden beneath deep snow drifts. Only the top of the Hut roof remained unsubmerged. Access to the Hut was henceforth obtained by a vertical drop into the north-western corner of the encircling ambulatory of the main hut and from thence by a snow tunnel to the entrance porch of the workshop, (Plate XLII, Fig. 2 & Plate XLIV, Figs. 1 & 2).

At 4 p.m., after several hours' respite on the afternoon of the 6th, a wall of snow came down the ice slopes to the south, and a tearing, raging wind, thicker than ever with drift, was on us again.

Pea-soup blizzards continued and we waged a rare battle with the elements to maintain an unbroken sequence of scientific observations. Hurley was successful in obtaining some photos illustrating the fierce winds and drifting snow but paid the penalty with frost-bitten fingers and cameras filled with snow.

The last Skua of the season was seen during the lull on the 6th, but occasional penguins were seen even later in the autumn than this.

On April 11th a ding-dong hurricane was in progress, the wind screeching as it tore past the Hut. I was on night watch. Though the wind had abated considerably by midnight, I found that taking the meteorological observations was quite a task. The thermometers in the screen located only about 20 yards from the Hut entrance had to be read. This entailed crawling on hands and knees to and from the instruments, holding one's position against the wind at the screen, holding down the door of the screen and focussing the light upon each instrument. It took me twenty minutes from leaving the exit of the Hut to gaining it again, going devilish hard all the time; and returning with blood blisters on the ends of my fingers.

On April 13th the anemometer, which had been damaged and carried to the Hut for repairs, was successfully taken back to its observing location by some of the stronger members of the party; but not without much effort and, for Ninnis, a badly frost-bitten face.

On April 14th Bickerton commenced repairing the air-tractor, the frame of which had been badly damaged on the voyage south. The machine was housed in the hangar constructed on the west side of the main room of the Hut, abutting the ambulatory from which entrance to the hangar could be secured without going outside into the ever-blowing gale.

A short calm spell on April 17th allowed further progress to be made in the erection of the wireless masts. This work of erection was deplorably delayed by the severe weather prevailing. In such fierce cold winds it was indeed a herculean task to erect the masts and aerial system in a manner sufficiently substantial to resist the hurricane winds.

The evening of the 25th–26th was shrouded in thick drift and a high wind. Correll, on night watch after reading the thermometers at the screen, failed to find his way back to the Hut. The stove fire went out and the ensuing cold woke Hurley who slept close by it. Unable to find the night watchman, Hurley donned his outdoor gear and set out to search the neighbourhood. Groping about in the thick drift and calling loudly he eventually found Correll completely lost and curled up under the snow within a few yards of the south-east corner of the Hut.

At 3 p.m., on the 26th there was a sudden calm and we witnessed a remarkable alpen-glow on the icy headland west of Winter Quarters; it showed up fiery red like a bush-fire. This afternoon there was a curious greenish colour in the sky, where unobscured by cloud and haze.

The 27th was a beautifully calm day. We breakfasted at 7 a.m., and pushed on with the erection of the wireless masts. The sea which had been kept open by the winds, began to freeze over rapidly. Numbers of Snow Petrels and Antarctic Petrels passed by Cape Denison; many were secured for their skins and parasites.

The sun set at 3.30 p.m., and the moon rose gloriously at 5 p.m. There was a white fog sky in the evening. Later the blizzard wind again roared down on us incessantly.

WINTER BLIZZARDS.

The month of April closed with continuous blizzards and falling temperatures. The average wind velocity for the month as recorded by the cup anemometer was 51·57 miles per hour.

On May 2nd, the wind became gusty in the afternoon and the drift cleared somewhat so that we could see about a little. The sea-ice was found to be holding in the Boat Harbour but elsewhere had been swept out beyond the northern horizon. The Tide-Gauge was brought out and arrangements made for erecting it on the bay-ice in the Boat Harbour. We found that hempen ropes used as stays and halliards for the wireless masts erected less than a week ago were already seriously abraded by the snow blast and chafed by flapping. Steps had to be taken to replace these by steel wire cables. A truly remarkable degree of abrasion of the exposed surface of wooden objects and of polishing of metal objects by the snow blast was illustrated in the vicinity of the Hut.

Whenever there was any reasonable diminution in the force of the wind, Hunter, Laseron and I made every effort to increase the biological collections by netting, trapping and dredging in the Boat Harbour. Small but useful catches were obtained. Thus on May 5th when we hauled up the fish-trap, it was found to contain seven holothurians.

On the evening of this day the wind descended on the Hut in shuddering blasts. It was estimated that in the gusts, velocities of 150 miles were attained. We spent some time watching the arm of the barograph rising and falling with the passage of the gusts.

In order to study the structure of the ice of the adjacent glacier, of the lakes and of the sea-ice, a number of shafts were sunk into the formations in question. For example, on May 6th in a wind of 73 miles per hour, Hurley and I set to work to sink a shaft in Long Lake. Later when we got down close to the bottom of the lake, long fronds of a fresh-water alga were found which, on thawing out at the Hut, were found to have adhering to them plentiful microscopic life, chiefly rotifers and tardigrades.

During a portion of both May 8th and 9th the wind fell off to a mere 20 miles per hour resulting in great outdoor activity. The installation of the Tide-Gauge was completed and the erection of the Wireless Masts was advanced.

The dogs enjoyed the break in the weather and revelled in racing about the landscape. As usually happened when they were set loose, they maltreated seals basking on the water-front, and consequently had to be tied up again.

May 10th and 11th were marked by hurricanes with drifting snow so dense that at times one's feet were lost to sight. The hourly average velocity for the whole of the 11th was 80·9 miles.

The 12th was a day of splendid fine weather. Numbers of Snow and Antarctic Petrels were about; we shot seven for skins. At 3 p.m., there was a fiery sunset and at 4.45 p.m., fine auroral lights illumined the northern sky.

The calm did not last long for the high wind and thick drift soon returned. Between 9 and 10 a.m., the wind averaged 94 miles per hour. At 4 a.m., Webb and Hannam had to make the journey to the Magnetic Hut for observations and found great difficulty in fighting their way thereto and therefrom.

On May 14th, an impressive raging torrent of air and snow roared past the Hut. At 5 p.m., I recorded "The grains (of snow) appear to shriek by their impacts. The vista is chaos. I am quite sure that anybody out in this turmoil for a few minutes would gladly take a chance and exchange for existence in Hell. Webb dived off into this chaos for the Magnetic Hut; in an instant he was lost to sight. His work is indeed a difficult contract." The wind this day was found to have reached an hourly average of 97 miles.

On the 16th we effected some dredging in the Boat Harbour in a 43 miles per hour wind. The catch was mud with some annulates and the bivalve *Anatina*.

On the night of the 17th gusts of exceptional velocity, quite 150 m.p.h., passed over the Hut and at times, notwithstanding that it was almost entirely buried beneath the hard compact névé, it cracked ominously. Our thoughts were concentrated on the problem of what to do should the Hut be destroyed. The average hourly run of the anemometer for this day reached a maximum of 99 miles.

At midnight St. Elmo's fire outlined all objects; the whole of the stay wires and the corners of the thermometer screen, the rocks, the ground wires of the wireless installation and prominent points of one's person were outlined in a luminous discharge. The whole of the ground glowed as with phosphorescence.

The drifting snow of the 19th was the densest to that date. At 8 p.m., on May 20th, the wind fell off to calm, which continued during the following day. There was consequently great outdoor activity. Fifteen Petrels, Snow and Antarctic, were shot for skins. The Snow Petrels came as a flock feeding on euphausia frozen into the thin film of ice on the sea surface. McLean, helping with the erection of the wireless aerial, was hauled to the top of the mast to effect some fitting. When he was brought to the ground after completing the job all of his ten fingers were found to be badly frost-bitten.

Things were no better on the 22nd when a violent blizzard was in operation with the air temperature at — 26° F. Those working out of doors were all affected by frost-bite in some degree or other.

There was a short lull on the morning of the 24th, then the wind returned with thick drift. On this day one hour's run of the anemometer aggregated 100 miles; actually a higher reading should have been recorded for it was discovered that the strain was periodically causing the cup spindle to disengage. Madigan estimated that this loss would probably not be less than 10%, so that 110 miles in the hour was indicated.

Being Empire Day, a toast was drunk to King George and the Empire. A further toast was drunk to " The Meteorological Staff and Annie " for the 100 mile record. It should be mentioned that the anemometer was popularly referred to as " Annie ."

There was a short calm spell on the evening of the 24th and again between 8 and 9 p.m., on the 25th. Webb was able to make some star observations to check the chronometers and we secured some good dredge hauls and a Crab-eater Seal.

I found that a variety of lichen which was coloured black in summer time had now turned green, as observed when dug out from beneath snow drifts.

May 27th was a day of no drift, though a very strong wind of 60 to 80 miles per hour continued to blow. At this time and later in the year we had a good deal of weather of this kind.

Though there was open water in Commonwealth Bay, the Mackellar Islets appeared to be embedded in a continuous sheet of sea-ice. Viewed from the ice slopes above Cape Denison, this unbroken field of ice also appeared to extend all around the northern horizon. The following day was also without drift and the wind much reduced, thus allowing further outdoor activity. Bage commenced the erection of an astronomical observatory (the Transit House) on the eastern side of and close to the main Hut. Hunter, Madigan, McLean and Bickerton made several successful dredgings. They secured masses of the giant sea-weed which formed a thick forest on the rocky sea bottom off Cape Denison, Adhering to this sea-weed they found abundant invertebrate life, especially polyzoa, round worms, crustaceans and minute gasteropods.

On June 1st, Madigan and Hodgeman erected a mast to carry an instrument intended to record the maximum velocity of the wind during gusts. It was constructed by Correll and others on a design which I had employed when on the B.A.E., 1907–09. It was a modification of an instrument designed by Dynes; the recording sheet was driven by clock-work and the wind force measured by tension on a metal spring.

We again dredged in the Boat Harbour adding to our collection some new starfish, pycnogons, sponges, and gasteropods. I recorded that the bottom of the Boat Harbour was a fine picture. It could be viewed only during a period of complete calm when the surface of the water was unruffled. Then, lying on the

bay-ice with one's face close to the water, the whole bottom was clearly in view. "It looks like a wonderful forest after a snow-fall. Great branching brown weed rises many feet from the bottom and is covered with rounded adhering masses of ice plates. Lumps of this weed, buoyed up by the ice, float away periodically." Lying on the bottom, large white worms and starfish could be seen. Pieces of this sea-weed were secured measuring as much as 16 feet in length.

June 3rd, being the King's Birthday, we drank to the occasion at the evening meal. A thick blizzard was seething by outside. The previous day the average wind velocity for the whole 24 hours was 83·75 miles per hour.

June 8th, 9th and 10th was a period noted for intense auroral activity, including brilliant, coloured displays. At the same time Webb recorded great magnetic storms.

By June 15th when the wind abated somewhat, we found the floor of the Boat Harbour almost entirely encrusted with ground-ice. That day Bickerton, who for long past had been working on the air-tractor in the garage, finally got the engine running satisfactorily. Hurley, assisted by some of the others, was at this time progressing well with the sinking of a shaft in the glacier just east of the Hut. They eventually bottomed on sea-worn pebbles and frozen sea-weed indicating that in the Cape Denison region there had been a fairly recent elevation of the land in relation to sea-level.

At intervals during the year, from a station on the rocks at Land's End, I took sights to prominent points along the ice wall of the neighbouring coast, thus providing data for estimating the forward movement of the land-ice sheet.

Mid-winter Day, June 21st, duly arrived and with it a diminution in the wind. In fact, it was almost quite calm during most of the day. The sun showed above the horizon at midday so that we just saw for a brief moment all its disc before it again departed. In reality the sun was entirely below the horizon and was rendered visible only by the high degree of refraction viewed through such cold dense air.

The average daily temperature was now lower than formerly, and it was noticeably more difficult to maintain above freezing point the temperature inside the Hut.

We had decided that the air temperature of the Hut should, so far as possible, be maintained at about 40° F. measured at breast height in the centre of the room. Of course the temperature near the walls or on the floor was always lower, actually at or below freezing point. Under these circumstances moisture from the air inside the Hut condensed on the walls and parts of the ceiling. There was now a thickness of 5 inches of ice on the inside of the windows notwithstanding that they were sealed up on the outside by a wooden lid over the glass. On the wall under my bunk there was ice several inches thick. On the side of the bed against the wall, the blankets were frozen together and to the wall with ice formed from the freezing of moisture in the Hut air.

All meals served this festive (Mid-winter) day were of a high order of culinary merit, culminating in a protracted dinner of many courses, embellished with speeches and musical numbers. It was just midnight when all was over and the washing up completed.

WINTER ACTIVITIES.

On June 24th the temperature was low,—26·3° F., and a strong wind roared by. Madigan reported electric sparks half an inch long jumping from the drum of the anemograph to his finger. Streams of sparks of this kind were frequently experienced in the winter months.

Throughout the winter period those of us not employed in other work were engaged in preparations for sledging. Both man harness and dog harness had to be made. Each sledge had to be fitted with deck, mast, cook's box, instrument box, kerosene platform, etc. Innumerable small calico bags to hold sledging foods had to be made and sledging foods had to be weighed out and packed in them; each such bag contained the ration of some particular commodity for three men for one week.

Ninnis and Mertz spent much time in exercising and training the dogs for the sledging programme ahead.

June 26th, much progress was being made in the excavation of a cavern in the glacier ice located at about a third of a mile south of the Hut. This was to be a shelter for carrying out certain magnetic determinations. There, far removed from any rock or other magnetic objects, observations were to be made as checks upon the values of the magnetic elements as determined at the observing station on the rocky area near the Hut.

Another undertaking which was commenced about this time was a detailed plan of the rocky area in the neighbourhood of our Hut. This was executed by Stillwell in the form of a plane-table survey figured as a frontispiece to this volume.

A falling off in the velocity of the wind leading occasionally to short, calm intervals was, at this period of the year, frequently experienced in the morning and forenoon between the hours of 5 a.m. and noon. The incidence of calm spells in summer was quite otherwise, namely, from noon to 8 p.m.

On June 28th there were twenty-one large icebergs in sight off the distant Cape to the west of Winter Quarters. This was a beautiful day, one of the calmest experienced. Wonderful sunset colours embellished the sky and ice and sea. In the evening the moon was surrounded by both a halo and a corona.

In order to study further the remarkable atmospheric electrical effects manifested, I had a pointed metal collector (comb type) mounted on the very peak of the roof. From it a wire lead came through the ceiling embedded in a sulphur insulating plug and then terminated in a free end within the Hut just below the peak of the roof. Experimenting with this we found that electrical discharge was generally in progress. From the free end of the wire lead within the Hut, a silent brush discharge was nearly always to be seen; at times the luminous brush was as much as 2 inches long. An earthed wire brought up close to the free end of the collector wire resulted in a stream of sparks, which sometimes reached a length of half an inch.

A Crookes vacuum tube linked to the collector wire and the ground wire remained continuously illumined for long periods. From this we judged that, by a multiplication of this device, the whole Hut could be illuminated. With a view to testing the fluctuations in this excitation, the end of the ground wire was left (for a period of some weeks) within a quarter of an inch of the terminal extremity of the collector wire. A rattle of electric sparks could be plainly heard in all parts of the Hut. This installation thus became an audible indicator of the occasions when notable electrical excitation prevailed. We found that such was often the case for days on end.

Antarctic Petrels and Snow Petrels were still in the neighbourhood, for on July 8th one Antarctic Petrel and two Snow Petrels were seen off Cape Denison. The temperature at this time was about —15° F.

I noted in my diary under date of July 11th, that the weather was quite "settled," for the barometer had not varied one tenth of an inch during the preceding 24 hours, the thermometer was steady, the atmosphere clear and the wind a regular 70 miles an hour.

On July 13th a very high wind was blowing and the temperature —25° F. While such strong winds continued there was no hope of a permanent sheet of ice forming on the bay waters.

On the 16th, 17th and 18th of July quieter weather prevailed. The sky was overcast during most of the time and the temperature above zero Farenheit. Several Snow Petrels were observed feeding on small crustaceans in the surface waters off Cape Denison. Seals were sighted on floating ice or swimming in the bay.

On July 19th, it was blowing very hard, the average velocity for the day was just under 90 miles per hour. The wind was punctuated by strong gusts in which the puffometer indicated that a velocity of 140 miles per hour was reached.

The dogs housed in the ambulatory on the east side of the workshop sometimes became frozen to the icy ground. On such occasions, unable to move and doubtless very cold, they whined piteously until released.

July 21st was a day of light breezes and calm with a good view of the sun, well seen about noon. Strong prismatic colours of sunrise and sunset were spread over the landscape. A striking alpen glow was recorded on the ice cliff face of the margin of the land. The bay quickly froze over in an air temperature of —18° F. Full advantage was taken of this opportunity to push on the erection of the " wireless " masts. Bickerton was hauled up one of the masts and worked in a cramped position aloft for 3½ hours. His legs were quite numb with the cold when he was eventually lowered to the ground. (Plate L1, Fig. 1.)

This spell of good weather continued until the evening of the 22nd. During this day the sea was everywhere found to be frozen over. We could doubtless have walked across the frozen surface to the Mackellar Islets, but in the uncertain state of the weather and on such thin ice this was unnecessarily risky. A seal was seen basking on the ice and several were heard blowing in the tide-cracks.

Unfortunately a fierce wind with thick drift-snow descended from the plateau on the 23rd and continued for some days. On the 27th during one single hour the wind travelled 92 miles. As a result all the young sea-ice broke up and was swept away to the north. Even the ice on the Boat Harbour became badly cracked.

On the 29th, in the early morning, the wind temporarily abated to about 30 miles per hour. The sky remained overcast and snow continued to fall. No seals were observed on the sea-front and only one Snow Petrel came within sight from the shore. By 10.30 a.m., the strong blizzard wind had returned and by midnight had reached a velocity of 94 miles per hour. Throughout six consecutive hours on the afternoon of the 30th the wind averaged 97 miles per hour.

The air was highly electrified, the detector in the ceiling emitted " singing sounds like a cricket. " The brush discharge from it was so energetic that quite a strong odour of ozone pervaded the Hut. When on night-watch duty this evening I recorded as follows: " The plateau horizon illuminated, no doubt of this, and could not be due to any other cause but self-illumination due to phosphorescence, triboluminescence, or electric discharge of driven snow particles."

During part of July 31st, the wind fell off to 55 miles per hour and we were able to advance the erection of the " wireless " masts. Also Ninnis and Mertz transported a quantity of sledging rations as far as the Magnetic Cave on the ice slopes to the south.

During the month of July, as opportunity offered, everybody had worked upon the modification of their personal sledging clothing with the object of perfecting it, so far as possible, to meet the exigencies of the foul climate prevailing in this portion of Antarctica. We by now had realised that any sledging programme that might be achieved must necessarily be in the face of the most adverse windy conditions. In fact we should have to travel in such weather as usually calls a halt to sledging operations pending the advent of improved conditions. Thus we spent much time in thinking out new devices in connection with sledging equipment and clothing which would give greater efficiency in the face of such adverse weather.

A strong blizzard continued during the first few days of August. In a 70-mile-an-hour wind Ninnis and Mertz transported more bags of sledge rations up the ice slopes to the Magnetic Cave. In order to assist sledging operations, I decided to take the first opportunity to excavate a cave in the glacier at the spot about 5½ miles to the south of the Hut where, in the autumn, we had depoted a loaded sledge. This it was calculated would provide a safe camping shelter just above the steepest slopes on the rise to the plateau. We could then as speedily as possible assemble there quantities of stores for the projected sledging campaign.

On August 4th I noted: " No auroral lights were visible. The northern sky, especially for 15 degrees above the horizon, presents the appearance of a faint diffused nebulous luminosity, a feature entirely absent in the southern sky. " I speculated at the time as to whether this phenomenon might not perhaps be a luminous effect in some way connected with the freezing of water vapour, possibly triboluminescence of the contracting and cracking minute ice crystals floating in the air.

On August 6th, Hurley, making tests on rolls of exposed but undeveloped cinema film taken earlier in the year, discovered, to our great chagrin, that the pictures taken on Eastman Kodak film* had all so badly faded as to be useless, though test pieces developed at the time of exposure gave excellent results.

* This unfortunate quality of stock of Eastern film was eliminated in subsequent manufactures and does not relate to Kodak film stock of later years.

Fortunately we also had a good stock of Lumière (French) film and that proved on test to be as good in August as when first exposed. Henceforth Hurley used only the Lumière film but we had to face the loss of a great length of picture already taken on Eastman film stock.

A 40-mile-an-hour wind prevailed on August 8th; the sun shone brightly and there was no drifting snow. This I referred to in my diary as the best sample of weather experienced for a long time past.

"We have just had 17 days without a chance of sledging, continuous heavy weather. To-day the dogs took one hundredweight of pemmican up to the Magnetic Cave. Ice can be seen over all the sea beyond the Mackellar Islets. I collected many rock and mineral specimens to-day."

ALADDIN'S CAVE.

On August 9th the weather improved after noon. In company with Ninnis and Madigan I left the Hut with a load of sledging provisions, bound for the spot at 5½ miles out where we had depoted a sledge and equipment at the beginning of March. It was 3 p.m., when we left the Magnetic Cave with one sledge of equipment and eight dogs to help haul the load up the ice slopes against the wind. By dusk we had only got as far as the 3-mile flag erected the previous autumn and had to camp there. As it was almost dark some difficulty was experienced in erecting the tent in the wind which was then pouring down the glacier.

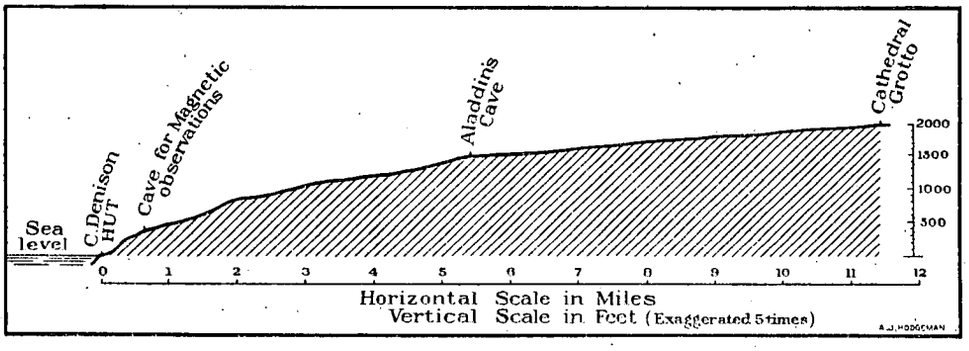

FIG. 12. Profile of the coastal ice-slope at Cape Denison.

We rose next morning just before sunrise and continued up the ice slopes against a strong wind. Our destination was reached at 4 p.m. The sledge which had been left early in March, anchored to the glacier, was still there, partly buried in hard névé. It had apparently remained buried under snow for a considerable time. On its south (exposed) side the aluminium cooker was highly polished by the snow blast. The wood work and leather lashings of the sledge were also much abraded on the weather side. (Plate LIV, Fig. 1.)

The box in which the thermograph had been left in operation was now found to be full of packed snow, in which the instrument was embedded. It recorded a minimum temperature of —34·1° F.

After camping that night, we were up early on the 11th and commenced excavating a cave below the ice surface intended to be of service for all sledge parties passing that way. The cavern was completed next day. It was henceforth known as Aladdin's Cave because of its many wonderful qualities as a haven for sledgers. (See Text 9 and Map Plate VI.)

This was a truly magical cave for us, where we could be in perfect peace while outside the blizzard roared on. "The walls sparkle like diamonds as the moisture from our breath freezes thereon in minute scintillating crystals. We hang up our clothes by merely damping the corner of each article with the tongue and then pressing them to the wall." Water for drinking was provided by melting ice hacked from the wall.

Rubbish was disposed of down a small crevasse to which the cave communicated by a porthole in one wall. It was also a great relief to be able to converse with ease in such comfortable quarters away from the noise of the wind and the flapping of a tent.

Up on the glacier surface above, the dogs tethered to an anchored line of rope had each rolled itself into a ball for protection against the wind. We did what was possible to make them some shelter from the cold southerly blast.

The following day, August 13th, it was decided to push on further to the south. This meant heading into the face of a strong wind, but there was no drifting snow, so we had a clear view around.

For a time fair progress was made up-hill over slippery blue ice. We passed by many small open crevasses and over old wide ones plugged with driven snow. Then the sky quickly became densely overcast and it was obvious that we were in for a heavy fall of snow which would mean dense drift, prohibiting travel for want of visibility. As there was dog food enough to last for only three days, I decided to depot what food we had and return to the Hut as quickly as possible. Thus at a point somewhat over 8 miles south of the Hut we cached the food and retraced our steps.

The strong wind now behind us blew the lightly loaded sledge along downhill over the polished ice surface. The sledge travelled so fast that the dogs were no longer of use, for they and the sledge harness were constantly becoming entangled in the over-running sledge. So, since the sledge had to be safeguarded from falling into crevasses, we unharnessed the dogs, allowing them to go ahead or follow behind as they wished.

The daylight faded but not before the sledge depoted at Aladdin's Cave was sighted. It did not take long to arrive and scramble down below in shelter to camp there for the night.

The next day as the landscape was enveloped in thick drifting snow we decided to await an improvement in the weather. On the 15th the drift was still blowing, though somewhat less dense. However, we felt that we could wait no longer so decided to set out for the Hut though, of course, under conditions of very limited visibility, with howling gale behind, and with no landmarks or blazed trail. The descent of the steep coastal ice slopes in search of the patch of rocks at the sea front on which our Winter Quarters Hut was located, was accordingly no mean task. There was indeed a lively possibility that while groping through the drift along the polished ice slopes we should be blown over the cliffs into the sea.

It was anticipated that the dogs, huddled up on the snow at the entrance to the cave, would follow us to the Hut. However, after having covered about half a mile of our way to the Winter Quarters we noted that they were not then with us. There was, of course, a chance that the dogs had gone on ahead. To go back in search of them was discounted; firstly, because there was but a small chance that in such a thick drift we could locate Aladdin's Cave; secondly, because to return meant dragging our sledge uphill against a roaring wind, which would have been difficult. Therefore, we continued down the ice slopes, hoping to find either that the dogs had arrived at the Hut before us, or failing this, that they would have sense to return to the Hut when they became hungry.

We were delighted when, at lower levels, the wind became gusty and in intervals between the gusts, distant objects became visible. Then suddenly the sea appeared below us and some icebergs in the offing came into view. It was obvious that in the descent our course had been too far to the east. We continued on a course making further to the west and arrived at the Hut at about 1 o'clock. To our dismay none of the dogs had returned.

It was ascertained that during our absence on the plateau there had been two short fine intervals at the Hut which had been seized upon for the erection of the topmast section of the more southerly wireless mast. Thus there were now erected two good masts which we hoped would give sufficient height for the aerial, permitting wireless communication with Macquarie Island.

Comparison of the record of the wind blowing on the plateau during our few days absence showed that the intensity of the wind at the Hut had on the average been less than at higher elevations on the ice slopes.

As the dogs did not return by nightfall, arrangement was made for Bage, Mertz and Hurley to set out for Aladdin's Cave first thing on the morrow, weather permitting. However, there was a hurricane of wind on the 16th, so, after dragging their sledge to the Magnetic Cave in an 82-mile-an-hour wind, Bage's party returned to the Hut, hoping that a break would occur by the following day. Unfortunately the weather remained impossibly bad until the morning of the 21st when the drift abated and the wind fell to 60 miles per hour.

As the dogs had not returned the relieving party set out in twilight at 6.30 a.m. Later in the day heavy clouds appeared and drifting snow again commenced, indicating freshly-fallen snow on the Plateau. Increased wind and thick drift followed which we anticipated would prevent the return of Bage's party; this it did (Plate LIV, Fig. 2). It was not until the 25th that there was some small improvement in the weather and then Bage's party returned all well bringing with them all the dogs but Grandmother who had died.

They reported that on the 21st when coming in sight of the depoted sledge on the ice above Aladdin's Cave, the dog Castor was actively jumping about evidently having realised their approach. They found the dogs had made no attempt to break into the provisions in the sledging food-bags, but had evidently just curled up in the snow and waited. They were all frozen down to the ice except Basilisk and Castor. Pavlova was in the best condition doubtless because we had given her some extra food on the morning of the 15th prior to our departure from the Cave. Most of the dogs were more or less listless when found. They would not eat until taken down into the Cave and given warm food which revived all but Grandmother who died four hours later. It is interesting to note that when relieved these dogs had been just seven full days without a meal.

During their enforced stay at the Cave, Bage's party enlarged and improved it considerably.

SPRING RECONNAISSANCE JOURNEYS.

More days of blizzard and drift followed until on the 31st good weather arrived. It was a day of variable winds and plenty of sun light. Sledging rations were taken up the ice slopes to the Magnetic Cave. Other members of the party, after great trouble, completed the wireless aerial. A strop that had supplied an attachment at the top of the mast had carried away and great difficulty was experienced in climbing to the top to replace it. The bitterly cold wind froze the fingers of those who attempted to climb the mast. Eventually Bickerton designed and made climbing irons and with their aid easily reached the summit and finished the job.

September opened with a day of really good weather. Thin sea-ice had formed off the Cape and we were able to walk out on it for a distance of a couple of hundred yards and there dredge for marine life. The ice broke under my weight and I had some difficulty in climbing out of the water on to the bay-ice, for it was so thin that it kept breaking away more and more as I attempted to clamber on to it.

Three seals were killed and skinned. Mertz, Ninnis, Whetter and Laseron took a load of food up to Aladdin's Cave. Others pushed on with the construction of the Astronomical Observatory and with the plane-table topographical survey. In the evening Bage and Webb were occupied with star observations.

Though thickly overcast and with some snow falling, calm weather continued during September 2nd. No seals were seen and the only bird noted this day was a single Snow Petrel. Though calm weather continued at sea-level during the 3rd, a party comprising McLean, Whetter, and Close, who sledged stores to Aladdin's Cave, reported that on the highlands winds of 20 to 40 miles per hour with light drift persisted all day.

On this day we dredged through the sea-ice at a point half a mile out from the Hut. Wonderful hauls were secured. When returning to the shore with some of the dredging gear which was being transported in a hand cart, the latter broke through the ice and Hunter with it, but no real loss was sustained. Hurley, who had ventured on dangerously thin ice in search of photos, also broke through, but managed to

get out of the water again, also saving his large camera, though it was damaged by immersion. Another seal was located and secured. All outdoor undertakings were well advanced as a result of this spell of favourable weather.

September 4th commenced as a beautiful calm day, but the barometer then began to fall ominously. Ninnis, Mertz and Murphy took stores to the depot at Aladdin's Cave (Plate LX, Fig. 2). At 1½ miles out they found the dog Franklin lying on the ice. He was still there when they passed by on return, so they took him along with them back to the Hut.

Several days prior to this event Franklin and Scott had been to Aladdin's Cave with a sledging party and when returning, running loose, had been last seen when about 2 miles from the Hut. On that evening it was observed that all the other dogs except Franklin and Scott had returned. Franklin was next seen several days later, as reported above, but Scott was never seen again. We conjectured that he had fallen into a crevasse and that Franklin had lain down nearby faithfully waiting for him all that time.

It is worthy of note that the plateau party that day came upon a wall of drift at about the 1,000 feet level and thereafter travelled through wind and drift all the way to the Cave. On the return journey the lower calm air was again entered at the 1,000 feet level.

A number of us spent the day dredging through the sea-ice in deeper water, where splendid hauls were made. At 4.30 p.m., whirlies with drift-snow were observed slowly but steadily descending the ice slopes. The dredging equipment was hurriedly packed up and we made for the shore, arriving there only just in time, for a high wind swept down upon us at that very moment, and it had soon attained a velocity of 80 miles per hour, effectually clearing out all the sea-ice and once more leaving us with open water.

By the 7th the wind had subsided to 56 miles per hour, and Webb, Stillwell and McLean set out man-haul sledging to the south, taking the dip-circle with the object of securing useful magnetic data. Though the outlook was not promising when they left, it was hoped that the weather would improve.

I had arranged for several reconnoitring parties to leave the Hut as soon as possible. This was mainly with the object of ascertaining whether the Cape Denison weather was merely quite local or really typical of that section of Antarctica. We hoped that better could be expected as we receded from Commonwealth Bay. Also in order to plan better for the projected summer sledging journeys, it was very desirable that more should be known of the hinterland. A further useful purpose to be served was to give some of the men experience in sledging and to test them.

Cold blizzard conditions prevailed on the 8th, 9th and 10th, but there was some improvement on the 11th. On this day a party comprising Ninnis, Mertz and Murphy departed from the Hut in a 48-miles-per-hour wind, with the intention of striking to the south-east of Aladdin's Cave.

The following day Madigan set out in a 50 m.p.h. wind to lead to the west a party, comprising himself, Close and Whetter.

At this time of the year and on to summer, though the winds continued in great strength, there were often considerable periods when at sea-level the air was entirely free from drifting snow. The reconnoitring parties at this time, however, discovered that though there might be no drift-snow at sea-level, it still persisted to a disagreeable degree at higher elevations.

Webb's party returned on the 16th in a gale of wind. After leaving Aladdin's Cave they had sledged south for a little more than three miles and then pitched camp, for it was necessary to make a search there for the small depot of pemmican, picks, shovels, etc., left in that vicinity by my party in August. The drift cleared at noon on the 11th and the bamboo pole marking the depot became visible a quarter of a mile away to the right. The march was then resumed in a 50-mile wind at a temperature of —20° F. They were forced to camp at a point 11¾ miles south of the Hut.

The wind rose to about 80 miles an hour during the night. It was too strong for travelling against it on the 12th, so they decided to excavate a cave in the ice in case of accident to the tent, which latter they were finding great difficulty in maintaining erect.

A tunnel was driven into the sloping surface of the ice towards a narrow crevasse about a foot wide. It was a good ten hours' job in tough ice before the crevasse was reached. Into this fissure all the hewn ice was thrown, instead of laboriously dragging it out through the tunnel. The Cathedral Grotto, as it was henceforth known, was soon completed and the party transferred to it their equipment and made themselves comfortable (Text Fig. 12).

During the next three days the wind was so strong that it was impossible to leave the Grotto in safety unless shod with the best of crampons. As there was only one pair of the long spiked Swiss crampons amongst the whole party, further progress could not be made. Much time was then spent in building a high breakwind of ice blocks. In a pit excavated on the leeward side of the latter Webb made a full set of magnetic observations.

Eventually, as there was no prospect of going further south, a depot flag was hoisted and provisions cached. The party then commenced a furious race back to the Hut with a 75-mile-wind in the rear.

The second party, Ninnis, Mertz and Murphy, on leaving Aladdin's Cave, diverged to the south-east, in which direction they made steady progress against a strong headwind. The surface was so rough that the jarring loosened nuts in the sledge-meter. This resulted in much trouble, the meter having to be attended to at frequent intervals.

Against a 65-mile-an-hour wind, the special finnesko crampons which we had devised for wearing over finnesko were found to be inadequate. As a consequence progress would have been quite impossible but for the fact that Mertz was provided with a pair of the long spiked Swiss crampons.

Their camp of September 15th which was located at 18 miles south-east of the Hut was one to be remembered, for a hurricane raged all day and all that night. The tent was very much damaged by the wind but they managed to maintain it until next morning. All this time the three men lay in their three-men sleeping bag fully dressed and ready to take the road at a moment's notice.

The tent, though very much damaged by the wind, was maintained as a partial shelter until next morning. Then they had to make a bolt for Aladdin's Cave. This they reached only with great difficulty, for they had to march part of the way with a furious wind abeam. This constantly swept them downhill on to the lids of wide crevasses, which, fortunately for the party, were strong at that season of the year. They reached the Hut on the 16th.

We were now thoroughly anxious concerning Madigan's party, for they were still on the plateau and obviously facing very difficult conditions, for high winds and low temperatures had persisted ever since their departure from the Hut.

Many months had now gone by and wireless communication with Macquarie Island had not yet been achieved. Hannam and Bickerton were still working on the aerial and the lead-in to the Hut, but the high winds discounted all their efforts, constantly breaking the aerial and the lead-in to the Hut. Another matter which they found caused endless trouble was the condensation of moisture on the sending and receiving gear which was housed in the workshop. The moist air from the living-room poured out into the workshop and condensed on all objects. We were later to find that it was owing to this condensation that we failed to establish communication during this first year at Cape Denison.

There was a very strong blizzard wind with low temperatures on the 20th and our anxiety for the safety of Madigan's party increased.

On September 23rd we commenced digging away the snow drift blocking the entrance to the hangar for it was anticipated that it would not be long before the weather should have sufficiently improved for use to be made of the air-tractor. As the days went by, anxiety concerning the party on the Plateau still further increased; nevertheless I felt that Madigan's resourcefulness should ensure their safety.

When, on the morning of September 26th, Madigan's party had not returned, I decided to lead a party in search of them. Arrangements were made to depart early the following day. During the 16th a further quantity of sledge stores was moved up to Aladdin's Cave. Much to our relief at 2.30 p.m., after an absence of just over two weeks, Madigan, Whetter and Close returned. Their faces were rather badly frost-bitten.

They had a thrilling story to tell. The party had reached 50 miles to the west of the Hut on the high plateau. During their fortnight of absence the average wind velocity recorded by the Robinson anemometer at the Hut amounted to 58 miles per hour, implying worse conditions for the sledge party on the plateau.

The following abbreviated account is an abstract from Madigan's report on the journey. See map-plate vii for a plot of the track followed by this party.

After leaving the Hut at 7.30 a.m., on September 12th, they fought their way up the ice slopes against a very strong wind. It was not until 2.15 p.m., that Aladdin's Cave was reached. Later in the afternoon they pushed on to a point about 6½ miles from the Hut. There camp was pitched for the first night.

The next day after a march against a 65-miles-per-hour wind, Webb's old camp at 8¼ miles out was reached at 1.45 p.m. So far the journey had been over glacier-ice. In the area around this camp small ice mounds were scattered over the surface of the glacier-ice. These were about 6 feet across and up to 18 inches high. It was just at about this point also that isolated white sastrugi of hard snow-ice were met with at intervals over the surface of the glacier-ice.

At 8¾ miles out from the Hut, when on top of a rise in the ice surface overlooking a slight depression to the south in which sastrugi-furrowed snow had lodged, they turned west. They were then still in a region of small ice mounds which continued to a point 11 miles out from the Hut. Beyond the 11 mile point crevasses increased in size, some of them ten to twenty feet wide. These crevasses all trended approximately east and west. At 15 miles out the blue glacier-ice changed to hard névé.

Their camp on September 14th was at a point 15¾ miles from the Hut. The journey was continued west on the 15th in a 75-miles-per-hour wind which was accompanied by light drift-snow. Camp was pitched at sunset at a point 25 miles from the Hut. The surface traversed during the day had been of the nature of partially consolidated snow.

Continuing next day, they were favoured with somewhat better weather. At 28 miles out a number of icebergs standing off the furthest point of the coast visible to the north-west from Winter Quarters came into view. They were then immediately south of that point (Point Alden).

As progress to the west was achieved the hard snow surface encountered became more strikingly sculptured, groups of major sastrugi standing out prominently above an almost flat surface.

The ground traversed on September 17th, lay across the plateau at an elevation of a little over 3,000 feet. Drift-snow obscured much of the view. The ground was then found to be sloping gently to the north-north-west. Camp was pitched at a point 34½ miles out.

The next day they pushed on to a point 45½ miles from the Hut. At 4 p.m., on Thursday the 19th a point 50 miles out was reached. This point was the limit of their journey. The surface there was much the same as that of the previous 20 miles. A depot flag was hoisted and with it was cached one week's provisions for three men and a one-gallon tin of kerosene. The height of this camp, ascertained by hypsometer, was 3,330 feet above sea-level.

Friday the 20th was a day of dense drift to the accompaniment of a wind estimated to be blowing at about 80-miles-per-hour. Even close objects were obliterated by the drift. Consequently the commencement of the return journey had to be delayed until the following day, when, though the wind was still blowing about 60-miles-per-hour, the atmosphere was almost clear of drift, and the sun shining.

When they had returned to a point 46½ miles from the Hut the sea came in sight on the northern horizon extending between north-north-west and north-north-east. Some six peaked bergs and three large tabular ones could be distinguished in the area of sea within sight.

Most of the way back to Winter Quarters, they followed their outward track though there was some divergence in the later stages. Camp on the evening of September 24th was at 32 miles from the Hut. There they experienced the heaviest wind met with on the journey. At 3 a.m., on the 25th the cap of the tent gave way and the fabric split right up one side. However, with the use of plenty of alpine rope, the fabric was again tied on to the poles and the whole anchored with an ice axe embedded in the ground on the windward side of the tent. Thereafter the cooker could not be lit and they had to eat cold provisions and snow.

With the first appearance of light in the morning the party got under way and made a long day of it, managing to reach Aladdin's Cave at sundown. Fortunately, the wind during marching time fell off very considerably, actually to about 40-miles-per-hour. All were relieved to be back at the Hut next day.

RETURN OF THE PENGUINS.

For some days at this time the winds continued unabated but with little or no drifting snow. However, late in the afternoon of the 28th it fell off to 30-miles-per-hour thus permitting continuance of outdoor operations. Several Antarctic Petrels were seen disporting themselves over the sea.

As a result of experience gained on the September sledging tests modifications were introduced in the design of the tents to fit them better for use under the prevailing windy conditions. One of the new features was the rigid attachment of the tent poles to the fabric.

On September 26th two of the dogs, Franklin and Basilisk, after sledging to Aladdin's Cave, failed to return to the Hut. When set free at the Cave for the return journey they evidently turned back to the Cave. On the 30th Hurley and Ninnis set out with food with the intention of succouring the dogs, but had to return after reaching 2 miles out.

October 1st began with thick drift and a high wind which continued on the 2nd. There was a diminution of drift on the 3rd so Mertz and Ninnis set out for Aladdin's Cave in search of the missing dogs. They had difficulty in locating the Cave owing to limited visibility. On reaching the goal, the dogs were not to be found though evidence was discovered that they had been there recently. Mertz and Ninnis then returned to the Hut to find that the two dogs had arrived just half an hour before them.

High wind and thick drift continued for the next few days. The outlook for sledging was indeed disappointing.

By October 4th flights of Snow Petrels over the rocks in the vicinity of the Hut were recorded as of frequent occurrence.

On October 7th the wind fell off to about 40-miles-per-hour. This gave an opportunity for a final effort to increase the height of the wireless masts. Bickerton worked for five consecutive hours suspended in ropes in the wind at 90 feet above the ground, finally achieving the erection of top-gallant section of the northern mast, bringing the total height to 115 feet.

During this day also the work of removing the snow drift blocking the hangar was nearly completed and further sledging stores were taken to the depot up the glacier. A number of Antarctic Petrels which were now quite plentiful were shot for skins.

After this slight respite of the 7th the strong blizzard wind returned and continued for many days without flagging. However, with the increased daylight and somewhat warmer temperature much outdoor work was accomplished. Numbers of Antarctic Petrels and Snow Petrels and an occasional Silver-grey Petrel were now to be seen daily.

About this date, though Hannam had failed to receive any wireless signals from our Macquarie Island station, he frequently broadcasted a short statement advising the location of our Base, in case the *Aurora* had not returned with the news the previous summer. There was always a chance that this message would be picked up. It was Hannam's opinion, however, that communication with Macquarie Island was not likely to be effected until the top-gallant mast, already hoisted on the northern mast, should be erected also on the southern mast. My entry at this time regarding the "wireless" ran as follows:

"The 'wireless' masts have held remarkably well in the fierce hurricanes, but this might well be expected for they have innumerable steel wire stays. One day of fine weather, anything not exceeding a 30-miles-per-hour wind, will now suffice to finish the southern mast and we shall then make a final effort to establish communication."

In a strong blizzard wind on the 12th McLean sighted an Adelie Penguin, the first of the season; it was sheltering behind a rock near the shore. Every few minutes this penguin sallied out to take stock of the weather but on each occasion quickly beat a retreat. On sighting McLean it hurried across to him and was promptly captured. It was a fat male bird weighing 15 lbs.

The 13th was an eventful day. The wind increased in the early morning hours, rushing by in great gusts which shook the Hut, notwithstanding the fact that none of that structure except part of the roof was then above the snow surface. My entry remarks as follows:

" We again congratulate ourselves on having so staunch a Hut. There is no exaggeration in stating that probably every other Hut that has previously been erected in the Antarctic would have been carried away bodily long ere this. "

On this day objects outside the Hut were being moved about as they never before had been. Sledges that we had thought secure were found a quarter of a mile away. Heavy loaded boxes, lumps of ice and small pebbles were continually flying past the Hut so that it was really dangerous to be outside.

When we were halfway through dinner, at about 6.50 p.m., we thought part of the roof had carried away for there was a rending sound audible above the din of the blizzard. On investigation, the northern wireless mast, 115 feet high, was found lying on the ground, shattered. This ended any further attempt to establish wireless communication during that year (Plate XLVIII, Fig. 2).

The puffometer missed being in action during the period of heaviest gusts, but when later in the day it was put into commission for a period of 20 minutes, it was recovered minus the attached ball which had been torn off by the wind. During that short period, six super gusts had swept by stretching the spring to the limit, indicating 202-miles-per-hour which was the maximum the instrument could record. I noted at the time: " It is certain that repeated gusts swept over the Hut on the night of this day at 250-miles-per-hour how much more it is not possible to say. "

On this day McLean found the second penguin of the season. It also was a male bird. The breast meat removed for eating weighed 2 lbs. 7 ozs.

On October 14th half a dozen Adelie Penguins arrived and two large female Weddell Seals were seen basking on the bay-ice.

A lull in the incessant wind intervened at elevations near sea-level on the afternoon of the 15th, but a and beyond 300 feet above the sea, on the ice slopes to the south, the wind continued.

On the 17th, as high winds were still a constant feature, I recorded that " there appears to be little hope of a decent sledging season." Adelie Penguins were by this time quite numerous (Plate LVII, Fig.1).

The 18th was a day of steady and continuous strong wind reaching 80 miles per hour during the morning. Up to this date, October had proved one of the windiest periods of the year. This day a Weddell Seal calved on the bay-ice of the Boat Harbour. Adelie Penguins were about in numbers, groups occupying all the rookeries scattered over the rocky area. A mob of 35 were ashore at the eastern point of the Boat Harbour. We observed that penguins can make good progress against the wind, bending down to lessen the windage and halting frequently for a rest. This day they were occupied building nests. Some of the birds take a long rest between the carrying of each stone; they put a few stones together and then lie on them to get them into place. Numerous small developing eggs were found within a female Adelie taken today.

Though it was blowing hard on the 19th, I decided that at all costs we must get away on exploratory sledging journeys not later than the end of the month. Work on sledges and other sledging equipment was still in progress in the workshop. The taxidermists also were busy preparing Adelie Penguin skins. Antarctic Petrels were notably plentiful at this time but Snow Petrels scarcer than they had been.

On the 20th though the wind remained steady its strength fell off considerably and the temperature rose to 14° F.; this strengthened our hopes for a sledging season. A flock of Silver-grey Petrels was observed flying past the coast. The Adelies commenced copulating today. The first Skua Gull of the season was sighted; this I shot for its skin.

There was very little wind on the 21st and the temperature rose to 23° F., at noon. Snow then began to fall from an overcast sky. The temperature within the Hut rose, which resulted in thawing of the ice crust on the ceiling. The steady drip that ensued was most disagreeable.

On this day an albino Adelie Penguin came ashore; it was pithed and skinned. Also an Emperor Penguin weighing 62 lbs., was caught on the bay-ice. Snow Petrels, Antarctic Petrels and Silver-grey Petrels were seen in numbers, as well as a few Skuas. Hunter found an external parasite on an Antarctic Petrel. A bull Weddell Seal skinned this day was found to be full of internal parasites.

DEPARTURE OF SUMMER SLEDGE PARTIES.

The strong blizzard wind returned and did not moderate until October 25th, when Ninnis and Mertz with the dogs took up to Aladdin's Cave 400 lbs. of dog food in the nature of desiccated seal meat and blubber. Record time was made notwithstanding the wind, the whole journey occupying only 3 hours 45 minutes. The next day Ninnis and Mertz took another 550 lbs. of dog rations to the Cave. They reported a strong wind still blowing beyond the 3-mile flag-post.

As the weather had by this date decidedly improved I finalised the sledging programme and announced same after Divine Service on October 27th.

The wind was down to 40-miles-per-hour on the 29th but increased the following day. Nevertheless, Ninnis and Mertz with the dog team transported 500 lbs. weight of food to Aladdin's Cave, again meeting a very strong wind blowing steadily at elevations above the 3-mile post. It was apparent by now that the 3-mile post was at a critical elevation so far as the flow of air from the plateau was concerned, for it frequently marked the downward limit of the fierce plateau wind.

The month ended with a day of strong wind and thick drifting snow. The month's average wind velocity at the Hut as recorded by the Robinson Cup anemometer amounted to 56·9 miles per hour.

More fresh seal meat for dog-food was cut into one-pound blocks and partially desiccated over the the stove in the workroom.

Two Emperor Penguins came ashore and were secured on November 2nd. Weddell Seals were killed almost daily at this time. Snow Petrels in numbers were found to be making and occupying nests at all rocky points along the coast. Several loads of sledge foods were taken part of the way to Aladdin's Cave during the first days of November.

On the 5th a special farewell dinner was indulged in, anticipating that the sledge parties would set out the following day. However, the 6th turned out to be a day of driving wind and thick drift. On the 7th in a high wind Murphy, Hunter and Laseron, who constituted a supporting party for the main Southern Party (Bage, Webb and Hurley), managed to get their sledge to a point 3½ miles on the way to Aladdin's Cave but returned to the Hut for the night. They found the usual very strong wind above the 3-mile point.

My instruction to Captain Davis when he departed west in January was that he should arrive at Cape Denison with the vessel in time to relieve our party on about January 15th. There was now, therefore, only a short time available for sledging. My plans, now finalised to meet the case, were designed to secure in the short time available as much information as possible concerning the plateau to the south, and the coast to east and west.

Bage, Webb and Hurley were to constitute a Southern Party whose chief objects were, first, to investigate the extent and nature of the plateau to the south and, secondly, to determine the magnetic elements at a chain of stations along the route. They were instructed to proceed due magnetic south towards the Magnetic Pole provided that such a course did not unduly deflect them from their southerly (geographic) course.

All parties were instructed to be back at Cape Denison by January 15th. Owing to the short period available for sledging, the probability of Bage's party being able to sledge as far as the South Magnetic Pole appeared improbable. Assistance was to be given them by Murphy's supporting party which undertook to transport, for a considerable distance along the track, a quantity of food stores for their use.

With regard to the charting of the region to the east of Cape Denison, the coastline as far as longitude 145° E. had already been roughly delineated from the *Aurora* in the early days of January. Further to the east, Wilkes's map of 1840 indicated a coastline in about latitude 66° 50′ S. extending for several hundred miles in that direction. However, Scott in 1904 had proved this to be in error so far as the farther east section beyond Wilkes's Cape Hudson is concerned. On the other hand, the distribution and density of the pack-ice that we had encountered westward from the Balleny Island, when attempting to push south in the *Aurora*, appeared to support Wilkes's contention of land in the neighbourhood of his Point Emmons and Cape Hudson. But Lieut. Pennell in the *Terra Nova* in March, 1911, had sighted Antarctic coast (Oates Land) at no great distance to the east of the charted position of Wilkes's Cape Hudson, but at some 138 miles further to the south.

It was clear, therefore, that if Wilkes's chart were correct so far as Cape Hudson is concerned, then the coast must turn sharply at that point and run away south to Oates Land.

I was hopeful of joining up Adelie Land with Oates Land, but with so short a sledging season as was available along this blizzard-ridden coast, it was obvious that the undertaking would be difficult of achievement. The plan which I adopted was to divide the work of charting the region east of Winter Quarters into three divisions. A Near East Party was to complete in detail the mapping begun on board the *Aurora*, extending as far east as longitude 145°. An East Coast Party was to carry on along the coast further to the east with the expectation of penetrating as far as Cape Hudson. A third party, the Far East Party, was to travel as directly as possible towards Oates Land, with the expectation of making a very rapid advance across an expanse of inland ice, thus to arrive in the neighbourhood of Oates Land in time to get an approximate idea of the position of the coastline between Oates Land and Cape Hudson.

Madigan, McLean and Correll were to constitute the East Coast Party to which was assigned the delineation of the coastline immediately to the east of the shelf-ice (Mertz Glacier Tongue) met by the *Aurora* on the seventh of the preceding January.

Mertz, Ninnis and myself with two dog teams were to push on still further east. I planned to travel over the land, and hoped to complete the charting of the further coastline linking up with Oates Land.

To Stillwell was assigned the charting and geological examination of the near east coast between Winter Quarters and the shelf-ice to the east (Mertz Glacier Tongue). As he had not to cover so great a distance, it was arranged that he, Close and Hodgeman should sledge east in company with Madigan's party and my own party for 30 miles or more, hauling, in addition to their own requirements, a quantity of food for our further-east parties. After parting company with us somewhere east of Aladdin's Cave, Stillwell's party was in the first place to undertake a limited reconnaissance of the coast adjacent to the shelf-ice and then to return to the Hut for further stores and a re-organization of the party before undertaking detailed mapping of the near-east coast. On his return to the Hut after the first reconnaissance Stillwell was to be joined by Laseron, who would then be returned from supporting the Southern Party. Close was to be the third member of the party. Hodgeman on return from the first near-east sledging journey with Stillwell was to join Bickerton and Whetter, who were then due to set out on a sledging journey across Adelie Land to the west of Winter Quarters.

To this latter party under the direction of Bickerton, I had assigned the air-tractor sledge, which was, however, an item of doubtful utility. Had our Main Base Station been located on a flat, hard snow surface, like the Ross Barrier, we would have had confidence in the utility of this air-tractor. But on the polished, furrowed and crevassed coastal slopes or over the rough sastrugi ridges of the plateau of Adelie Land, its probable performance was a matter of great doubt. The outlook was rendered more uncertain, for on account of the prevailing high winds and dense drift there had been no opportunity of testing the performance of the machine, though November had already arrived. It was clear that if the air-tractor was to be used at all it

could only be employed in the very height of summer, when some respite from the usual drifting snow might be expected. Consequently, Bickerton's party, which included Whetter and Hodgeman in addition to himself, planned to set out not earlier than December 1st. Bickerton was instructed to make what use he could of the air-tractor, but should it in any way fail to be of service, it was to be abandoned. In that event they were to proceed with the programme, man-hauling their sledges.

It was calculated that considering the very short period available for our sledging operations, this programme should yield the maximum information obtainable regarding the region surrounding Winter Quarters.

On the morning of November 9th the drifting snow was denser than it had been for some days past so it was certain that the parties camped the previous night at Aladdin's Cave would not be departing therefrom; consequently my own party also delayed our start from the Hut. Penguin eggs were then being laid in such numbers that we had them cooked for all meals. Omelettes made of them were found to be excellent and in great demand.

On the following day, November 10th, the drift abated, but a brisk south-south-east wind continued to blow. The moment for departure arrived. Bage's party left the Hut during the forenoon and made good pace with the expectation of soon catching up to their supporting party which had set out on the 8th. Bickerton accompanied them for three or four miles to help them drag the sledge up the steepest sections.

At 12.30 p.m., Mertz, Ninnis and I set out with two teams of dogs, intending to camp the first night at Aladdin's Cave (Plate LVIII, Figs. 1 & 2).

SUMMER AT THE BASE STATION AND RETURN OF SLEDGE PARTIES.

That evening and for some days thereafter, there remained at Winter Quarters only Bickerton, Hannam and Whetter. Hannam undertook to attend to the magnetographs and Whetter was to carry on the meteorological record. Bickerton worked on his air-tractor and made preparations for the journey to the west. Those at the Hut were also busily employed for part of each day during the next fortnight collecting penguin eggs as a reserve store food in case we should be detained at Cape Denison for a second winter.

All went smoothly at the Base Station and without special event until November 27th, on which day both Stillwell's party and Murphy's party arrived back from the Plateau.

Murphy, Hunter and Laseron had supported Bage's party as far as 67 miles from the Hut where at an elevation of 2,250 feet a depot had been laid. They had done their job well, but it had proved no easy matter, for most of the distance had been covered in a dense haze of drifting snow and wind. The unvarying white light of thick overcast days had been so severe that all were suffering from snow-blindness. Stillwell, Close and Hodgeman had, on the whole, experienced better weather. Besides assisting the further-east parties, they had executed the first section of the charting of the near-east coast.

On December 3rd, Bickerton's party departed on their journey to the west. Stillwell did not leave the Hut again to continue his east-coast survey until the 9th. As already mentioned his party on that occasion included Laseron and Close.

After this date, there then remained only three men at the Hut to carry on the routine observations: Hunter, who in addition to his biological work was chiefly responsible for the meteorological records; Hannam who continued to act as magnetician; and Murphy, who was generally in charge of stores and preparations for embarking equipment when the *Aurora* should arrive.

Mid-summer at the Hut passed without special event. Then the first of the sledge parties to return was Stillwell's which arrived on January 5th after executing a very good piece of coastal charting in the region immediately east of the Hut.

Bage's party returned on the evening of January 11th having accomplished a really fine job under harassing weather conditions. They had proved the plateau nature of the country for a long way to the south and had secured very valuable records relating to terrestrial magnetism. They had faced a gruelling

task and on arrival back at the Hut were found to be all much affected by snow-blindness. Failure to locate a food depot laid down at 67 miles out from the Hut landed them in a very serious position, from which by a splendid effort they successfully extricated themselves.

Madigan's party reached Winter Quarters on January 16th. Travelling over land-ice and sea-ice they had reached a farthest east point in longitude 150° 12′ E. Besides charting the coast they had made some important geological observations including the finding of a coal-bearing formation. This sledge undertaking was executed in a thoroughly good fashion, a very creditable performance. Towards the end of the journey, owing to an extraordinary thick fall of soft snow and shortage of food, they found themselves in a very serious position, but evaded disaster chiefly as a result of a great performance by Madigan, who managed to reach and locate a buried food depot and returned with supplies for the others.

Bickerton's party reached the Hut on January 18th after a protracted and depressing journey in wind and drift across the plateau of Adelie Land. The air-tractor, which gave so much promise at the start, had suddenly collapsed, apparently owing to seizure of the pistons in the cylinders, which happened at a point only about 8 miles out from the Hut. The air-tractor was then abandoned and the journey west continued on foot. They penetrated as far west as the 138th meridian, securing valuable information relating to the nature of the ice plateau, its meteorology and some magnetic data.

My own party sledging eastwards over the coastal highlands was severely harassed by bad weather and by the prevalence of crevasses, both ever present features of the zone between the inland plateau and the sea. These troubles were surmounted satisfactorily until December 14th when approximately in longitude 151° 40′ E., Ninnis, with the best dog team and almost all the supply of stores, broke through the lid of an exceptionally bad crevasse and all were lost in the black abyss below. This catastrophe, as it entailed the loss not only of our companion but of nearly all our food, demanded the immediate return to Winter Quarters of Mertz and myself. Mertz died on the way, but in an advanced stage of starvation I happened to stumble upon a cache of food left on the plateau by a search party. This food carried me to Aladdin's Cave and so to the Hut on February 8th, but not before the ship had departed west to relieve our Western Antarctic Base under the command of Frank Wild.

When I arrived back at the Hut late on February 8th, 1913, it was to find that the station was manned by a party of six under the leadership of Madigan. This was in accord with instructions I had left for Captain Davis, which provided for the eventuality of the non-return of my sledge party before the date when the *Aurora* should be compelled to proceed west to relieve Wild and his men. My companions were now Madigan, Bage, Bickerton, McLean, Hodgeman and a newcomer, Jeffryes. The latter's keenness to spend a winter in Antarctica and his qualifications as a skilled wireless operator led to his inclusion in the party of volunteers selected by Captain Davis.

During the comparatively calm weather of January, Davis had taken the precaution to have the wireless mast re-erected in case it should be needed (Plate LIX). Hannam had found that the wireless receiving and transmitting set, as originally located in the workshop, was most unsuitably placed. This arose from the heavy condensation of moisture from the humid air escaping into the chill workshop from the adjacent, comparatively warm living-room.

The instruments were transferred to the living-room which was warmer and drier, and where henceforth there was ample room to house the equipment owing to the reduction in the number of the party.

The value of the improved wireless installation was soon demonstrated, for, on the very night I returned, I was able to recall the ship. The ship returned, but a strong off-shore wind greeted the vessel as she neared the land. After some hours of waiting, without any evidence of the wind abating, Captain Davis felt impelled to depart and so headed the ship west. He feared that further delay might result in catastrophe to Wild's party, the season being already well advanced and the ship having a long way to go to their relief.

Since the sea off Adelie Land would be free from ice during March, we at Cape Denison felt there was hope for the return of the *Aurora* at a later date, after the relief of the Western Base Party. However, this was not found possible, so after remaining expectant for a month we finally settled down to a second year of routine observations.

A SECOND WINTER.

What we missed in the loss of our original dog teams was amply made up by the cheery company of the excellent band of sledge dogs, formerly Amundsen's, which had been landed from the *Aurora*.

We were extremely gratified to establish at last regular wireless communication with Macquarie Island. Contact was established with Macquarie Island on February 15th, and the first messages were given and received on February 20th. Shortly afterwards daily weather summaries were transmitted, sent via Macquarie Island to Australia.

We had a plentiful supply of penguin eggs, also a store of seal and penguin meat was accumulated before autumn set in. As may be well imagined, my health was in a poor state for some time after return to the Hut. My interior remained disturbed for weeks. Also the mental strain had been so considerable that for several months I found it difficult to sleep soundly.

On March 16th we received a wireless message advising the safe arrival of the *Aurora* at Hobart. Numbers of Adelie Penguins were still to be seen in the vicinity of the rookeries. On March 19th sixteen of these penguins that had completed their moult were branded with black paint with a view to checking the possible return of these same birds to the Cape Denison rookeries the following year. However, it may be here mentioned that none of the branded birds were ever seen again.

By the middle of March we had completely settled down to a routine: Madigan, with some assistance from Hodgeman, attended to the meteorological instruments and took charge of the dogs; Bage undertook the magnetic observations, transit observations (which, with the aid of wireless signals, were to fix accurately the meridian of our observatory at Cape Denison) and other helpful activities; Bickerton's chief concern was to operate the power-plant for the wireless and to keep wireless masts and aerial intact; McLean kept the biological log and maintained the Hut in ice and coal. McLean also became editor of " The Adelie Blizzard," a monthly publication of prose and verse. Hodgeman rendered general assistance. Jeffryes's only duty was to listen in and transmit messages each evening. My own time was mainly taken up with furthering the biological and geological work, the preparation of reports and general affairs.

After a year of soda-bread (made of baking-powder and flour) we were all heartily sick of it and longed for real yeast bread, so I set about trying to cultivate yeast. Samples of various dried fruits, and a little beer were allowed to stand for a few days in water to which a little sugar and flour had been added. The mixture was kept alongside the stove where it would be maintained at a temperature at least a little above freezing point. In a week's time the contents had an evil smell and were covered with a copious growth of moulds as well as, apparently, some yeast activity. From this objectionable mess a chain of subcultures was made leading eventually to a pure culture of yeast from which was produced bread to the satisfaction of all. Thereafter the supply of yeast was maintained and creditable bread was a regular feature at meals.

Some heavy falls of snow were experienced late in March and early April. After such a fall on April 7th the following day was one of beautiful weather. On that occasion twenty-six Weddell Seals were ashore near the Hut and more along the coast to the east of Cape Denison. Also we were visited by one Giant Petrel, one Skua Gull, four Antarctic Petrels and one Snow Petrel.

Skua Gulls became scarce and the last was seen on April 10th. On that same day a Giant Petrel was also observed. Seals, which had come ashore in great numbers during February and March, were never abundant after this date.

The last of the season's Adelie Penguins, a lone straggler, was seen on April 16th. Its mates had already gone north to better weather. Autumn winds and snows were just as fierce and serious as those of the previous year.

April 21st and 22nd were notable occasions for good wireless reception, in fact, so favourable that our conversations with Macquarie Island were jammed out by the din on the aether coming from Australian stations and shipping. It was noted that on these days there was a conspicuous absence of aurora polaris, The previous week was one of much aurora and poor wireless transmission.

A regular daily feature of late April was a falling off in the wind in the late evening. The transition from wind to calm was a period of gusty and whirly conditions. Each morning the wind picked up again.

Eventually on May 8th the two upper sections of the main wireless mast collapsed. It seemed a hopeless task to attempt to re-erect the mast. However, after much discussion a method of dealing with the situation was evolved which appeared to offer prospects of success. To put this into effect, calmer weather had to be awaited.

Already we had found a relationship between the good working of the wireless and the prevalence of auroral phenomena. Time after time the flow of wireless messages was interrupted as soon as notable auroral manifestations appeared in the heavens.

Mid-winter Day, 1913, arrived but there was no break in the weather to differentiate it from any other day. June 26th brought a few hours' calm of which good use was made in preparations for lowering the broken topmast. Mild weather continued for several days thereafter and further progress was made with repairs to the mast.

Much drift and a high wind returned on June 30th and continued without a break for days. At 1 a.m., on July 6th the wind velocity recorded was 116 miles in a one-hour run of the anemometer and thereafter the wind averaged 107 miles-per-hour for eight consecutive hours. These figures were, however, known to be low, for there was a noticeable loss of record due to a loose collar allowing the anemometer cups to slip on the shaft. During the night of the 6th to 7th some gusts of terrific violence each lasting 20 to 30 seconds swept over the Hut.

Jeffryes's health broke down at this stage, the mental strain proving too much for him. Henceforth he himself suffered much and we were to face a depressing and anxious period.

During the slight lull on the 9th a Weddell Seal came ashore for a few minutes, but soon again returned to the sea. As was to be expected in such weather, seals seldom came ashore at Cape Denison during the winter months.

For the past months I had spent a little time each day writing a popular story of the expedition, and at this stage had completed the first chapters and some of the appendices.

During the afternoon and evening of July 11th a record low barometer (27·794 inches) was experienced. The following morning was a period of calm, providing the long sought opportunity to repair the wireless mast. To our great disappointment the drift returned again after a lull of only several hours.

Following upon strong winds and dense drift on the 14th, 15th and 16th, the best day since Midwinter's Day arrived, for on the 17th there was good sunshine and no drift, though the wind still ranged between 30 and 60 miles-per-hour. Many Snow Petrels were seen feeding over the waters of the Bay and a seal was observed in the sea near the shore.

Much of my time at this period was spent in skinning birds and seals for museum specimens. We had a good stock of carcases in store for such winter occupation. Glaciological observations* also helped to keep me occupied throughout this winter.

After a one-hundred-miles-per-hour wind on the 18th, an improvement set in, allowing further work to be done on the mast during the 21st. The repairs were on this day advanced well towards completion. Additional opportunities for continuing with this work occurred before the end of the month.

A week of worse weather brought to a close the last days of July and ushered in the first days of August. Snow fell continuously on August 5th, amounting to at least 12 inches of snow in 24 hours. It appeared at different times in different forms such as sago-snow, tapioca-snow, six-rayed flakes, fluffy balls and tiny

* The data accumulated is to be incorporated in the volume on glaciology to be issued as one of our B.A.N.Z.A.R. Expedition reports.

hard spicules. Tremendous snow-drifts built up everywhere in the neighbourhood of Winter Quarters. The wireless repairs were completed by the evening (Aug. 5th) and a flow of messages followed, relayed on from Macquarie Island.

The surface of the sea, as observed from Cape Denison, was completely strewn with brash and pack-ice, which, however, remained unconsolidated owing to the rise in air temperature. Nine seals and two Emperor Penguins were seen resting on the floating ice. Antarctic and Snow Petrels were numerous.

Days of snow and moderate wind followed. August 12th was a beautifully calm day, permitting Bickerton to spend several hours aloft strengthening the mast stays. For the purpose of studying its structure, Hodgeman, McLean and I dug a shaft in the sea-ice. Seals were killed for food for the dogs and for ourselves. In the stomach of one of these we got a cuttle fish and three bivalve molluscs.

Wind and drift with scarcely a break of even a few hours' duration continued throughout August until almost the end of the month. During a sixteen-hours period on August 16th, the wind record showed an average of 98 miles-per-hour. The best break in the weather was on the 19th and 20th when for part of the time the wind fell off to a calm, but snow fell in torrents. Snow started to fall at 1 a.m., on the 20th and by 1 p.m., it lay on the level ground (not in drifts) somewhat over 18 inches deep. It was a sight to see the dogs ploughing through it.

A high wind with dense drift continued throughout the 21st and 22nd. During the afternoon and evening of the latter day the wind came roaring down from the plateau as a series of pulsing gusts. The pen of the barograph as the instrument rested on a shelf inside the Hut could be observed moving up and down with the pumping effect of these gusts, one of which caused a notch on the barograph curve registering a sudden fall of one-and-a-half tenths of an inch pressure.

Between the 24th and 27th of August the weather was much improved permitting resumption of outdoor scientific occupations, such as geological collecting and the establishment of additional ablation sticks in the glacier-ice. This was also a remarkably well favoured period for wireless communication; numbers of messages were despatched. The remainder of the month was marked by wind and thick drift, the only break being a calm of one hour on the 31st. The strict limitation imposed upon outdoor activities reflected beneficially on the progress of my story, " The Home of the Blizzard, " of which seven chapters were already completed.

SPRING ONCE AGAIN.

During September 5th to 10th the weather improved considerably, allowing outdoor work to be resumed. At this time the sea-ice rapidly closed in until open water showed only in the immediate vicinity of Cape Denison. By the 9th the sea was completely frozen over. There was great activity in fishing and hand-netting to enhance our biological collections. In the evening we were treated to one of the most active and brilliant exhibitions of aurora polaris yet witnessed. The 10th was spent in geological investigations. I had by now greatly augmented the collections made by Stillwell during the previous year. Hauling sledge loads of specimens from the moraines was good exercise for the dogs.

There was wind enough on the 11th, but the sea-ice held for the most part. The temperature fell to a minimum of —29° F. A lull occurred about noon on the 12th and McLean seized the opportunity to cross the sea-ice (bay-ice) on a visit to the Greater Mackellar Islet.

For months past Jeffryes's mental condition had been a source of great worry to us, but as no one else in the party was proficient in the morse code, he was encouraged to be interested in and to operate the wireless. Some messages got through all right, but his operation was quite unreliable. At times he despatched quite imaginary messages, but Sawyer at Macquarie Island censored these; for one evening when we had temporarily relieved Jeffryes of his duties, we had advised Sawyer of Jeffryes's condition.

The sea-ice was still holding on the 14th and Madigan and Hodgeman went across it to visit the Mackellar Islets. The sea-ice continued to hold on the 15th. We were about this time engaged in the manufacture of a dredge, for the shore party's dredge equipment had gone off with the ship. At this time also we were sinking a shaft in the glacier on the ice slopes at a quarter of a mile to the south of the Hut.

On the 16th a young seal was killed on the bay-ice. It was found to have been wounded, probably by a Sea-leopard or a Killer Whale, and the wound was charged with pus. A crab-trap which we had made was now also employed to secure marine specimens, with some useful results.

Having been struck by the rate at which auroral streamers sometimes flit along the curtains from one side of the heavens to the other, I made some calculations based on observed rates of motion in recent auroral manifestations. As a result, I have arrived at the conclusion that a rate of travel of 130 miles per second is not uncommon.

September 17th was a day of dense drift which, however, diminished next day and by the 19th we were greeted by a beautiful sunny clear day. A strong northerly and north-westerly wind got up; a most unusual event. A fully grown Sea-leopard was shot, found basking on a mass of drift-ice which was floating alongside the shore. The creature measured 12 feet 3 inches long and 7 feet 7 inches girth around the body and flippers. It was a female and inside it we found a young one 4 feet 5 inches long which Dr. McLean believed was due to be born about three weeks later.

About this time Bage began to receive time signals from the Melbourne Observatory, relayed through Macquarie Island. Immediately upon receipt of these, whenever the weather was propitious, he made transit observations of the stars with a view to fixing the meridian of Cape Denison as accurately as possible.

Antarctic Petrels were now plentiful, but only one solitary Snow Petrel had been seen for days past. September 20th was a day of northerly and north-easterly winds with considerable falling snow.

On the 22nd, though calm most of the day at the Hut, heavy drift could be observed on the ice slopes at elevations above 1,000 feet. This drift descended to the Hut at 6 p.m. During the day we made good hauls with the new dredge. McLean obtained a number of internal parasites from an Antarctic Petrel. I succeeded in obtaining a thin (low freezing point) oil of good quality from Sea-leopard blubber by fractional freezing.

By the 23rd bay-ice covered the sea everywhere except for occasional lanes. A dredging made along a crack at the mouth of the Boat Harbour yielded from a depth of about 25 feet much sea-weed, a few pycnogons, mollusca, one starfish, and some crustaceans.

So far as we could see by observing the distant highlands to the west, there did not appear to be any evidence of wind on the plateau during this day (23rd). However, that night wind, accompanied by drift, recommenced. Next morning the wind and drift as usual swept steadily past the Hut. At one time during the morning, while McLean was standing on the rocks at the extreme point of Cape Denison (300 yards north of the Hut) in a light northerly wind, he observed when looking south to the Hut that the southerly wind with drift-snow reached only to a point immediately north of the Hut, where the drift-laden wind was seen to rise and pass overhead to the north.

At 6 p.m., this day, there was a dead calm around the Hut. A dark column of drift could be seen to the west rising over the rocky ridge. Also at this time dense clouds of drift could be seen rising from the plateau at about the 1,000 feet level. A few minutes later the vicinity of the Hut became foggy, due to fine falling particles of drift precipitated from the overhead current. The near slopes to the south were obliterated by drift, which appeared to be rising at 300 yards to the south of the Hut. Very soon after this the wind descended, enveloping the Hut; later during the night, it increased considerably.

Heavy wind blowing on the morning of the 25th cleared away at noon. The crab-trap was lowered to the bottom in the Bay. I had the misfortune to fall into the sea while assisting in the operation. Some dredgings were made but were not very successful. However, by the aid of a hand-net there were secured a number of starfish, a fine, large white worm and some pteropods. Two Antarctic Petrels were shot. In one of these McLean found two tape worms.

On the 26th and 27th we experienced a fierce south-east wind, with much drift and St. Elmo's fire.

On September 27th, the wind was so strong that it damaged the anemometer, the instrument then being out of commission until repairs had been effected. The force and roar of the wind indicated that for some hours it must have exceeded 100 miles per hour. The snow-laden air flowed fluid thick. I went out into it for three-quarters of an hour to study the phenomenon. For 90 per cent. of the time, when in a

standing position, one's feet were invisible owing to the density of the drift. For 25 per cent. of the time one could not see one's hands held at arm's length. During most of the forty-five minutes I was seated only 6 feet away from the Hut, but at that distance did not once catch sight of the Hut. Great trouble was experienced in locating and bringing in coal briquettes for the stove.

There was a considerable amount of good weather on the 28th and 29th permitting dredging and geological collecting from the moraines. Some depots of rock specimens that during bad weather had been accumulated about a mile from the Hut were now sledged in by the dog team.

After noon the wind and drift of the morning of September 30th cleared up at sea-level, but, as was so often the case, continued unabated on the ice-cap above the 1,500 feet level.

October 1st was a day of high wind and dense drift. There was, however, plenty to be done inside the Hut in the nature of packing rock specimens and sorting and pickling the product of our dredgings. The blizzard continued all the following day until, at 7.15 p.m., it suddenly withdrew up the ice slopes to the south where dense clouds of drift-snow were still seen to descend to about 400 feet above sea-level; then, launching out over the Hut area and the sea, continued north over the lower stratum of sea air. At this time strong northerly gusts swept the Hut area.

On both the following days (the 3rd and 4th) the blizzard wind acted in the same peculiar manner, withdrawing up the ice slopes for a short time in the early evening. At this time we were getting good hauls in the fish-trap from the floor of the shallow Boat Harbour. A notable feature was the abundance of long carnivorous worms which were attracted by meat baits placed in a trap.

Throughout the winter when the wireless installation was in commission I had done all that was possible to conserve Jeffryes's health and permit him to continue operating the "wireless"; this was particularly desirable on account of his skill with the morse code. I now found it impossible to continue this course any longer. Thus the job of operator was thenceforth undertaken by Bickerton, who soon proved himself quite efficient in this new capacity.

A strong blizzard wind with thick drift continued throughout the 5th and until about 11.20 a.m. on the 6th, when it suddenly lifted from the lower levels, retreating first to the 400 feet then to the 1,000 feet level on the ice slopes to the south of the Hut. On the highlands some 10 to 20 miles distant to the west of the Hut, we could clearly observe that a southerly wind with drifting snow still continued all day long at elevations about 1,500 feet, while at lower elevations no drift or wind could be detected. At 5 p.m., the southerly blizzard and drift descended again to sea-level. A very high wind with dense drift continued during the next three days ultimately carrying away the wireless aerial.

The wind took off after lunch time on October 10th. Ice then quickly formed over the whole surface of the Bay. Bickerton seized this calm spell to repair the aerial and re-established communication with Macquarie Island. Later in the day a heavy sea swell came in from the north; the breaking waves at the water-front tossed kelp out of the sea on to the ice all along the ice-foot. The ice then broke up and went out to sea, taking several fish-traps with it.

SUMMER COMES.

October 11th was a day of splendid weather. Looking down through the placid water from the ice-foot we could see great numbers of fish (notothenia type) inhabiting dense patches of coarse kelp. Madigan and others fished with lines and caught them almost as quickly as the hooks could be rebaited. Fifty-one fish were thus caught in a very short while. Looking down into the clear water numbers of a very small type of fish and some jelly-fish were also observed.

The weather on October 12th was almost as good as that of the previous day. More fish were caught. McLean examined for parasites and found plenty. Many Antarctic Petrels and some Snow Petrels were about. A seal disported itself on the bay-ice.

Wind with falling snow and drift characterised the 14th, 15th and most of the 16th. The sea swell suggested that the pack-ice to the north had cleared away.

The first penguin of the season was sighted on October 17th. Late in the afternoon eleven others were found (Plate LXII, Fig. 1). This proved to be a remarkably good day for wireless transmission. For some time past the Macquarie Island Station had been heard only occasionally and with difficulty. This evening the Macquarie Island signals came in clearly at 9.30 p.m., when there was still very strong twilight. The following night was also equally good for the " wireless. "

Weddell Seals and petrels, including a few of the Silver-grey variety, were now a daily feature. The first Skua Gull of the season was sighted early on the 20th.

A strong blizzard and some drift continued from the 19th until the afternoon of the 24th, then a spell of finer weather intervened and gave opportunity for studying the bird and seal life. As many as 250 Adelies were now ashore in the vicinity of the Hut. Also on that day there were seen several Antarctic Petrels, a Silver-grey Petrel and a Giant Petrel. The Penguins commenced making love on the 24th (Plate LXI, Fig. 1). The Snow Petrels had not at that date commenced making nests. At this time a strong surface drift setting to the west was a regular feature of the waters off Cape Denison.

From October 25th to 30th inclusive was a period of blizzard winds, at first accompanied by drifting snow, but later without drift. About the end of this period the air temperature rose to —17·8° F. This resulted in quite a summer feeling in the air. Enormous numbers of Adelie Penguins were by now distributed everywhere along the shore; they copulated this day for the first time this season. Cape Pigeons, Silver-grey Petrels and Skuas were much in evidence, but Antarctic Petrels and Snow Petrels were somewhat scarcer.

At the end of October and during early November I despatched a further batch of " sea-letters, " messages sealed in water-tight bottles, thrown into the sea with the object of ascertaining the direction of surface drift currents.

Many Cape Pigeons and Silver-grey Petrels were in evidence on November 1st; also Snow Petrels were more in evidence in the neighbourhood of Winter Quarters and appeared to be taking an interest in the rocky areas where they nested last year (Plate LVII, Fig. 2). We shot a couple of Skuas for skins.

In the early days of November, though the strong wind descended upon us as usual, drift was confined to the plateau during the day time, but came down to sea-level during the night hours.

On November 3rd penguins were still very busy in the rookeries but no eggs had appeared. An Adelie Penguin killed for food weighed 16 lb.; it yielded some external parasites.

Bickerton at this time was busily engaged making a memorial cross to record the deaths of Ninnis and Mertz. This was to be set up on a high point of the rocky ridge to the west of the Hut (Plate LXV, Fig. 2).

On November 4th there were many Skua Gulls about. I shot three of them and found on one of these six external parasites representing what appeared to be two distinct species. Giant Petrels and Silver-greys were also about.

The sea water was perfectly calm during part of the 5th and many worms and pteropods could be seen swimming about in the clear water. Some small fish, about 4 inches long shaped like mullet, were also noted. Snow Petrels and Wilson Petrels now commenced hovering over the rocks preparatory to nesting.

On the 6th there was a strong wind with some drift. So far no penguin eggs had been laid. I had melted down the blubber layer adhering to the skin, together with some of the abdominal fat of three Adelies taken in late October, and found the total oil yield to be 1½ lb. from each bird. If the entire body were rendered down an increased quantity of oil would be yielded. The weather improved on the 7th. On this and other days about this time I took the opportunity to extend Stillwell's plan of the rocky area of Cape Denison, incorporating off-lying islands. This day Snow Petrels were found on nests amongst the rocks and Wilson Petrels were seen hovering over their former nesting areas.

Preparations were now under way for a short sledging journey to be directed, first to the east beyond Aurora Peak to retrieve the depot of instruments and specimens left by Madigan's party when returning from their sledging journey of the previous summer. Also it was our intention to try to locate the depot of

instruments left on the plateau by Bage's party in the preceding January, when, on account of shortage of food, they had to drop everything and make forced marches to the coast. I arranged for Madigan and Hodgeman to join with me on this excursion.

The first penguin eggs were laid on November 9th, followed by many more on the 10th. By the 12th penguin eggs were so abundant that I collected 50 merely from the small rookery to the west of the Boat Harbour (Plate LXII, Fig. 2).

On the glacier slopes two miles to the south of the Hut we experimented with an improvised wireless field receiving set, hoping that it would be useful on sledging journeys.

We had intended departing from the Hut for sledging on November 16th but when that day arrived, dense drift postponed departure. The bad weather continued until November 24th, delaying our departure until that date.

FAREWELL VISIT TO THE ICE PLATEAU.

Madigan, Hodgeman and I, with the dog team and two sledges, departed from the Hut at 4.30 p.m., on November 24th, and camped at Aladdin's Cave for the night. We laid a wire out on the ice surface to act as "wireless" aerial, with good results, for we clearly heard both Jeffryes and Bage despatching messages from the Hut. The next day our course was directed to the south-south-east for 3 miles over a hard crevassed glacier-ice surface, then to the south-east for 4 miles, the last three of which were over sastrugi-furrowed névé. The evening camp was pitched rather early in order to experiment with the "wireless" receiving set. For some reason we completely failed to pick up the signals. Other attempts were made during the next several days, but no more was heard of the Hut station.

The following day clouds banked up from the south-east and snow fell during the morning and again in the evening. The sledge-meter broke down when 16 miles on the way, so camp was pitched for the night to enable repairs to be made.

Heavy snow fell during the morning of the 27th, but not sufficiently dense to prevent our finding the Madigan Nunatak which lay 2¼ miles north-east of the night camp. The rock outcrop was found to be composed of gneiss. It is the tip of a high rocky peak which is almost entirely submerged under the ice-sheet. Only about 50 feet of the tip projects from the ice. Before camping for the night we continued on a south-east course for a further 8¾ miles.

The next day after a run of 21½ miles, the summit of Mt. Murchison was reached and camp was pitched there for the night. That was a beautiful evening. All clouds which had covered the sky for several days past had cleared away and during the midnight hours the sun skimmed along the southern horizon. There was no appreciable wind and the temperature, 5° F., appealed to us as very pleasant. Away to the south and east a wonderful view of the Mertz Glacier trough depression lay before us. On the farther side of it away to the south-east, the rising ice slopes of the distant land beyond Penguin Point stood out clearly. To the north the blue waters of Buchanan Bay could be observed lapping against the glaring white expanse of the Mertz Glacier Tongue.

The nearly flat crest of Mt. Murchison is only about two acres in extent. In the centre of this area, about a foot in length of the tip of a bamboo mast projected from the snow surface. This was the depot mast left by Madigan the previous year. When erected about twelve months previously it had stood about ten feet above the general level of the ice surface. In the interval, nine feet of hard compressed névé had accumulated.

Next morning a south-by-east wind was blowing at about 35 miles-per-hour. Soon after noon the wind died down and drift subsided. At 1.50 p.m., Madigan and Hodgeman set out with the dogs to search for the cache of rock specimens and instruments depoted several miles to the south by Madigan's Party when returning from their sledge journey. Their search was unavailing for heavy falls of snow had evidently completely buried all trace of the articles.

The following morning (November 30th) we broke camp and made back over our old tracks, for about 12 miles thus reaching a point about 18 miles south-east of Madigan Nunatak, (Plate LX, Fig. 1). There we changed course to 40° S. of W. and continued for another 4 miles before camping for the night.

On December 1st the sky gradually became overcast and ended in a sunless glare which made difficult travelling over the rough sastrugi. The day's run was $10\frac{3}{4}$ miles on a course W. 20° S., travelling approximately along the crest of the ice-cap where to the south it descends to the Mertz Glacier Valley and to the north it falls away towards the sea.

The following day and for days thereafter the weather remained bad. Overcast skies, falling snow, drift and wind continued, rendering it impossible to navigate accurately with any hope of locating the depot of instruments left by Bage's party twelve months earlier. We decided that it would be useless to make the search for that depot unless clear weather intervened. But drifting weather continued day after day. Eventually on December 8th I decided to abandon any further attempt to locate that depot for there remained insufficient time to do the job, even if the weather should be fine, and to get back to Winter Quarters before the ship should arrive. Accordingly we started the return journey that day in moderate drift and a 40-mile wind. Bumping over hard sastrugi one of the sledges was badly damaged, the bow and the left-hand side top rail being broken.

Sledging across the direction of a high wind, as we had been during the day, was a wretched business, particularly so for the rear one of the two sledges. The rear trailer sledge kept working away sideways, and repeatedly capsizing. At other times the wind would sweep it away and rush it into ice "anvils" thus eventually breaking the bow. The dogs objected to the drift and were greatly depressed. The total run of the 8th was 20 miles.

During the early morning hours of the 9th the wind got up considerably, reaching as much as 70 miles per hour. There was no respite in the weather, thick drift and high wind being the daily experience. We remained in camp until the 12th when there could be no further delay for the ship was just about due at Winter Quarters. Accordingly, though strong wind and drifting snow continued that day also, we struck camp and set out through the drift aiming to reach the Hut that night.

The weather improved as we descended to lower altitudes. Cathedral Grotto was located and a meal partaken there. The Grotto was lined with beautiful ice crystals which had grown on the walls during the past winter. Some of these reached three inches in length.

When we came in sight of the open sea beyond Commonwealth Bay as many as seventy icebergs were counted in the region to the north-west of Winter Quarters. Then at 11.15 p.m., when we were at the 1,000 feet level, I caught sight of the *Aurora* steaming in from the north-east but still a long way off. Our party reached the Hut at 12.30 a.m., on the 13th, (Plate LXIII).

Though unsuccessful in locating the lost depots, our sledging trip added to knowledge of the contour of the ice plateau; also we secured meteorological records at high levels for comparison with the weather during the same period at Cape Denison.

THE FAR EAST SLEDGE JOURNEY.

Doctor Mertz, Lieutenant Ninnis and I had spent considerable time perfecting the equipment for this undertaking*. In an endeavour to push as far east as possible we were to be assisted by all the dogs available. These were sufficient in number to make two teams. Three sledges were included in the equipment, the third of which was to be in the nature of a spare only very lightly loaded and trailed behind the second. This was to ensure transport for the return journey should the runners of the other sledges become worn out as a result of travelling over the rough glacier-ice of the coastal slopes.

The sledge ration adopted amounted to 32 ounces of concentrated food per man per day. Pemmican and plasmon whole-meal biscuits composed the bulkiest section of the ration. Next in importance was a cocoa mixture rich in dried milk (Glaxo) and sugar. In addition minor quantities of chocolate, tea, sugar, cheese, butter, and sultana raisins were taken. The desiccated milk powder used on this journey, as at all other times in connection with the operations of our Expedition, was prepared from whole milk of an extra high butter-fat content. This furnished a well balanced food in a highly concentrated form.

For convenience and to reduce weight these foods had all been taken out of their original containers and packed in calico bags closed with a tape tie. In the case of each, the week's ration for three men was contained in a single such bag. Then all the bags constituting a week's supply for three men were packed into a single container, a large bag made of water-proof fabric. These, referred to as sledge food " tanks," had a square base the width of the sledge, and were closed against the entry of snow above by a lamp wick tie.

Saennegras and spare clothing together with a few other personal items were carried in another " tank," which, though similar in general character and in basal section, was much taller than the squat food tanks.

The cooking equipment comprised an aluminium Nansen cooker, a primus heater, alcohol (for priming the heater) contained in a half-gallon tin and in a " ready bottle " holding only about 4 ounces, a reserve store of matches in a sealed tin and a funnel for pouring kerosene. With the exception of the cooker, these were all housed in a three-ply wooden " cooker-box," which occupied front place on the sledge. The cooker itself was secured on top of the cooker-box. Certain other repair equipment was also packed in the cooker-box.

At the rear of the sledge was secured another three-ply box with hinged lid referred to as the " instrument box." In this were packed navigating instruments, hypsometer, thermometers, photographic gear, medical outfit, note-books, etc.

The " kerosene tray " for carrying the fuel for the primus heater was usually in the nature of a three-ply board attached to the top rail of the sledge on either side. Upon it to the number required, were secured the necessary 1-gallon screw-topped tins of kerosene. This part of the load was always carried at the rear of the sledge, as a precaution against possible leakage contaminating the food.

Complete details of the full equipment adopted are as follows :—

	lb.	oz.
The Principal Sledge, 11 feet long	45	0
Fittings for Same : Instrument-box, 7 lb. 5 oz.; cooker-box, 7 lb. 6 oz.; kerosene-tray, 3 lb.; mast-attachment, 2 lb. 8 oz.; mast, 1 lb. 15 oz.; spar, 1 lb. 8 oz.; decking (canvas and bamboo), 3 lb. 5 oz.; rigging, 7·5 oz.; 5 leather straps, 5 lb.	77	6·5
Drill Tent, strengthened and attached to poles, also floor-cloth, 33 lb.; spare drill cover, 11 lb. 8 oz.	44	8
Sleeping-bags, 3 one-man bags	30	0

* In the preparation of this account, apart from matters of geographical and general scientific interest, the narrative has been presented in as brief a form as possible consistent with a proper understanding of the problems both physical and mental that beset us in the prosecution of this undertaking. Further details, more especially of a psychological nature, are to be found in the popular account submitted in "The Home of the Blizzard" (London) 1934 edition.

	lb.	oz.
Cooking Gear: Nansen cooker, 11 lb. 3 oz.; 3 mugs, 1 lb. 8 oz.; 2 tins, 10 oz.; scales, ·5 oz.; 3 spoons, 1·5 oz.; matches, 13·5 oz., and damp-proof tin to hold same, 3·7 oz.; "Primus" heater, full, 3 lb. 10 oz.; "Primus" prickers, 2·5 oz.; "Primus" repair outfit, 2 oz.; kerosene tin openers and pourers, 4·5 oz.; spirit for "Primus" in tin, 5 lb. 14 oz., also a ready bottle, full, 1 lb. 5 oz.	25	14·2
Repair Outfit: Spare copper wire, rivets, needles, thread, etc., 1 lb. 14·5 oz.; set of 12 tools, 15·5 oz.; requirements for repairing dog-harness and medically treating the dogs, 3 lb. 8 oz.	6	6
Medical Outfit: 6 "Burroughs & Welcome" first field dressings; absorbent cotton wool; boric wool; pleated lint; pleated bandages, roll bandages; adhesive tape; liquid collodion; "tabloid" ophthalmic drugs for treating snow-blindness; an assortment of "tabloid" drugs for general treatment; canvas case containing scissors, forceps, artery-forceps, scalpel, surgical needles and silk, etc.	2	12·3
Photographic Outfit: A ¼-plate, long, extension-camera in a case, with special stiffening board and 36 cut films, 4 lb. 4·5 oz.; adaptor to accommodate camera to theodolite legs, 2 oz.; a water-tight tin with 14 packets, each containing 12 cut films, 3 lb. 10 oz.	8	0·5
Surveying Requirements: A 3-in. transit theodolite in case, 5 lb. 14 oz.; legs for the same, 3 lb. 6 oz.; sledge-meter, 8 lb.; Tables from Nautical Almanac and book of Logarithmic Tables, 1 lb. 3 oz.; 2 note books, 1 lb. 6 oz.; angle-books, 5 oz.; map-tube, 10 oz.; maps, 6·5 oz.; pencils, 1·5 oz.; dividers and rubber, 1·5 oz.; protractor and set-square, ·5 oz.; prismatic compass and clinometer, 8·5 oz.; sun-compass (Bage's), 1·5 oz....	22	0
Other Instruments: Zeiss prismatic binoculars × 12, 1 lb. 13·5 oz.; hypsometer, 2 lb. 1 oz.; 2 ordinary and 2 small minimum thermometers, 10 oz.; specimen labels, 1 oz.	4	9·5
Rifle, 22-bore with cover and cleaner, 3 lb. 3·7 oz.; ammunition, 1 lb. 0·5 oz.; sheath knife, 5·5 oz.; sharpening stone, 1·5 oz.; fishing-line and hooks, 3·5 oz.	4	14·7
Waterproof Clothes-bag, 4 lb. 8 oz., containing 9 pairs of finnesko stuffed with saennegras, 21 lb.; extra saennegras, 3 lb.; 3 private kit-bag scontaining spare clothing, etc., 39 lb.; 4 extra rolls of lamp-wick for lashings, 1 lb. 3·5 oz.	64	3·5
Odd Gear: Pick, 4 lb. 5 oz.; 2 spades, 8 lb. 4 oz.; ice-axe, 2 lb. 4 oz.; alpine rope (20 metres), 3 lb.; skis (1 pair), 11 lb.; ski-stick, 1 lb. 1 oz.; ski-boots (2 pairs), 6 lb.; attachable crampons for the same, 4 lb.; finnesko-crampons (3 pairs), 9 lb.; 3 man-harnesses, 6 lb. 8 oz.; man-hauling tow-rope, 1 lb. 1 oz.; flags, 9·5 oz.; a water-proof bag to hold oddments, 4 lb. 8 oz....	61	8·5
Beacons: A depot-flag and bamboo pole, 5 lb.; a special metal depot-beacon, mast, flag and stays, 16 lb.; 2 damp-proof tins for depositing records at depots, 7·5 oz.	21	7·5
Other Sledges: A second sledge decked with Venesta boarding and fitted with straps	55	0
A third sledge, 12 feet long, and strong rope lashings (spare spars mentioned elsewhere acting as decking)	60	0
Fuel: Kerosene, 6 gallons in 1-gallon tins	60	0

	lb.	oz.
Food—Man Food: 9 weeks' supplies for 3 men on the ration scale, plus packing; also 25 lb. weight of special foods—"perks"	475	0
Dog Food: Dried seal meat, blubber and pemmican; also the weight of the tin and bag-containers	700	0
Total...	1,768	11·2

Mertz, Ninnis and I with the two dog teams left the Hut (Cape Denison) at 12.20 p.m. on November 10th, and arrived at Aladdin's Cave at about 3.45 p.m. The Southern Party (Bage, Webb and Hurley) arrived at the Cave shortly afterwards and later, allowing a brief halt for a meal, they continued on their journey to the south.

My own party had some hours of work ahead selecting stores from the depot, finally arranging sledge loads, and mending the sledge-meter which had received damage when the dogs on the way to the Cave had bolted at too fast a pace over the hard pitted glacier-ice.

Madigan's East Coast Party and Stillwell's Near East Party had left the Hut on the 7th and were man-hauling their sledges to the south-east ahead of us. With the dogs pulling our sledges we could easily catch up to them. In case we had not previously caught them up, a rendezvous was arranged at 18 miles south-east of Aladdin's Cave.

At 10 p.m. there was a 25-mile wind with very light surface drift.

November 11th.—When we turned out at 7 a.m. there was practically no drift, but the wind registered about 40 miles per hour. Leaving the Cave at 8.30 a.m., we continued to the south-east under a sky becoming rapidly covered with thin alto-stratus cloud. By 12 o'clock the sun was entirely blotted out. An hour later the drift snow obscured the view to such an extent that we decided to camp, in case Madigan's and Stillwell's parties should be passed unseen. We had then got past the coastal zone of clear ice and were camped on a sastrugi-furrowed névé surface.

November 12th.—Detained in camp by thick drift.

November 13th.—By noon the drift had cleared a little so we decided to strike camp and continue to 18 miles out from the Cave, hoping there to meet the other parties. It was not until 4.15 p.m. that the sledges were dug out and a start made. The approximate location of the rendezvous (18½ miles out) was reached and camp pitched about 7.30 p.m. There was no sign of the other parties for drift obscured the view. During the night the wind freshened (Plate LXVI, Fig. 1).

November 14th.—The sky gradually cleared but the wind freshened, reaching about 60 miles in the morning and about 70 miles in the late afternoon. At noon the drift was so thick that visibility was reduced to about 3 or 4 yards. The dogs were under the snow, completely buried. Ninnis and Mertz, who took turns day by day attending to their needs, had difficulty in locating some of them.

During the night the wind increased to about 80 miles per hour; I expected the tent to collapse under such onslaught.

November 15th.—The hurricane continued but reduced to a 50-mile strength by noon. It subsided still further during the afternoon but revived during the night hours.

November 16th.—The wind diminished during the morning hours until quite calm at noon. However, clouds gathered rapidly over all the sky and later some snow began to fall. The sledges were dug out and packed. Each of us then went out in several directions for about a mile, hoping to catch sight of the other parties. They were eventually sighted several miles to the north of our position. All parties then proceeded to the east-south-east and, converging, finally joined up later in the day at what we called junction camp (Plate LXVI, Fig. 2 & Plate LXVII, Fig. 1). There we took over some stores from Stillwell's party, part of whose function was to act as support thus far to Madigan's and my own parties. The surface at Junction Camp was of the hard plateau névé type.

November 17th.—The dog Gadget was in poor condition and could not keep pace, so he was despatched and used as rations for the others. It was near noon before camp was broken but we soon caught up to the man-hauled sledges. Then after preparing tea for all hands we took farewell of the other parties and proceeded to the east (Plate LXVII, Fig. 2).

At 4 p.m. the sea came in sight. The floating glacier (Mertz Glacier Tongue) met by the *Aurora* on January 7th, earlier in the year, was clearly in view in the distance extending to the north-eastern horizon. A halt was called to allow the other parties to catch up so that we could inform them of a change in the direction of our course as a result of the present discovery. At this spot the sastrugi were observed to be directed from S. 10° E. Later we continued on a course E. 25° S. for a few miles further before camping at 7.30 p.m. At that time the sun was just beginning to appear through the pall of strato-cumulus cloud which had covered the sky all day long, and had made it difficult to see the inequalities of the surface which had resulted in much slipping and falling. Here the surface was of very hard sastrugi-furrowed névé.

November 18th.—The day opened fine, clear and almost calm. The daily routine on this as on all our sledge journeys included meteorological observations made at suitable intervals. These records appear elsewhere in these Reports.* Hypsometric determinations of elevation above sea-level, necessitating the shelter of the tent, were made on the occasion of lunch or evening camps. When the sky was sufficiently clear for observations, latitudes were determined daily at noon, while the sun's position at about 5 p.m. was the basis of longitude fixes.†

We had not gone far this day before sighting a rocky nunatak (thereafter known as the Madigan Nunatak) projecting from the ice-cap at several miles to the north of our track. After 7½ miles of very pleasant travelling on a course about 15° south of east, a halt was called for lunch. An inquisitive Skua Gull alighted alongside the tent but stayed with us only for a few minutes. Here the sastrugi had swung around to true north and south, the prevailing wind evidently being deflected slightly by the swing of the coastline and contour of the land. As the journey progressed, such local influences were found to have a definite effect on the wind direction.

In this locality the surface is undulating and for the most part good for sledging, but outstanding sastrugi as much as 3 feet in height channelled out of the hard névé, often located in patches, were scattered over the landscape. Later in the day isolated sastrugi ridges were found to reach 5 feet in height.

The noon temperature was 16° F. At 5.30 p.m. there came into view the unexpected sight of a high rocky nunatak, later known as Aurora Peak, and a stretch of coastline. The course was then changed in order to pass to the west of the nunatak where there appeared to be a good passage down to lower country beyond.

The sledge-meter broke down during the afternoon owing to severe jarring in its passage over hard sastrugi. As our course during the day had been slightly down-hill, the dog teams had travelled at times too rapidly for the well-being of the meter which was a light model designed for smooth surfaces. After 15 miles for the day, camp was pitched at 6.45 p.m. Repairs to the sledge-meter were effected in the evening.

The sky had become clouded during the day but the sun broke through at 7 p.m. Calm prevailed in the evening, with a temperature of 5° F. at 8 p.m. The direction of surface sastrugi at the camp was N. 30° E. (true).

November 19th.—The day opened with a partly overcast sky and light breeze from the west. After travelling several miles to the south-east the surface began a rapid descent. Here there were two sets of superimposed systems of sastrugi respectively south-west to north-east and south to north. The descent was commenced immediately after lunch. The steepness of the grade caused trouble with the sledges for they were constantly over-running the dogs, so to ease matters a circuitous route had to be adopted so that we covered 5 miles in order to gain 2 miles to the south-east. Evening camp was pitched at 6.45 p.m. in

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* Vide Series B, Vol. V, pages 219-224.

† On the folding map of King George Land accompanying this report the track of our Far East Sledging journey and the location of the various camps are shown. There also is to be found information regarding the altitude of the land traversed. As this information is incorporated in the map much of such data will be omitted from the text.

a remarkable depression, 800 feet below the previous night's camp, on the west side of Aurora Peak. The rock outcrop on the summit of Aurora Peak was far above us. We decided to pass it by without further investigation, anticipating that Madigan's Party would pay it a visit. At 9 p.m. when we retired to the sleeping bags, the sky was clear and the wind was light from the south-west.

November 20th.—The wind rose during the night and when we turned out at 7 a.m. there was a 40-mile wind with considerable drift. The surface ahead was too steep for dog sledging, so the sledges were man-hauled to less steep ground some 400 feet below. After advancing one mile further we lunched on the floor of a crater-like depression. At the time we fancifully anticipated that Aurora Peak might be volcanic. However, Madigan's party proved it to be composed of an ancient gneissic formation. The depression we were in was evidently a glacial cirque. After lunch the journey was continued due east past the south side of Aurora Peak. From the cirque we had debouched on to a great wide glacier in its lower reaches where the surface was apparently not very far above sea-level.

On reaching the main glacier we were soon in difficulties with crevasses. These were mostly partially or wholly blocked with snow lids. The seriousness of the position was not fully realized until we had some of the dogs dangling in space, hanging by their harness ropes. These were the dangerous type of crevasse, sheer-walled and of great lateral extent. The depth was not ascertainable, certainly very great for one looked down through a region of light blue to blackness below. I slipped down to my arm-pits on the margin of one of these before appreciating the need of holding on to a rope line attached to the sledge. At this time Mertz was on ski, which give a good bearing surface to carry one's weight over crevasse lids; Ninnis and I were walking each alongside a sledge. A halt was called for the night. At 8.30 p.m. the temperature was 12° F. Very light breezes were coming from the south-south-west.

Another of the dogs, Jappy, was in very poor condition so I decided to despatch him and utilize the meat for rations for the other dogs.

November 21st.—When we turned out at 7 a.m. there was a little light drift blowing down the glacier, but the sky was clear so that good weather could be expected. Some time was spent mapping in the features of the neighbourhood of Aurora Peak, then we set out on an easterly course towards a rising ice surface on the south side of the glacial valley.

We had not gone far before coming upon a gigantic ice cauldron, out of which swirling drift was pouring. In this area the glacier surface was much shattered but fortunately most of the crevasses were more or less choked. One huge wide and completely open rift was passed. There was more trouble with the dogs slipping into these traps. Then an area of " pimples " was reached. The pimples were each high ice-dome mounds, a structure which we found mysteriously developed on flat crevassed surfaces usually marginal to the main glacier.

Ninnis had a very narrow escape when we were preparing to pack the tent after lunch. He went through to his armpits in the softer edge of a crevasse lid. It was then discovered that the tent had been pitched on the lid of a very dangerous sheer-walled crevasse of 15 feet in width. It was fortunate that Ninnis had the camera legs in his hand at the time; this helped to distribute his weight, though the legs were broken in the process.

During this day Mertz reconnoitred on ski for some time in search of the best way through this troubled area. During the afternoon pressure-ice was met. Here the glacier-ice was thrown into steep undulations often with yawning crevasses along the crests. Much time was spent attempting to cross this belt, but eventually we had to retreat. Then after working our way to the south-west along the length of the glacier, other attempts were made but little headway was made to the east. Eventually camp was pitched and whilst Mertz looked after the dogs, Ninnis and I roped up and set out to search for a practicable way across the pressure area. This we did after traversing a distance of about 3 miles.

In this area the pressure-ice is in great folds with valleys up to 200 feet deep and with an average of a third to a quarter of a mile across. The ridges are either ice-domes or gaping crevasses, but these may be choked and contorted by the work of the whirling snow drifts of winter. Sheer ice-falls were met with, with vertical faces up to 40 feet high and great sink holes descended to 60 feet in depth.

The light drift that had continued most of the day fell off in the evening.

November 22nd.—The day opened bright and clear with only light breezes from the south. A start was made at 9 a.m. To begin with, there were 2¼ miles of heavy going on a south course along valley lanes in the serac region. We were then able to turn to the south-east, arriving on a broad flat glacier surface which could be seen sweeping away in an unbroken sheet to the south-west-by-west. The sastrugi early in the day trended N. 35° E., but in the latter part of our march were directed to N. 50° E.

From 10 a.m. on, clouds formed in the south-east and spread to the west-north-west blotting out the topographical features of the ice surface. A few flakes of snow fell after noon and a little later a light south-east wind arose.

Before 1 p.m. the temperature had risen to 27° F. At the lunch camp the ice surface thereabouts was flat with occasional small crevasses. On ahead on the east side of the glacier the rising surface of ice-covered land was visible.

After lunch the mean direction of the course followed was to the south-east, becoming more easterly later in the day. During the earlier afternoon snow could be seen falling on the highlands to the east.

Early in the afternoon the ice surface was excellent for sledging, but as the land margin in the west side of the glacier was approached the surface became "pimply" and then much crevassed. Eventually the rear sledge, then carrying the dog rations, broke through. At a point just below the ice surface its rear end wedged, with the result that it became suspended, hanging nearly vertically down the crevasse. A halt for the day was then made, and the sledge unpacked item by item, as it hung in the crevasse before it could be retrieved. The unpacking had to be done by one of us suspended over the edge on an alpine rope.

The day's run had exceeded 16 miles, so that we retired well satisfied.

November 23rd.—In the morning there was light drift blowing before a wind coming from the land slopes to the south-east. We were late getting away and had hardly traversed 1 mile when the rear sledge again broke through into a crevasse; it jammed, however, when a large part of its length was down below the surface. Actually Ninnis was fortunate in not shooting through with it. He grabbed a rope attached to the sledge just as he was slipping down. Again, valuable time was lost in unpacking the sledge piece by piece and hoisting the heavy tins of seal meat from the crevasse.

A couple of miles further on brought us to the edge of the land-ice slopes on the east side of the Mertz Glacier. After ascending the slope for a short distance, the lunch camp was made at 200 feet above the glacier level. At noon the temperature was 30° F.; a 25-mile wind was blowing from the south-south-east. Looking inland to the south-west up the big glacier just crossed, we could discern steep ice-falls where the plateau-ice descended into the head of the valley.

During the early afternoon a well-defined alto-stratus radiant developed from a point on the N. 35° E. horizon; this converged in both directions and gradually spread to the west.

During all the afternoon the sledges were gradually ascending over a fairly hard névé surface on a course about E. 50° S. The south-easterly wind which had been blowing at about 15 to 20 miles per hour during the afternoon increased somewhat at 9 p.m. carrying drift with it. The distance covered during the day was a little over 10 miles. Dark lowering snow clouds developed in the east, and a little snow fell during the night.

November 24th.—When I woke at 5 a.m. it was to find that our chronometer watch had run down and stopped. I had omitted to wind it the previous evening. Sun observations for time, made on subsequent days, did not give the accuracy that observations at a fixed station would have yielded. Consequently, subsequent positions may be affected by slight error in longitude. However, this can be but small and relatively unimportant.

During the morning the sky began to clear and the wind fell off to a light breeze coming from the usual direction of the wind in this locality as evidenced by the sastrugi, namely, S. 20° E.

A south-easterly course was followed during the day. We were now sufficiently high up on the land-ice to obtain a good view over the Mertz Glacier. To the east of the Glacier, sea-ice with two bergs embedded in it was in sight. The land-ice over which we were travelling sloped gently to the north and was very regular in outline except for a cascade-like break-away some 5 miles in a direction N. 50° E. from the lunch camp of this day. A better view of this was obtained later in the day when it became apparent that this was the ice-fall at the end of a coastal embayment (Buckley Bay) on the east side of the Glacier.

The dark open water-sky of the northern horizon extended around to almost east of our position. This was clear evidence that the coastline ahead receded to the south and indicated that land did not exist as far north as appears in Wilkes's chart.

Good progress was made during the afternoon but from 4 p.m. onwards the wind, accompanied by light drift, increased until at 10 p.m. it had reached a rate of 40 miles per hour. At that time the temperature was 10° F. Camp was pitched late in the evening after covering 16 miles. There the direction of the sastrugi was S. 10° E.

November 25th.—This was a miserable morning for travelling. When we set out a 40-mile wind was blowing with low drift. By 1 p.m. it had fallen to 30-mile strength and after 3 p.m. it quickly subsided to 10 miles.

At 5 p.m. a good view of Buckley Bay was obtained. The nearest part of the coast appeared to be about 30 miles to the north. The direction of sastrugi here was N. 15° E.

After a day's run of about 16 miles, camp was pitched. Dense cumulus clouds followed by cumulo-nimbus came up rapidly from the east after 6 p.m. and for a time completely enveloped the landscape in fog. At 10 p.m. the sky was overcast with strato-cumulus cloud and a 15-mile breeze was coming from the south-south-east. The temperature was 15°F.

November 26th.—When we continued the journey in the morning the sky was completely overcast and a little snow was falling. However, the wind (south-south-east) was easy, only 15-mile strength. Proceeding due east from the camp of the previous evening, we descended gradually until at about 7½ miles on the way a steep fall loomed up before us, seen indistinctly and uncertainly through the dim, grey " snow-blind " surroundings. A halt was called for investigation.

Directly in front, the ice surface descended into a depression. Some open crevasses were in sight. Though the light was bad, sufficient could be seen to make it almost certain that we had just crossed over a promontory of the land and now arrived in sight of another great embayment of the coast. The course was changed towards the south-south-east, but we had scarcely gone a mile when a large black patch came in sight to the east, dimly seen through the haze. After watching this for some time and finding that it did not change shape, we concluded that it was an extensive outcrop of black rock, but still at a considerable distance.

On nearer approach several days later we could see that this black wall was of the nature of high coastal cliffs, in which the rock exhibited a strong columnar structure. As, however, it was within the ambit of Madigan's Party we eventually steered a course to the south and did not visit it. Madigan's Party did reach a portion of that coast and examined the rock face further to the east at a locality which we named the Horn Bluff. Their account shows it to be a thick sill of columnar dolerite overlying a coal-bearing sedimentary formation. The 1,000-feet high cliffs continued, though with some breaks, as the coastal face of the land for a length of about 60 miles.

Having surveyed the scene on the afternoon of the 26th we continued on for some distance, skirting the edge of the depression in search of a way on to the south-east across the crevassed break-away which margined the lower country to the east. When camp was finally pitched, we had done about 13 miles for the day.

November 27th.—In the morning the sky was almost clear, but a 20-mile wind was blowing down the ice slopes from the south-south-west. At noon the wind, still from the south-south-west, had increased to 35 miles and was accompanied by low drift. The temperature was then 20° F. After breaking camp a bergschrund crevasse area had to be negotiated. This occurred where the descent steepened just beyond

the evening camp of the 26th. The crevasses were very broad and though snow-filled where the crossing was made, there were weak patches through which we broke. Everything had to be transported on ropes. Having negotiated this bad zone during the morning, we advanced rapidly in the afternoon. The steeply sloping ice-cap led down within a couple of miles on to an extensive glacier (afterwards named the Ninnis Glacier), occupying a broad recession in the coast. Then the ice surface gradually rose as a great billow several miles across with its crest about 200 feet higher than the valley bottom which, in its turn, was some 400 feet below the camp which we had left in the morning.

To the north we had sighted a large ice-covered island which was eventually named Dixson Island. This stood several miles off the coastline as the latter swept around into the great embayment across which we were now making our way.

During the afternoon our course lay over more rolling billows in the ice. These were observed to have an amplitude of about 250 feet and were spaced at about 1½-mile intervals. These billows in the glacier-ice to the south of Dixson Island were due to the obstruction offered to the movement of the glacier-ice.

By late evening 16 miles had been covered on an east-south-east course. When camp was pitched we were well in towards the centre of the Ninnis Glacier and a region of much soft snow accumulation. One of the dogs, Betli, was lost in a crevasse early in the day.

November 28th.—The wind died down to almost a calm between 7 and 8 a.m., thereafter increasing from the south-by-west to about 20 miles per hour. Clouds spread and by 2 p.m. the entire sky was overcast with stratus and nimbus; also a little fine snow fell. At noon the temperature reached 23° F. The surface was covered with extremely soft snow so that much hard plugging was required to negotiate 4½ miles by lunch time. Soon after getting on the march again we came upon an ice surface which was badly broken and crevassed. This we judged to be the most actively moving part of the glacier. The light was atrocious so we did not succeed in penetrating far before being forced to camp for the night. To the north beyond Dixson Island the top of a high turretted iceberg could be seen; this was evidently embedded in sea-ice on the west side of the Ninnis Glacier.

November 29th.—The sky cleared considerably during the early morning and later on the wind subsided. Progress was slow on account of the broken nature of the surface. We had just arranged to pitch camp at 11.45 a.m. ready for a latitude observation when the hinder one of the coupled sledges suddenly dived into a crevasse and hung vertically. We were only just in time to prevent it dragging the other sledge and dogs with it. After quickly anchoring it with the hauling rope one of us went down on a rope and attached a stronger line to the lower end of the sledge. On account of the bow having jammed under an overhanging cornice, it had to be unloaded while in the crevasse before it could be got up. However, the job was done in less than an hour. My entry here indicates that we were getting rather depressed.

"We have had a most aggravating morning; very deep, soft snow and climbing hills with plenty of crevasses. The dogs very done. Things are looking serious for our onward progress. If only we could have a straight out sledging proposition instead of these endless snow hills and crevasses."

After lunch we plugged on once more with disappointing results, so Mertz skirmished a mile or so in several directions and ascended a high ice point for a better view, but brought back no hope of proceeding to the east or south-east. I then decided to turn back and we later commenced pushing our way further to the south. In this direction we followed along large partly open crevasses. We entered what resembled a huge stone quarry with shattered ice on every hand; then plunged into "the Devil's Punch Bowl"; the sledges were then dragged up a long slope which seemed to be leading to a better surface. At this stage drift began to obscure low objects. The tent was erected so that we could make some tea whilst the sledges were being overhauled and repacked. It was then about 4 p.m. and the temperature was 24° F. A southerly wind was blowing at 30 miles per hour.

After refreshment the march was resumed over more crevassed areas through which progress was achieved only with the greatest difficulty. The sledges and dogs were roped together in a long line for safety and progress in many places was by hand-over-hand man-hauling. During all this time we were rising steadily along a depression making to the south-east. The night camp was pitched about 9 p.m. on a flat area which stood quite 800 feet above the lowest part of the day's track.

Heavy wind and drift hampered operations during the later part of the day's task. All the time between 7 p.m. and 9 p.m. the south-by-east gale averaged between 45 and 55 miles per hour. The dogs were all quite done when a final halt was called. The day's extreme effort had resulted in our covering only $10\frac{1}{3}$ miles, but we had advanced on our course considerably less than that.

November 30th.—At 1 a.m. after a short period of dead calm a series of whirlwinds from south-east to east sped down the glacier past the tent. Immediately afterwards a persistent, strong southerly wind set in. It blew at 75 miles per hour for a short time then fell off towards morning, though never less than 45 miles, but at 10 a.m. it increased once more. At 11 a.m. it was a 60-mile wind carrying much drift.

This drift greatly hampered us breaking camp and getting on the march. Everything had been packed on the sledges except the tent, which had been left up until the last moment. Then we found the dogs would not face the thick drift. Accordingly we retired to the tent awaiting an improvement in weather.

At 3 p.m. the wind quickly fell off to a calm except for frequent whirlwinds. No time was lost in packing up and getting away. We could see the highlands ahead to the south-east still enveloped in thick drifting snow, while over the Ninnis Glacier, more especially to the south and west, great whirlwinds raced about travelling in every direction and at variance with each other. The dimensions of the whirlwinds were clearly defined by the quantity of fine drift snow sucked up; thus it was observed that some of them were several hundred yards in diameter and carried snow up to 300 to 400 feet in height.

Continuing to the south-east we covered 3 miles over a névé surface of rolling hills. Then a crevassed area was encountered. The hills which were anticlines in the ice were split open to form great chasms along the crests. This brought to light the lower blue ice. After much reconnoitring we finally pushed forward for 2 miles on a course east-by-north, slowly working through the crevasses. Then we had to turn south-south-east for another mile. It was now near midnight and the sun had set. The light delineating the detail of the crevassed ice surface was then so bad that camp was pitched among the crevasses. The wind which had been puffy during the evening hours now settled down to a 10-mile breeze from the south-south-east. The day's toil had accomplished only about 4 miles in an air-line on our course though the total hauling had been much more.

December 1st.—When we debunked about 9 a.m. cirro-stratus clouds from the north were spreading over the sky. The wind had almost ceased.

We plugged on up-hill through crevasses for several miles but only with the greatest exertion, for the temperature this day reached 34° F. which made the surface very sticky. The sledges were hard to move even with men and dogs all pulling our hardest. We began to consider travelling at night only, when the temperature would be lower.

We had now ascended considerably above the lower part of the Glacier and a good view of our surroundings presented itself. In the direction of north through north-east to east was a region of serac-ice leading to what appeared to be shelf-ice and the sea. To the south-east were undulating crevassed hills, typical of ice riding on a rocky bottom; to the south the landscape was the same, only at higher elevations; to the south-west was the same type of surface leading to higher portions of the ice-cap at a distance of about 40 miles. My diary entry states: "It is obvious that we have been deluded by Wilkes's reports of the existence of Point Emmons and Cape Hudson, in which direction it appears that no land exists. If Wilkes saw anything more than pack-ice it can have been no more than a barrier (shelf-ice) edge."

It was clear that we were then on ice which was northward of the margin of the true land. This being so we concluded that Madigan's Party "must be hard on us from the north," for their instructions were to follow the coastline. Consequently we decided to make further to the south.

We continued to rise as progress was made over undulating hills. The surface in this locality was mostly ice and half-ice. Crevasses were frequent and the up-grades steep. This meant heavy work man-hauling with the dogs. The sledges ran much easier as the evening progressed owing to the colder conditions.

December 2nd.—We did not retire for the evening until 1 a.m. The temperature was then 13° F.

Only a short advance was made before the lunch camp where I had decided to take a round of angles to help fix some of the interesting topographical features now coming into view. To the east, the rock face first seen on November 26th was clearly in view; a palisade of gigantic columns.

The going was heavy in the afternoon for there was no wind and a high shade temperature which even at 6 p.m. was 27° F. It is interesting to note that at this latter time the temperature inside the instrument box on the sledge was 70° F. Such warmth made the snow soft and sticky.

In our gradual ascent today we traversed slopes deeply carved by the wind into sastrugi, commonly reaching 3½ feet high. The sastrugi were undercut and ablation-pitted. Long ice-floored lanes were also a feature of the surface hereabouts.

The day's run was only about 9 miles. At midnight a quarter of the sun's disc was in view over the ice-cap to the south.

December 3rd.—We got moving at 10 a.m. The first 5 miles were over difficult country forcing us to the south of our course. After this the surface was much better, for we had got through the actively moving ice of the valley of the Ninnis Glacier and commenced on the more stagnant ice-cap.

From noon on, fog banks had been observed rising from a number of points on the consolidated sea-ice to the north-east and especially from the rocky area to the east; apparently due to the chilling of rising columns of warmer humid air. In this way extensive fog banks developed, which drifted towards us, and by 4 p.m. had partially obliterated the sun, hampering our movements on account of the bad light. So camp was pitched for lunch at 4 p.m.

Later, the journey was continued until we camped for the night at about 11 p.m. after covering over 12 miles for the day. At that time the temperature was 12° F. and a 15-mile wind was coming down the ice slopes from the south-east. The sky was overcast. From 7 p.m. on, during the evening hours, there had eventuated a very sparce fall of snow in six-rayed stars, up to a sixth of an inch in diameter.

As we proceeded over the slowly rising land-ice slopes this day the surface passed from half-ice névé to marble-like névé, and then to softer névé more typical of the plateau surface.

December 4th.—The morning commenced with considerable cirro-cumulus and strato-cumulus in the northern sky, but as the day advanced globular cumulus and strato-cumulus spread over the east to south-east; in the north-east these lower clouds merged into a sheet of strato-nimbus. The indication, therefore, was that we were in for a heavy fall of snow.

The surface over which we travelled was a great improvement on foregoing days, but there was still much half-ice and occasional crevasses. From an elevation of 2000 feet we steadily rose during the day to 2,800 feet. Some dangerous crevassed ice was encountered at an ice-fall, where evidently the rock basement beneath the ice fell away rapidly. The day's run was 15 miles, the last 5 being over sastrugi-furrowed compact névé of the plateau surface type. This belt was preceded by a hard white marble-like type of névé ice, the surface of which was at frequent intervals deeply dissected by the wind to form hard, sharp-edged sastrugi occasionally rising to a height of a couple of feet. We noted that the direction of the sastrugi swung round very much to the east during the latter part of the day's march.

Since midday the light had been very bad indeed, "snow-blind" conditions, for the sky became completely overcast with nimbus cloud. The night camp was pitched at 8.30 p.m., after a day's run of 15 miles. When we turned in at 10 p.m. the temperature was 15° F. and there was a 15-mile breeze from the south-east.

December 5th.—At 8 a.m. there was a 20-mile wind from the south-south-east and light low drift; much of the sky was occupied by cumulo-nimbus cloud. A couple of hours later the wind had risen somewhat and showers of snow fell from time to time resulting in thicker drift. During the morning the surface traversed was over a rather flat region of sastrugi-furrowed névé. By midday the ice surface encountered rose steeply

and some large crevasses were crossed. At the top of this slope and near the top, the surface was studded with numerous large anvil-shaped, hard sastrugi about 30 inches in height. These were distributed along east to west lines, whereas the sastrugi themselves were directed to the south-east.

The evening camp was pitched at 7.50 p.m. at about 12 miles for the day. The wind was then blowing at 35 miles per hour from the east-south-east, and was laden with thick drift, fed by the falling snow.

December 6th.—The wind increased and continued all day rising from 40 to 60 miles per hour. Snow was evidently falling and dense drift swept over the plateau. We decided not to attempt to advance under these conditions.

At 11 a.m. and at 6 p.m. we boiled some hoosh and took stock of affairs outside the tent. The dogs were all coiled up under the snow and had to be individually found in order to give them a ration of food. The temperature at 6 p.m. was 14° F. The drift was then so thick that Mertz, whose turn it was to feed the dogs, reported that he was unable to see the sledges from the tent though they were only several yards away.

December 7th.—The blizzard continued with wind up to 70 miles per hour. During the forenoon it became gusty and fell off to 30-mile strength but later again increased. Sledging was out of the question.

December 8th.—The wind blew at 70 miles during the night but moderated considerably during the day. Heavy snow continued falling all day long and the air was thick with drift. We were still storm-bound. These days were very trying to us, for in addition to the anxiety at not being able to progress with our programme, there was much discomfort in the conditions under which we were existing. There was the incessant flapping of the tent; the beat of it striking the sleeping bags; the cramped position huddled in sleeping bags with wind and accumulating snow pressing in upon us, already in all too limited quarters; the short ration (greatly reduced since we were not making progress); finally, various ailments brought on by these conditions. I had swollen and burst lips and some neuralgia. Ninnis developed a very painful gathering at the base of the nail on one of his fingers. We were taunted by vivid dreams.

Late in the afternoon the wind abated rapidly and by 4 p.m. was merely a light breeze, so the outlook brightened considerably.

December 9th.—We were up at 5 a.m. and commenced digging out the sledges and dogs, for all were deeply buried. A 25-mile wind was blowing from the south-east-by-south. The sky cleared considerably during the morning. The sun, with a large ring around it, was seen hazily through cirrus cloud.

A course was set to the east over a wretchedly soft snow surface into which we sank above our ankles and more at times. Wind and low drift still continued. A Snow Petrel paid us a visit during the morning. We were then about 2,300 feet above sea-level. At noon the sun was sufficiently defined for a latitude determination, the first observation that had been possible since December 3rd. At this time the temperature was 23° F.

During the afternoon the surface traversed was very flat along the line of march but there was a gentle slope down to the north. The sledge-meter gave trouble on account of balling with the soft snow. When camp was pitched at 8.30 p.m. we had covered about 16½ miles, a strenuous performance owing to the wretched soft surface. A 15- to 20-mile wind was still blowing.

December 10th.—In the morning there was light, low drift to the accompaniment of a 15-mile wind from the east-south-east. The surface was in the same wretched condition as on the previous day. We had not gone far before Ninnis drew our attention to a couple of knobbly masses just appearing over the snow horizon to the north-east. Later other such irregularities appeared on the north-north-east horizon; also a low depression was met running to the north. Later in the day a good view was obtained of the frozen sea to the north and east. The immediate coastline was hidden for the most part by the plateau surface in the foreground, for the land-ice evidently fell down steeply to the sea at no great distance to the north of our position. We could see several large icebergs off the coast. A whale-backed in-shore island lay a few degrees to the west of north from our position at 3 p.m.

The old winter system of sastrugi underlying the recent summer accumulation of snow was found to be directed N. 6° E. The recent summer blizzard had developed in the snow drifts sastrugi trending from the south-east-by-south.

We continued on a course about E. 5° S. and made a total of something over 12 miles when camp was pitched at 10 p.m. The sledge-meter had again balled with soft snow and gave an unreliable figure. Travelling was hampered not only by the soft, deep snow but wind and surface drift had continued all day, becoming particularly troublesome in the evening hours.

December 11th.—The journey was continued in a 30-mile wind with much low drift. The weather was unsuitable for obtaining observations for position; also the sledge-meter was again found to be blocked with ice.

The whale-backed island was seen to be located east of the long rocky coast bounded by columnar cliffs. A good view of the sweep of coastline east of the whale-backed island was now obtained. There the coastal margin is mostly ice. It makes east then extends to the north, ending in a sharp point of ice-capped land, the extremity of a peninsula. From this prominent point, which I have named Cape Freshfield, the coast turns south continuing in that direction to beyond the latitude of the whale-backed island; then it turns to the east and was seen extending out of sight in that direction. To the east of the whale-backed sland several ice-capped islands or icebergs could be seen close in-shore.

At 10 p.m. ice-falls appeared ahead and to the south of our course, so camp was pitched for the night. At midnight there was still a 25-mile wind with low drift. The temperature then was 11° F.

December 12th.—We were about again at 9 a.m. feeding and harnessing the dogs and taking a round of angles to delineate the coastline. The sharp southward turn of the coast beyond Cape Freshfield necessitated our turning south and ascending to higher elevations on the plateau. Ahead on our present course lay steep cascades of shattered ice descending from the higher plateau and ending in high coastal cliffs. At the base of this impressive ice-fall gigantic icebergs, firmly held in the frozen sea, illustrated every stage in the final disintegration of the plateau ice-cap.

We set out to the east-south-east in a 20-mile wind with low drift. Later in the day, after crossing several bad crevasses, we had to swing to the south-south-east to head a much-crevassed area which led on down to the head of the embayment in the coast. The surface was steadily down-hill except for several large undulations in our path.

Camp was not pitched until about midnight. At that time the temperature was 4° F. The wind had fallen off to a calm and there was every indication of good weather ahead.

December 13th.—It was evident that the coastline onward to Oates Land from our location of this day trended in a nearly west to east direction. It appeared, therefore, that by following a course across the coastal margin of the plateau ice sufficiently far inland to be free from crevasses, we should at last be able to push rapidly forward to the east. There were indications of a spell of good weather ahead, so the prospect of contacting with Oates Land was good.

We decided to continue the outward journey for another week, and to proceed as far east as possible in that time. It was resolved that as soon as we should reach a suitable location on the plateau, all stores required for the return journey to the Hut should be depoted. It was anticipated that by the evening of the 14th we should have arrived at a point about 30 miles to the south-east of our present camp (camp of the 12th) where in all probability would be an excellent location for this depot. From there back to the Hut an air-line would be over the unbroken inland ice far from the coast, and thus provide a guaranteed good (so far as the plateau is ever good) all-weather travelling surface with the prevailing wind in our favour.

We were up at 9 a.m. busily engaged upon a complete revision of sledge stores and equipment. The most worn sledge, that which had carried the heavy tins of dried seal meat for the dogs, was discarded. Also the lighter of the two spades, the handle of which was broken, was thrown away. The dogs had eaten the strap off the cooker-box, so this and other general repairs were effected. The dogs were assembled in two teams. The six best dogs constituted the first team which we anticipated would return to the Hut

with us. The second team, also six in number, were the inferior animals, most of whom were already in very poor condition; these it was obvious could not survive and would be fed to the others should they collapse. The best dog team was to haul the rear sledge upon which was loaded the most vital equipment.

This course was adopted, for it was anticipated that should trouble come from unseen crevasses it would be met by the leading sledge.

Ninnis's finger had been painfully inflamed for days past; so bad was it that he had had little sleep. He now told me that he could stand the pain no longer and asked me to cut it open, with the expectation that by so doing good would accrue. All these operations consumed time, so that it was 2 p.m. before we finally got away. At first the light was bad but the sun made an appearance later. To begin with there was some up-hill and down-hill work over a good surface, then big crevasses up to 100 feet in width, mostly snow-choked, appeared in our path. Some detours had to be made but later in the day we were able to make rapid easting on a course E. 15° S. At this stage we were steadily ascending to the high plateau south of the impassable shattered ice-wall which was seen to form the coast to the east of our camp on the evening of December 11th.

Whilst ascending over crevassed slopes this afternoon, a number of remarkably high monoliths of compact hard névé were observed. These were conspicuously distributed on high hill-tops and on seaward-facing ice slopes.

Rolls of dark cumulus cloud were seen over the sea area in the far north and north-east, which suggested open water or loose pack. However, as far as the eye could reach in that direction the sea was covered with a sheet of ice. In the nearer view it was a complete, frozen sheet in which some icebergs were held. In the farther distance the surface was much more uneven, probably frozen consolidated pack-ice, in which icebergs were also visible. However, at such a distance it was not possible to determine whether the far distant formation was fast-frozen pack or whether it was unconsolidated drifting pack. The fact that low, dark cloud was over the north-eastern horizon for several days together at this time indicated almost certainly that open water or loose pack-ice existed in that direction.

At this time, although we were at a considerable elevation on the ice-cap and had a clear view for some days of the northern and north-eastern horizon, yet no sign of off-lying land was discerned. This observation appeared to put an end to the possibility of land in the locations assigned by Wilkes to Point Emmons and Cape Hudson.

To-day in ascending the ice slopes to the higher plateau the rolling contour of such surfaces was well exemplified. From crest to crest the rises ranged from 1 to 4 miles apart. The vertical amplitude of the wider pitched ones reached 300 feet. When sledging over a snow-filled valley in the late evening hours a remarkable booming sound filled the air. We concluded from the evidence available that this was due to the subsiding of large areas of compact pie-crust surface. Our weight caused the crust to sink and the air to be expelled.

We were in camp again by midnight at an elevation of 1,900 feet. The temperature then was 2° F. It was almost calm, merely gentle airs creeping down the ice slopes from the south.

December 14th.—We were up at 9 a.m. to find splendid weather. A 10-mile breeze was blowing from the south-east and temperature 15° F. After going only a very little way it was necessary to halt for a noon latitude determination.

Then the march was resumed. The surface was good, the dogs dragging the loads easily. Mertz was on ski ahead, whilst I brought along the first sledge and Ninnis the rear one. We had proceeded no distance beyond the noon halt when a calamity happened in which Ninnis was killed instantly. Any prospect of reaching Oates Land terminated and indeed, owing to the loss of food, the chance of Mertz and I being able to make our way back to the Hut was rendered very doubtful.

On a perfectly level and apparently unbroken snow surface our trail crossed what the sharp eyes of Mertz had detected as the very faint indication of a crevasse. As it happened, just before crossing it with my sledge, I jumped on the load and set to work figuring out the noon latitude from the sun's altitude just

determined. A little later, on concluding the calculation, I noticed that Mertz was gazing back apparently concerned about something. Looking behind I found no sign of Ninnis or his sledge. They had disappeared without sound, though steadily following in my tracks so short a time before. I ran back along the sledge tracks about a quarter of a mile and there discovered a gaping hole in the flat plateau surface where, in crossing, we had seen the faint indication of a crevasse.

Mertz quickly followed me but nothing could be done; for Ninnis, the dog team, sledge and load had been swallowed up in a flash. The crevasse which was 11 feet wide had clean cut perpendicular walls. The bottom could not be seen: we gazed down through a light blue haze to dark blue depths which, through deeper shades of blue, passed into blackness. Far below, caught on a slight irregularity of the ice wall we could see some remnants of the equipment and one of the dogs (Franklin) with his back broken, moaning and trying to raise the front part of his body.

Our comrade and all else had gone on down into blackness beyond. We did not have sufficient rope to descend to the ledge where Franklin was struggling, but by means of a fishing line ascertained the depth to be 150 feet.

Franklin soon ceased to moan and all was quiet. We listened and called for hours but no answering sound returned.

As the surface ahead was rising slightly, we decided to proceed a short way in that direction in the hope of getting a wider outlook over the surrounding country and possibly coming in sight of coastal features to fix our position the better. Actually we advanced about 5 miles beyond the scene of the catastrophe. There, though at a higher elevation, the ice-cap was found to be riven by many bad crevasses. Associated with the crevasses were high ice mounds, bluff on the windward (south) side but trailing away perfectly streamlined to the north. The approximate position of the spot reached was lat. 68° 56′ S., longt. 151° 44′ E. The ice cliff coastline continued to the east but no conspicuous feature came into view.

We then retraced our way to the fateful crevasse. Another hour was spent listening and calling hopefully into the black depths, but in vain.

Mertz and I took stock of our position and discussed plans for return to the Hut. All the dog food and almost all the man food had disappeared in the crevasse. Other important items lost were the tent, the ice-pick, the spade, the mast and the sail. The mugs and spoons were also on the lost sledge. Mertz's burberry helmet and trousers were gone but we had a plentiful supply of other spare clothing. Fortunately a spare light tent cover, the cooker and the kerosene were saved.

The good dog team, Basilisk, Franklin, Shackleton, John Bull, Castor and Ginger had been lost. Hardly one of the surviving team was in any but poor condition. There was no food for them to eat. Old finnesko and other discarded items they ravenously gnawed.

We decided to attempt to reach the Hut by as direct a route as possible, feeding the dogs to each other and substantially depending on the dog meat for ourselves. The first objective was to be our camp of the 12th where we had abandoned several items of equipment which would now be of great value under the new circumstances.

The burial service was read and final leave taken of our dead comrade. At 9 p.m. a start was made. The way was down-hill so progress was rapid. The 15 miles to the camp of the 12th were covered non-stop by 2.30 a.m. The total distance sledged since the night camp of the 13th was 24 miles.

December 15th.—We were about again at 10 a.m. reorganizing the available equipment. From the runners of the discarded sledge now retrieved were cut two supports which, in conjunction with Mertz's pair of ski, were thenceforth employed as a frame upon which to pitch the light tent cover. The broken spade which had been discarded on the 12th was made serviceable by lashing to it splints made from sections of the sledge rail. Two discarded tins were fashioned into mugs to hold food. With the aid of a pen-knife, spoons were carved out of pieces of the discarded sledge. The small quantity of sledging ration which remained was divided to allow us each about 8 ounces a day for about five weeks.

The dogs were, of course, very hungry indeed. There really was nothing for them to eat except some old finnesko and bits of leather. They chewed the wood of the discarded sledge and great vigilance was needed to prevent them damaging the good sledge and its meagre load. George was in poorest condition so was killed as food for the others; some of the best of the meat was kept for ourselves.

In the morning there was a light 10-mile breeze from the south-south-east and an almost clear sky. Later on the breeze died down and the day became very sultry: the temperature at 5 p.m. was 30° F. The snow was so soft and sticky that daytime travelling was out of the question.

Our first meal for the day was partaken at 5 p.m. The small ration of ordinary food was supplemented by dog meat fried over the primus on the lid of the cooker. The fact that it was only half cooked made it even less appreciated than it would otherwise have been.

At 6.45 p.m. we set off first travelling to the north-east to avoid crevassed slopes, then we gradually swung around to the west. The warm sun of midday had fritted the surface snow in the valley near the camp and now it was presented with a refrozen glazed surface. The few starved dogs remaining helped considerably in dragging the load but I pulled with them. Mertz went ahead on ski selecting the best track. The mournful procession plodded on hour after hour. The first 14 miles were over gradually ascending snow slopes until an elevation of 2,500 feet had been reached.

December 16th.—Clouds had been spreading south from the northern horizon and by 1 a.m. had completely covered the sky. The "snow-blind" light did not facilitate progress. Fortunately the deep, soft snow encountered on the outward journey in this region had by now hardened to form a satisfactory sledging surface. Camp was pitched at 5 a.m. after covering a distance of 18½ miles. The temperature was then 8° F. and a 10- to 15-mile east-south-east wind was blowing.

From 8 a.m. on, beautiful snow crystals began to fall and later the snow fell in a smart shower. After a scant meal we settled down to get some rest and if possible to sleep during the warmer hours of the day. On account of painful snow-blindness in both eyes I got little sleep. Copious treatment with cocaine and zinc sulphate eased the pain.

At 5 p.m. Mertz waxed the sledge runners to ease the dragging over wet snow and gave the surviving dogs a little more of George's meat. It was still snowing and the light atrocious.

After waiting for the temperature to fall somewhat we continued the march at 8.30 p.m. The surface was soft fallen snow completely burying the old sastrugi and thereby rendering steering a true course very difficult. The tiny snow crystals which continued to fall were of a beautiful pattern. I had one eye bandaged but was able to see with the other.

December 17th.—When only 5 miles on the way another dog, Johnston, could walk no further and had to be carried on the sledge. Then Mary gave in at 9½ miles. Pavlova was also in a very weak state. We had to camp at 2 a.m., after covering only 11 miles, hoping that a rest might revive the dogs. Johnston was shot for food for the other dogs and ourselves.

At 7.30 p.m. when we again broke camp the sky was still almost completely overcast. There was a 10-mile south-easterly wind and a temperature of 12° F. The wind rose somewhat during the night and some snow fell. It was a wretched business plodding along in that "snow-blind" light, trying to keep a straight course.

December 18th.—By now the only dog to give any real assistance with the pulling was Ginger. All the others merely staggered along. The sledge load, however, was comparatively light so that, with help from Mertz who on ski was in the lead stumbling over unseen sastrugi, and my own efforts hauling in short harness, the procession slowly but surely progressed, ticking off many hard-won miles. By Mertz keeping well ahead on a long line I found it easier to steer a straight course; also, being able to focus on him greatly assisted vision in seeing the details of the sastrugi surface immediately in front of me.

At 9½ miles Mary could walk no further and had to be carried. Camp was pitched at 5.25 a.m. after covering 18½ miles. There Mary was killed for meat for the other dogs and some for ourselves. This dog meat we found remarkably tough and stringy, but nevertheless, very welcome. At 8 a.m. there was a 20-mile wind from the south-south-east and temperature 9° F.

After sleeping better than on preceding days, we were up at 5.30 p.m. The sky was still overcast and occasional flakes of snow were falling. When the march began the surface was found to be descending slowly and proved to be very broken with high sastrugi from which the newly fallen snow had been removed by the wind. The sledge ran easily enough but Mertz and I were for ever falling, for it was impossible under the bad light conditions to see detail of the surface. Mertz, who was still travelling on ski, later decided that he could do better on foot over such a hard sastrugi-furrowed surface; also he was anxious to shoulder a full share of the sledge-hauling, which is not possible on such surfaces when on ski. Eventually at a little past midnight, it was agreed to camp for some hours, hoping for better light conditions.

December 19th.—It was 2 a.m. before we got into our sleeping bags. Moderately dense clouds had come up from the east so there was less prospect than ever of the sky clearing.

The journey was continued at noon and progress made until 5 p.m. when camp was again pitched, having covered nearly 13 miles since breaking camp on the 18th. At that time the sun emerged and a longitude determination was obtained. After a rest awaiting the cooler evening conditions we again proceeded at 8 p.m. The sky was then almost clear.

The way led over a very rough sastrugi surface. Here it was hard, deeply channelled, white ice. The "going" was unusually heavy. White lines seen across the surface ahead, where it descended somewhat, proved to be dangerous crevasses. The dog, Haldane, still in harness, plunged into one but was recovered. The chasm went on down into blackness below.

December 20th.—The crevassed area drove us to the south of our true course and eventually led into a region of wretchedly heavy sastrugi. Haldane collapsed and was then carried on the sledge. At 3.45 a.m. we halted on the top of a down slope to revive the dogs and to melt ice for a drink. To the water we added a few drops of the primus alcohol as a stimulant.

We were on again at 7 a.m. but the "going" was very heavy indeed. Ginger was still able to carry on but the other dogs had collapsed. Camp was pitched at 10.30 a.m. at 27¼ miles beyond the December 18th camp. As the sun was visible a latitude determination was made at noon.

December 21st.—The march was continued at 2.20 a.m. in a 30-mile wind with low drift. The temperature was just above zero Fahrenheit. The surface traversed was about on a level, but rather heavy as a sledging surface on account of hard, sharp-edged sastrugi. There were isolated very large ones, greatly undercut. For a time Dixson Island just came into view. We were then traversing the upper section of the Ninnis Glacier. My object was to make as straight a course as possible back to Winter Quarters. This kept us further from the newly discovered coast than on the out journey.

Haldane collapsed at 5 miles on the way and had again to be carried on the sledge. When camp was pitched at 10 a.m. after covering a distance of 11 miles, Haldane was shot for food for the other dogs and ourselves.

Emerging from the sleeping bags at 9 p.m. we found that the wind was rising rapidly. During the day it had reached 40 miles per hour but fell off calm in the early evening. However, before midnight it was again blowing at 35 miles with low drift and a zero (F.) temperature.

December 22nd.—We were soon rising slowly up-hill making about 300 feet in elevation in about 4 miles. While on this up-hill drag it was decided to discard some unnecessary items to reduce the load, for now every ounce counted. Thus were jettisoned the rifle, a length of rope and some spare socks.

After this ascent a long slight down slope was negotiated. Here the surface was hard and slippery so we had many falls. Far ahead we could see the crevassed slopes forming the western side of the Ninnis Glacier.

The sledge-meter was found to be frozen up and when trying to put it right the axle snapped, the metal apparently having crystallised as a result of low temperature and jarring over sastrugi. This additional misfortune did not help to revive our spirits.

Camp was pitched at 6.40 a.m. in a 35- to 40-mile wind and much drift. Clouds had rapidly spread over the whole sky, blotting out details of the surface of the ice. The collapse of the dog Pavlova was the final factor that decided us to camp. The distance done was nearly 13 miles.

Much time was then consumed in mending the spade and the sledge-meter, which had to be done before we could think of getting into the sleeping bags.

We arose again at 8.30 p.m. but it took until 11.30 p.m. before we got away. It was heavy up-hill pulling with snow falling and an overcast sky. Pavlova was being carried on the sledge.

December 23rd.—The steep up-hill pulling made both of us in our weakened condition feel quite ill for a time. After 4 miles of this task a crevassed area was entered. This was most unfortunate for in the "snow-blind" light and with several inches of soft snow on the ground there was great difficulty in seeing the crevasses. Only $5\frac{3}{4}$ miles had been covered at 4.30 a.m. when camp was pitched to await better conditions.

We were up at 5 p.m. but as there were snow-blind conditions and falling snow, we deferred striking camp. Pavlova was killed and hours were spent cooking a quantity of dog meat for future use. For immediate use broth was made from the bones. In this way we lightened the load of all bones and of the kerosene necessary to cook this meat. There was, however, so little food in sight that, in the face of such extraordinary obstacles to travellers imposed by the atrocious weather, we restricted ourselves to a very small ration of food. When we got into the sleeping bags again we were too hungry to sleep.

December 24th.—At 8 a.m. the sun began to break through the clouds. Snow was still falling but only lightly. The march was resumed. The sledge, comparatively light though it was, dragged heavily through the soft snow. However, a distance of 4 miles through the crevassed region was negotiated. The surface ahead was then unbroken but unfortunately the sky had cleared to such an extent that the hot sun softened the newly fallen snow and made sledging difficult. Accordingly, we decided to camp until midnight when the temperature would be lower. A small Prion paid us a visit but did not stay a moment.

The slowing up of our progress by bad weather had now convinced us that it was necessary to abandon all our load except vital necessities. Accordingly, the camera and unexposed films, the hypsometer and thermometers, spare clothing, some kerosene and oddments were abandoned. The two pieces of sledge runner previously employed in conjunction with the ski to hold up the tent were discarded, their place being taken by the theodolite legs. The theodolite was retained.

Some time was spent in stewing more of the dog bones, then at 7 p.m. we retired to the sleeping bags until 11 p.m. when another dog-bone stew was prepared.

December 25th.—I found two pieces of biscuit amongst spare clothing in my bag, so in a small way we celebrated the advent of Christmas with this additional food. Outside the wind had risen to 20 miles per hour and there was low drift.

At 2.30 a.m. a start was made on a west-north-west course. The surface rose steadily for about 3 miles then when on the crest of the rise Dixson Island came into view. From this vantage point it was found that we were on a broad plain area, but still in the valley of the Ninnis Glacier. Ahead the ice slopes leading into the glacier on the west side could be seen.

Continuing the journey there was a general down-grade of the surface as the west side of the glacier was approached. This led to an undulating region with high sastrugi and crevasses mostly filled. Christmas camp was pitched at 9.30 a.m. after covering about 10 miles. Observations for position were made but it was now difficult to obtain a high degree of accuracy owing to the shortcomings of the improvised

theodolite stand. The instrument was merely rested and levelled on top of the cooker-box. At this stage the Cape Denison Hut was reckoned to be distant about 158 miles on a direct course N. 43° W. (true). After a super meal of dog stew, we rested in the sleeping bags until 10 p.m. Then we had another dog stew and hot cocoa just before midnight.

December 26th.—It took till 2 a.m. before we were on the way again. A cold 25-mile wind was blowing which increased to 35-miles by 3 a.m. Considerable low drift continued throughout the night, and the temperature was very low.

Ginger still continued to pull; it was remarkable how she outlasted the other dogs. The surface was hummocky and flat with occasional down-hill slopes. Several belts of soft snow were met and crossed but the pulling through these was heavy. The normal surface here was marble-like glacier-ice, with here and there relics of overlying white névé-ice. Irregularly distributed over these surfaces were drifts of soft recent snow.

Had we had a sail the wind would have been a real help at this time. We longed for the excellent sail which went down the crevasse with Ninnis.

The wretched makeshift tent, pitched on the theodolite legs with the assistance of the pair of ski which we still carried, was very difficult to erect in a high wind. When a halt was called to pitch tent, it was about 10 a.m. and some 11 miles had been covered. So chilled were we and so awkward the makeshift gear and so long the business of cooking dog meat, that it was 4 hours after halting before we could retire to our sleeping bags. I noted at the time: "8 or 10 hours straight out sledge-pulling with only 2 men is a great strain which if we could pitch camp and boil up between would be entirely avoided." The time taken to camp in such wind put such a rest halt out of the question. There was no alternative but slow ceaseless and seemingly endless dragging for hours on end. In the condition we were, to halt was to freeze when the plateau gale was blowing. We got some sleep during the day. One of my eyes was again badly affected by snow-blindness. At 10 p.m. we were up again.

December 27th.—After having a little food we set to work to devise a jury sail out of the tent cover. It was not till 4 a.m. that the march was resumed. The wind was then blowing at 30-miles and the air exceedingly chill.

Soon it was evident that we were rising on to the higher ice-cap to the west of the Ninnis Glacier. The surface undulating but gradually ascending, was composed of loosely packed snow and made the going heavy. However, the sail was of assistance.

As noon approached the wind calmed and the sun's heat began to be felt, causing thawing on the north side of the tent when it was again pitched after 10 miles had been covered.

The warm sun now made us more hopeful of getting through to Winter Quarters, so we treated ourselves at supper to $\frac{3}{4}$ ounce of butter and half a biscuit each in addition to dog stew. This was followed by tea which, however, was very weak, it being the third time that the tea-leaves used had been boiled up. The last lot of tea-leaves used had served on four successive occasions.

At 10.40 p.m. we were again cooking more dog meat.

December 28th.—It was not until 3 a.m., however, that we were once more on the march. The surface was still soft but a little firmer than on the previous day. There was a 30-mile wind and drifting snow and whirlwinds during the morning hours. It was up-hill dragging over rising terraces. Dixson Island again came into sight for a short while.

Alas, out faithful Ginger collapsed after we had gone only 3 miles. She was put on the sledge and dragged 2 miles further. It was then 7.15 a.m. We decided to camp with the intention of making an early start in the evening.

There was no way of saving Ginger so she was killed and the carcase used for food.

The wind and drift buffetted the ill-shaped makeshift tent as the hours passed while I cooked Ginger's bones to get what good we could out of them, in order that the skeleton could be jettisoned as soon as possible. Mertz rested in his bag for so constricted was our shelter that only one could sit up at a time. Later in the day Mertz continued with the cooking while I slept.

December 29th.—At last at 2 a.m. we were off again still ascending the rising slopes. There was drift snow and a 30-mile east-south-east wind which increased to 40 miles by 4 a.m. The sail was really useful now but it was a bitterly cold job rigging it, securing makeshift ties with bare fingers. The fingers of both Mertz's hands were frostbitten tonight when rigging sail. This was clear evidence of greatly lowered vitality.

Terrace after terrace was scaled each ranging from 50 to 200 feet high and spaced 1 to 1½ miles apart.

For a while a view somewhat masked by drifting snow was obtained of the coastline east of the Ninnis Glacier. Camp was pitched at 8.30 a.m. after covering about 7½ miles. Ginger's skull and thyroids were boiled for breakfast. By 11 a.m. we were in the sleeping bags.

Though up again at 7.15 p.m. we did not get on the job marching until 11.15 p.m. Clouds were spreading and the wind rising.

December 30th.—By 4 a.m. the wind had reached 45 miles. The surface appeared to be undulating somewhat, and gradually improved, becoming harder and smoother with only minor sastrugi trending south-east to north-west. Later an older winter surface scored with north-south trending sastrugi began to appear through the upper summer crust.

At 9 a.m. a halt was called after 15 miles had been covered. Mertz was feeling decidedly ill, and crawled into his bag as soon as the tent was up. Driving snow had got into our clothes and thawed and then refroze. On account of the continuous drift the condition of our gear was deplorable.

While Mertz was resting I continued cooking dog meat until 2 p.m., after which I had a rest in the sleeping bag while the wind and drift streamed by. At 10.15 p.m. the sun clouded over and the light became very bad. This finally decided us not to travel until conditions improved. I cooked some of the meagre store of pemmican, hoping that it would do Mertz good.

December 31st.—At 5.30 a.m. some biscuit, butter and tea were served but we did not get on the way until 10 a.m. Snow was falling and the light was an atrocious " snow-blind " glare. We did not get far, but camped at noon after only 3½ miles. Again for a meal we had pemmican and cocoa thus hoping to revive Mertz who was still feeling very unwell.

At 7.15 p.m. the sun appeared and the wind fell off to a calm. At 9.30 p.m. I got up, prepared food and packed up. Soon after setting out the sky became overcast and the light bad. The surface was good enough and if anything slightly down-grade.

January 1st.—Steering a straight course was so uncertain that we camped after covering 5 miles only. Snow was falling and drifting and the wind strong. After taking some food we turned in at 6.30 a.m. Mertz was still unwell and not anxious to push on; he thought a day's rest might help, so we stayed in the sleeping bags all day.

January 2nd.—We had 2½ ounces of chocolate each. Then at noon I had intended to continue sledging so we had a little pemmican, cocoa and three-quarters of a biscuit each. The sun had gleamed through thin cloud but to our disappointment it disappeared altogether. The decision was reached to remain in camp in the hope of better travelling weather. Outside the snow continued to fall and the wind remained at about 30 miles. Later in the day we each had 2 ounces of chocolate.

January 3rd.—At noon Mertz boiled a little cocoa and had half a biscuit. I ate some of the dog liver. The falling and drifting snow and high wind continued.

During the afternoon the conditions outside improved and after some cocoa we set off. The wind was miserably cold and Mertz's fingers again became frostbitten, so we had to camp after doing under 5 miles, although the surface was good for travelling.

January 4th.—We intended to get out again at 10 a.m. for the weather had improved, and the conditions for travelling were comparatively good. However, Mertz's condition was no better so I doctored him and rested. There was still left a bag of dried milk and as this might be beneficial I gave Mertz a little from time to time.

Towards midnight it became completely overcast and started to snow.

January 5th.—Later in the day when the wind fell off to 20 miles I tried to get Mertz to agree to continue the march. However, he held strongly that in the condition in which he was it would be better to rest until the morrow.

I prepared a comparatively sumptuous meal at 3.30 p.m. drawing heavily upon our small supply of pemmican, biscuit and cocoa. The hope was that this would effectively revive Mertz.

Starvation, refrigeration and toil had by this time left their marks upon both of us. The skin had peeled off our legs in a remarkable manner.

January 6th.—I was up at 7 a.m. cooking food and packing up to make a further attempt to progress. At 10.30 a.m. we started over a very good surface trending slightly down-hill. The surface was slippery so we had occasional falls. I was quite dizzy and weak from long lying down in the sleeping bag and short ration. Alas! Mertz soon gave up. We had gone 2 miles in slow stages and with long halts. It was obvious that he was suffering pain. He said he could go no further. Then he reluctantly agreed to lie in his sleeping bag on the sledge, while I hauled it. We went on in this wise for a short while and I could have taken him far, but he then refused even to be a passenger on the sledge. Evidently the jolting was giving him pain. There was nothing for it but to camp.

January 7th.—I got out at 8 a.m. to prepare to continue the journey for Mertz had agreed the previous evening that he would lie in his bag on the sledge which, with the aid of the sail, I should drag along.

However, he was in too poor a condition to travel when I attempted to get him packed up. He had to be tucked back into the sleeping bag to keep as warm as possible. I myself was feeling the cold very much.

At 10 a.m. Mertz was delirious and commenced struggling in a fit. Later on he was much better, so I made some thick cocoa for him, but had to lift him up to drink it. He had other fits during the afternoon and from 8 p.m. on for several hours he struggled in delirium. It was very difficult to keep him inside the sleeping bag, where alone he had a chance of keeping warm. Later he became more peaceful and appeared to doze off quietly in the bag. Exhausted after the strain, I then lay down to rest. At 2 a.m. I found he had died in his sleep.*

January 8th.—With wind, falling snow, overcast sky and 100 miles to go to reach the Hut, the outlook was indeed gloomy. Now so weak and starved there seemed little chance of my getting back, for there was a broad crevassed glacier ahead and highlands beyond to climb. However, I determined to push on as far as possible, so lost no time in setting to work remodelling the sledging gear to facilitate one-man operations.

With the aid of a small pocket set of tools, the sledge was cut in halves and the front half fitted to carry my sleeping bag, the tent cover, etc. From the after part of the sledge a cross was fashioned. Then Mertz, toggled up in his sleeping bag, was covered by blocks of snow and surmounted by a cross made from portion of the sledge.

Spare clothing was sewn together to make a sledge sail. Everything that could be discarded was dumped. Ten dozen exposed packets of camera film had to be abandoned. These were deposited in a water-proof case inside Mertz's sleeping bag in case a search party should find the cross and recover the photographic record. Also a note explaining what had happened was deposited there. This work took all day.

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*After my arrival at the Hut, I gave our medical officer, Dr. McLean, a detailed account of the symptoms attending the illness of Dr. Mertz. He suggested colitis as the ultimate cause of death.

January 9th.—The wind reached a velocity of about 50 miles per hour. This prevented breaking camp for it appeared to me that had I done so it would have been impossible single-handed to repitch tent.

In the afternoon during a lull in the gale I read the burial service over my late comrade's grave. Much time each day was now and henceforth occupied in patching myself; for I was by this time in very poor condition. The skin had come off in sheets especially on my legs, a large part of my hair had been shed and innumerable small boils had broken out all over my body. Fortunately I had not discarded the medical outfit.

January 10th.—Heavy wind and drift prevailed during the morning but fell off late in the afternoon. It was then so late that I decided to wait until morning before breaking camp. The day was spent mending clothing and cooking all the rest of the dog meat. Consumption of the kerosene in this way was aimed at reducing the load to be dragged. I found that by very long boiling even dog paws made an appetizing gelatinous soup.

January 11th.—This was a beautiful day, sunny and almost calm. Breaking camp was delayed until 8.30 a.m. when the air was comparatively warm. The surface was good and slightly downhill. The small sail was set to take advantage of the light breeze. At noon a latitude observation was made.

When starting out on this march my feet felt awkwardly lumpy and tender. They got sorer and sorer so after covering 2 miles, a halt had to be made to investigate. Then I discovered that the thick skin over both feet had risen blister-wise and come off. Both feet were in a deplorable condition. All that could be done was to smear them with lanoline and lash the soles on with bandages. Then at a very slow pace a few more miles were covered.

Snow put into the aluminium cooker on top of the half sledge which I was now dragging gradually melted with the sun's heat. This provided me with an occasional drink. At 5.30 p.m. I was so nerve-worn with painful walking that had it not been a really beautiful, calm evening, I should not have had strength to erect the tent. As it was, $1\frac{1}{2}$ hours elapsed before the tent was up, the gear inside and all ready to prepare food.

Only $6\frac{1}{4}$ miles had been covered but the beautiful, warm, sunny afternoon had done much to tone up my system. During some of the halts I had taken off clothing and bared parts of my body to the sun. An almost instantaneous tingling followed and a wonderful exhilaration appeared to spread through my body. I became a sun worshipper.

January 12th.—On waking I found the sky completely overcast, snow falling and a 45-mile wind blowing. Under such conditions I decided to remain in camp for that would give my feet a rest. On several occasions during the afternoon the sun broke through the clouds.

January 13th.—The wind began to die away rapidly during the forenoon so I made haste to prepare a little food and get on the march. It was 2 p.m. before the sledge was packed. It turned out to be a beautiful afternoon, sunny and calm. The way lay on a down-grade over crevassed, hard ice slopes. The ice surface was covered with ablation pits. This sort of surface was hard on feet so tender as mine, with the result that large raw patches formed on the soles. Camp was pitched at 8 p.m. after covering a distance of $5\frac{3}{4}$ miles. The bright sunshine and calm had again acted as a wonderful tonic. For some time about 11 p.m. explosions both large and small rent the air. This phenomenon was apparently due to large scale cracking of the glacier-ice due to the heating of the surface on such a calm sunny day as this was and contraction on being chilled during the cold night hours. The noise suggested that a quantity of highly compressed air escaped with each explosion but it may have been due entirely to splitting and vibration of the ice. The phenomenon commenced at a point higher up the glacier and then slowly extended down the valley towards the sea, gradually dying away in that direction. An observation for position was made during the afternoon; this showed that the air-line distance to Aladdin's Cave was 82 miles.

January 14th.—Early in the morning though the sun was shining, a 40-mile wind was blowing from the east-south-east. By noon the wind had fallen off very considerably and I made a start travelling over a semi-ice surface, still falling slowly into the bottom of the Mertz Glacier valley. While traversing such a hard surface my feet were still very painful, but progress was made possible by wearing four pairs of thick

knitted woollen socks and over them finnesko with a thick pad of saennaegras. The sun was so warm that films of water appeared on the surface and small trickles disappeared down the crevasses. After 5 miles had been negotiated the bottom of the descent was reached and camp pitched on flat ice marginal to the glacier on its southern side. After 10 p.m. the wind rapidly increased in strength.

January 15th.—It was 11.30 a.m. before I was again on the march. The otherwise good sledging surface soon became impossible owing to wide-spread thaw. Then a belt of serious crevasses was encountered. Finally a head wind set in and the sun disappeared. There was nothing for it but to camp until conditions improved. I found it impossible to sleep. At 7 p.m. the surface was still sticky and snow falling from a completely overcast sky. About 8 p.m. the succession of booming explosions travelling down the glacier heard on the previous two evenings were again in evidence, but not so marked this time.

January 16th.—On several occasions during the night I got out to investigate the possibility of continuing but found heavy snow falling. However, at 5 a.m. a very gentle south-west breeze developed which it was hoped would improve things, so I was on the trail once more. The whole surface was deep, soft snow, the snow continuing to fall and the sky completely overcast. Nothing could have been more arduous than dragging a sledge under these conditions. The halts were very frequent and the pace extremely slow. Almost all crevasses were hidden by the blanket of snow. Providence was with me for I worked a passage across several long serac ridges without disaster.

The sledge runners balled and had to be scraped at short intervals. Also the sledge-meter became completely balled up. The light could not have been worse. No detail of the snow and ice could be distinguished. On one occasion, when the top of a long rise had been reached and the descent of a slope commenced, I suddenly realised that both the sledge and I, with the wind behind us, were starting down a crater-like slope into a yawning black void. By much effort and good fortune, I managed to scramble back to the brink and hold up the sledge which was already gaining momentum down the slope.

By 3 p.m., having advanced 5 miles, I could do no more. Later a dog jelly soup improved with the addition of a little pemmican had wonderful reviving qualities. During all these days of tribulation never less than one hour at each camp was spent in dressing my feet and other raw places, as well as attending to festered frostbitten finger-tips and innumerable boils.

January 17th.—The sky remained overcast and light snow fell throughout the night. Camp was broken at 8 a.m. and a determined attempt was made to proceed across the worst crevassed area of the Glacier, ploughing through a deep, soft mantle of snow. Sinking to my knees and deeper at times, I ploughed slowly on. Providential escapes from several large partly covered crevasses were experienced. Blundering blindly on I went through the soft lid of a large crevasse to my thighs but by falling backwards as I sank managed to escape. Soon after this I shot through to the full length of the rope. The sledge held and after a long and desperate experience I again saw the light of day. For the time being that was the end of my vitality. Camped alongside that crevasse I had to rest long and eat much to move again.

January 18th.—For a time it all seemed so futile to fight against such odds, but an idea occurred to me which saved my life on several occasions during the next forty-eight hours. This novel conception was to make a rope ladder from a length of alpine rope still on the sledge. This was then secured at one end to the bow of the sledge and extended along the long hauling rope to the waist-belt of my sledging harness. Then at 10 a.m., thus equipped, I again set out to grope a way forward. I slipped into several crevasses that morning, but owing to the soft, deep snow the sledge held each time and with the rope ladder I had no difficulty in getting out. However, I did not get far before exhaustion called a halt.

In this part of the Glacier one heard strange noises coming up the crevasses from below. Occasionally there was an obvious trembling of the ice and even jerky motions at times. The Ninnis Glacier in January is certainly in active motion.

January 19th.—In the early morning hours a 30-mile wind arose, descending from the ice-cap. By 8.30 a.m. this had fallen off considerably. The sky cleared and at last the sun appeared. What a difference this made. I found myself in a maze of crevasses and spent hours working a way through them, not without

some narrow escapes. Emerging from this belt of shattered serac-ice, the glacier surface ahead was seen to descend to a depressed marginal zone then to merge on the north-west side into the steadily rising névé-covered surface of the ice-cap, which smothered the high-land between the Ninnis Glacier and Commonwealth Bay. The depressed marginal belt of the Glacier was about one mile wide and though crevassed was not badly shattered. Everywhere over it there were large ice mounds or " pimples " as I recorded them at the time. These pimples were generally cracked across the top by irregular crevasses.

Having reached the rising slopes of the ice-cap, I found evidence of great accumulation of snow in this region. By 1 p.m. the bright sun had made the surface snow too soft and wet to sledge over, especially as the pulling was now up-hill. So camp was pitched early in the afternoon. Some time was spent waxing the sledge runners and improving the sail. Several items that could now be dispensed with, more especially the rope ladder and finnesko crampons were thrown away.

January 20th.—The sky had again become overcast soon after 3 a.m. This was unfortunate for I had noted crevassed areas on the rising ice slopes ahead. As the sun did not reappear, in desperation a start was made at 2 p.m. A light breeze gave some help. Progress was better than had been expected, but after covering 2½ miles up a steep rise the wind increased; as it was then retarding me camp was pitched in expectation of better weather on the morrow.

January 21st.—In the morning the sun shone brightly and there was a light favourable breeze. I got started at 10 a.m. and slowly scaled several steep terrace rises, ploughing through soft snow and steering a course between crevassed areas. It was very heavy work and only about 3 miles distance was covered by 5.30 p.m. when camp was pitched.

During the day there was a fine view down the glacier to Aurora Peak and also back inland up the glacier to extensive serac-ice falls which marked the head of the lower glacier.

Three black rock outcrops were in sight to the south along the length of the glacial valley.

The local movement of the air in this neighbourhood was observed to be down into the glacier valley from the ice-cap all around it. Also a regular feature of the wind in fine undisturbed weather was noted to be a calm in the afternoon, with light breezes beginning in the early evening and working up to strong wind in the early morning hours, then decreasing again to calm about 11 a.m.

January 22nd.—The day turned out one of good weather and sun gleaming through clouds. I got on the march at 11 a.m., climbing up terrace after terrace, over a soft shifting snow surface. It was very tiring work and I felt extremely weak after the day's effort of about 6 miles. This was counteracted by a ration of pemmican added to the dog meat for supper.

January 23rd.—I was up at 6 a.m. hoping to make a good march because the surface ahead was nearly flat. Unfortunately the sky soon became completely overcast and snow began to fall. Later on in the day the falling snow became denser and wind gave trouble. The sledge capsized frequently and I stumbled over unseen sastrugi. Eventually sledging conditions were so bad that I had to camp: that was at 4.30 p.m. and the air-line distance covered had been only about 3½ miles.

January 24th.—Overcast and snowing. I was up at 6 a.m. and dug the sledge out of the snow and ate some food. The tent was struck and the march begun. Soon the wind got much stronger and the drift much denser. It was impossible to see ahead more than about 30 yards. The wind helped a lot, for it was from the south to south-east quarter. Soon there was so much wind that one could sit on the sledge and be blown along. Later the wind continued to increase and I realized that it might soon be too strong for me to pitch the tent. Thus it was that a halt had to be called whereas, had there been two persons, much more could have been done that day with so favourable a wind.

Having halted it took several hours to get the makeshift tent erected and the gear inside. On this occasion the dog soup was strengthened with a little cocoa. The distance recorded on the sledge-meter was 5½ miles but there is good reason to believe that it had short recorded.

January 25th.—The wind had blown at 60 miles per hour during part of the night. Still the sky was overcast and deluges of snow fell gradually submerging the tent, pressing it down and slowly but surely burying me under the load so that I had the greatest difficulty to move. Nothing could be done but wait. The day was not all lost for I was resting and it gave opportunity for effecting medical repairs, which daily took so much of my time. This day the skin in large sheets came off both my hands.

January 26th.—The blizzard continued in the early morning blowing not less than 60 miles per hour. There were heavy falls of radial snow pellets. However, an improvement in the weather was effected towards noon. As the position looked so hopeless unless I could do something I decided to push on in dense falling snow and drift. This was a great experiment, for in the condition that I was then in, it was extremely doubtful whether I could again erect the makeshift tent.

Though the surface was deep, soft snow, it was smooth. So strong was the wind that no sail was necessary. With the wind behind, good progress was made. In all, a distance of about 8 miles was covered before I was exhausted. Fortunately the wind had fallen off to about 35 miles when, at about 8 p.m., a halt was finally made and the work of erecting the tent commenced. After many failures the plan I had thought out worked all right, but it took a very long time. My clothes and everything else that would hold snow were full of it—choked with it. The time taken in these operations can be judged when it is stated that it was midnight before I was able to turn my attention to food.

January 27th.—The snow that could not be got out of my clothing and sleeping bag gradually melted and everything became sodden. It was still blowing and snowing at noon so, with everything wet, I decided not to try another bout with the blizzard that day unless the weather should clear up. The sleeping bag began to moult seriously and it now appeared to be a race between my sleeping bag and myself as to which should become bald first. The beard on one side of my face was moulting in very unbecoming patches.

January 28th.—In the morning snow was still falling from an over-cast sky but the wind had decreased to about 25 miles. Nothing now remained to be done but to push on, no matter what the conditions were, for there was now only a little over 3 lbs. of food left, nearly all of which was fried dog meat.

Such of the clothing and equipment as was not sodden was frozen stiff. The level of the plateau around the tent had been raised 2 feet 3 inches which left little of the tent above, for the peak at pitching was only 4 feet above the ground level. An hour and a half was consumed in digging out the tent and sledge. The surface though soft was well packed by the wind and as the line of advance was on a slight down-grade, and there was a light favourable breeze behind, progress was rapid.

A little light snow continued to fall for some time but cleared up later; then the sun began to gleam. Finally the sky cleared and at last the weather became really fine.

My spirits rose wonderfully with the appearance of the sun; so on and on I trudged, now for the first time feeling that there was a really good chance of my getting through to Aladdin's Cave.

January 29th.—I set out again in a 45-mile wind with low drift, but the weather improved as progress was made to the north-west. After covering 5 miles I caught sight of a dark object ahead, and was soon amazed to find that it was a man-built snow block cairn with black bunting wrapped around some of the top blocks. It took no time to tear away the top tier and there was revealed a cache of food with a message from McLean, Hurley and Hodgeman. These good fellows had been searching for us and had left that spot to return to the Hut only that very morning. I might have approached Aladdin's Cave from anywhere through a wide arc but Providence had guided me to that very spot. The food had come just in time. All was now well so far as I was concerned, but it was still important to hurry on to the Hut in the hope that I would still be in time to embark on the *Aurora*.

Eating as I walked along a distance of 8 more miles was traversed beyond the depot. Unfortunately I had made a course too far to the north and arrived on steep sloping glacier-ice, facing the sea before realising the mistake. After many nasty falls camp was pitched after 13½ miles for the day. The sharp ice pressed painfully into my raw feet. Every few yards I slipped and fell, dragged by the sledge and a heavy wind blowing across the course I was trying to make.

We had left our steel crampons at Aladdin's Cave on the outward journey and the finnesko crampons I had thrown away long ago to lighten the load. I had reckoned on getting to Aladdin's Cave without crampons and then picking up the steel ones there.

Now that I had got off the direct track and had to sledge to the west around the coastal ice slopes in order to reach Aladdin's Cave, this deficiency of crampons had to be overcome. It occurred to me that out of the mahogany case of the theodolite something could be made to ease the pressure of rough ice on my feet and at the same time give a grip on the ice. Two boards to fit the soles of my feet were carved out of the wood by means of a pen-knife; then several nails, screws and wood bars were left projecting on the under side. These were secured to the feet outside the finnesko by lengths of lamp-wick.

January 30th.—It was some hours before these makeshift crampons were finished ready for use. Then after a few hours' rest the journey was resumed. The sea was nearby to the north of my course and the Mackellar Islets were well in view.

Alas! a rough, rather badly crevassed surface was encountered after a couple of miles. At 5¼ miles the wooden crampons had broken down completely; the wood unfortunately splitting rather readily. At this stage the sledge had slipped into and was wedged in a narrow crevasse, so it was after midnight when camp was pitched.

January 31st.—A strong blizzard wind continued all day. The time was spent repairing the crampons so far as could be achieved in the almost complete absence of requisite materials.

February 1st.—The wind and drift subsided late in the afternoon. I then proceeded without further difficulty and at last reached Aladdin's Cave at 7 p.m. My note-book says, "Great joy and thanksgiving."

The reconstructed crampons had broken down again. I had hoped to pick up a pair at the Cave but none were to be found. After a sumptuous meal I climbed out of the Cave to prepare to go down to the Hut, but found the wind had risen and drift was flying. As I had badly strained my right leg when sliding and falling on the ice slopes two days earlier and in the absence of crampons I decided to await an improvement in the weather. In the meantime work was commenced on the construction of another pair of wooden crampons from a petrol case found among the stores dumped at this depot. These crampons were eventually completed, bristling with projecting nails spread all over the soles.

However, the blizzard, far from abating, continued with great fury. I reasoned that even if the *Aurora* were still at Commonwealth Bay, she could not contact with the shore in such weather to pick me up. So I fed myself up, repaired my many troubles, and waited ready to hurry down to the Hut as soon as the weather improved. Unfortunately it was a long blizzard and days elapsed thus storm-bound.

February 8th.—It was not until February 8th that the wind showed signs of abating. Then a steady falling off took place beginning at 8 a.m. and later the sun appeared through the drift. At 1 p.m. the wind was negotiable, so off I started proceeding down-hill on the old familiar trail to the Hut. When half way down the ice slopes the wind fell off to a breeze and I was at last once again in clear air. The drift and wind still continued higher up the slopes behind me.

There was now a clear view of the sea. Near the northern horizon what appeared to be smoke from a ship was visible. It transpired later that this was the *Aurora* on its way west to the relief of the Expedition's Western Base.

The members of the Expedition who were manning the Main Base Station for a second year sighted me when I reached the brow of the ice sheet overlooking the Hut. They rushed up the steep ice slopes and helped me down to that haven which was to be our domicile for another year.

To these men who had volunteered to endure a second year in the very home of the blizzard in order to make a search for missing comrades I was and always shall be deeply grateful.

THE EAST COAST SLEDGE JOURNEY

Report BY C. T. MADIGAN, Leader.

THE East Coast Party consisted of A. L. McLean, P. E. Correll and myself. In company with Stillwell's Near East Party, we set out from Winter Quarters on November 8th, 1912. Progress was slow on account of strong wind and considerable drift snow which obscured the view and gave us some difficulty in locating our first night's goal, Aladdin's Cave. On arrival late in the afternoon, we were dismayed to find Murphy's Party still in occupation, held up by the weather. The cave was enlarged sufficiently to accommodate five men, leaving four men to occupy the large strong tent carried by Stillwell's Party.

It was not until 6 o'clock on the morning of November 10th that the weather had improved sufficiently to allow our two parties, Stillwell's and my own, to proceed. The loads were finally packed and amounted to about 800 lb. on each sledge. Some of Stillwell's was to be transferred to ours at a later date. We got away at 9 a.m. Our preliminary instructions were to proceed south-east from the Cave to about 18 miles, at which point Dr. Mawson expected to overtake us with his two dog teams. We were not to go further without having seen him.

The first few miles* from the Cave in a south-east direction give a gradual rise of about 100 feet per mile. The steepest part of the ascent to the plateau level is to the Cave, which is about 1,500 feet above sea-level. Still, with our heavy load, the wind and drift, going was very slow up till noon, when the wind dropped to almost calm and the drift cleared. During the afternoon we were hampered greatly by the crevasses, which were very frequent, and of all widths from 1 to 20 feet, and running east and west, parallel to the coast. All the wider ones were covered with firm snow bridges, in many cases the snow having formed into granular and even solid ice. In this region we found the narrow crevasses to 4 feet wide, the only dangerous ones. The older and wider ones had had time to form solid bridges. We had to travel along some crevasses for hundreds of yards to find safe crossing places.

We pitched camp at 6.30 p.m., having made only 5 miles from the Cave. Just before camping we saw something moving at the Cave, which was still visible, and bringing the field glasses to bear on it, we made out the figures of men. This afterwards proved to be Dr. Mawson's party and Bage's Southern Party, who arrived there together.

We got away at 9 a.m. the next morning. Soon after starting we had our first crevasse experience. Correll went down a fissure about 3 feet wide. I in the lead had jumped across, thinking the bridge looked thin, but Correll stepped on it and went through. He went straight down the length of his harness, about 6 feet. McLean and I soon had him out. The crevasse had vertical sides, and snow could be seen about 60 feet down in the blue depth. Our respect for crevasses rapidly increased after this, and we took greater precautions, shuddering to think of the light-hearted way we had trudged over the wider ones.

At 12 miles we got off the blue wind-swept ice, when the surface became almost flat, and snow had had an opportunity of settling. The light rapidly became worse and the sastrugi indistinguishable. This was our first experience while sledging of what we called a " snow-blind " day, with which we were to become only too well acquainted. On these days the sky is covered with a white even pall of cloud, and sky and plateau seem as one. No shadows are cast; it is impossible to tell the nature of the surface even at one's feet. One walks into a trench or a 3-ft. sastrugi without seeing it; the world seems one huge white void. We gave these days the name on account of the great strain on the eyes trying to watch the surface, very likely to produce snow-blindness. The only difference between this and a pitch-dark night is that the one is white and the other black.

At 2.30 p.m. a light snow fall commenced, and the wind rising to 45 miles per hour, heavy drift came on, which lasted all night. We had to pitch at once, having only reached 13 miles. We were just out of sight of the sea.

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* For the route followed by Madigan's Party refer to the folding map of King George Land accompanying this report A tabulated statement of the meteorological conditions encountered appears on pages 232–236 of Vol. V, Series B of these reports.

All the next morning, the 12th, the wind kept up about 45 miles per hour with dense drift. At 4 p.m. the wind and drift moderated somewhat, and we almost thought of starting, but as it was late and conditions still looked threatening, we decided to wait for morning. Dr. Mawson was not in sight and we knew he had not passed us.

The next day the wind averaged only about 30 miles per hour but the drift was dense and travelling still impossible. Towards midnight the conditions got worse.

The blizzard raged on the whole of the 14th, the wind being steady and about 60 miles per hour with dense drift. We found it very monotonous lying in the tent. As always happened during heavy drifts, the temperature outside was high, on this day averaging about 12° F., and inside the tent the temperature rose above freezing point and the accompanying thaw was most unpleasant, though nothing to what we afterwards experienced with outside temperatures of 31° F. We cut down our rations during this enforced idleness to two meals a day.

The drift was only a surface one this day, that is to say, no snow was falling, the drift merely blowing along the surface to a height of about 10 feet. There was cirrus cloud in the sky and the sun was shining, so that we expected the drift to blow out soon. But during the night the wind blew harder than ever.

In the early hours of the morning the wind reached 80 miles per hour, the strongest we experienced on the journey.

We were kept in the tent all the next day, November 15th. The wind averaged about 60 miles per hour with moderate drift up to noon, the drift decreasing in the afternoon, till at 9 p.m. it was only light, with wind 45 miles per hour and a clear sky, possible travelling weather. So we decided to move on on the 16th at any cost.

The morning of November 16th we found driftless with a wind of 35 miles per hour and almost clear sky. We were away at 9 a.m., and reached 16 miles by 2 p.m. The surface was fairly level snow, with small sastrugi but our load was very heavy and we went back to help Stillwell's party occasionally, as we were a little faster.

Just after the midday meal, at 16½ miles, I saw a little black spot on the horizon to the south. I watched this for a few minutes and it seemed to grow bigger. We stopped and saw that Stillwell had noticed it too. Was it a man coming towards us ?—but from the south—how could Dr. Mawson have got down there ?—and there was no sign of sledges or dogs or other men. We got out the field glasses, and sure enough it proved to be a man approaching, about 1½ miles away. We all left our sledges and went to meet him, imagining all sorts of wonderful things, such as the possibility of its being a party from Wild's Base, as we did not know where Wild had been landed. All our theories were soon dashed to the ground, however, as the figure gradually assumed the well known form of Dr. Mawson. He had made a little more south than we, thus avoiding the worst of the crevasses, and his sledges were just out of sight, about 2 miles away. After a short chat, we returned to our sledges, and Dr. Mawson went back to his.

We had made due south-east to this point by our shadow compass, and here deviated to the south-south-east. Before we had gone far we saw Mertz and Ninnis approaching with a dog team, which Mertz harnessed to our sledge, and Ninnis, Correll and McLean gave Stillwell a pull, so that we soon came up to Dr. Mawson's camp at 18¼ miles. It was dead calm by this time and overcast.

Ninnis's party in the spring had left a small depot at 18 miles, and a flag at 13¾ miles, but we had seen neither of these owing to the thick weather. We calculated we were somewhat south of the 18-mile depot, and Mertz went for a long walk to the north, but failed to find it. There was a fortnight's food at the depot, but it was decided this could be done without.

The next day, Sunday, November 17th, Stillwell and we got away at 11 a.m., a short time before Dr. Mawson's Far East Party. There was only a moderate wind blowing. We started on a course due east. By 1 p.m. Dr. Mawson's dog teams had overtaken us, and we halted for lunch.

At about 6 p.m. when 25½ miles out we bid final adieu to members of the Far East Party who, on a down-grade and aided by their dogs, rapidly drew ahead.

After another mile, at 26½ miles, we pitched camp at 8 p.m. out of sight of the sea again in a slight depression. We had only done 8¼ miles over a good hard surface, but were thoroughly tired out.

The next day, November 18th, broke with bright sunshine and a sky of scattered alto-cumulus cloud. We were out at 6 a.m. and found Stillwell's Party moving in their tent. There was a rush to shovels to fill the cookers with snow and a race for boiling hoosh.

At this camp we tallied up our provisions with the intention of taking what we might require from Stillwell's sledge and proceeding independently of him,* as he might leave us any day. As we were to be back at the Hut on January 15th, we had 59 days to go, for which we considered eight of the ample week's rations would be sufficient.

We had seven weeks' food on our sledge, so took another 50-lb. bag from Stillwell, leaving out the ration of plasmon biscuit but taking from Stillwell's 5 lb. of whole wheatmeal biscuit. We also took a gallon tin of kerosene, making our total 5 gallons, and filled our methylated spirit bottle.

We got away at 8 a.m. In a short time we saw Dr. Mawson's camp and crowded on sail to catch them. This we did literally, as there was a fair wind of about 10 miles per hour, the only west wind we encountered on the whole journey.

The sledge was provided with a bamboo mast 7 feet high, stayed fore and aft with wire, and attached to the cross-bar between the rails of the sledge just aft of the cooker-box by two iron brackets. The yard was a 6-ft. bamboo slung from the top of the mast, and its height could be varied by altering the length of the slings. This bamboo was threaded through canvas leads sewn to one side of the tent floor-cloth, which was then tied by the corners to the rails of the sledge. We could get a spread of about 30 square feet, and on the return journey often had to stop and shorten sail.

As the grade was slightly down into a depression leading to the bay, we made good pace, the sledge sometimes even over-running us. We rapidly neared Dr. Mawson's camp, but when within a few miles of it they started, and making more southing than we, were soon lost to sight in the rising ground to the south. Our course was due east.

At 33½ miles the sea could be seen due north, in the bay, with several typical flat-topped bergs, and to the north-west a rock nunatak about 2 miles off the course. The latter had been hidden before by rises of the ice surface. We felt very anxious to visit this nunatak, the first piece of rock seen away from the vicinity of the Hut, but felt that it ought to be left to Stillwell, as being in his territory.

It was our greatest desire to find rock outcrops. I had seen no trace of rock on my spring journey of 50 miles west from the Hut. Nothing can be more monotonous than snow, snow, snow, day after day.

Just before noon today the metal casting of our sledge-meter attaching it to the forks broke, the first of a series of break-downs. Correll bound it up with copper wire and laths from the splints in the medical kit.

At noon the wind died down and our sail was of little use. Added to this we met with the slight up-grade on the east side of the bay depression, so our pace was diminished. We camped at 7 p.m. in a dead calm, at 41 miles, 1000 yards, having made a run of just over 15 miles with our full load, a record which remained unbroken till almost the end of our outward journey. From this camp the nunatak and bergs were still visible, and the high point (Mt. Hunt) on the east side of the bay was to the north-east.

We had a splendid hard snow surface all day. The other party was still with us.

The next morning was calm and sunny, and both parties got away at 8 a.m. We continued due east. At noon, 46½ miles, I took a latitude shot with the 3-inch theodolite. This little instrument proved very satisfactory and was easily handled in the cold. The latitude was 67° 15′ S. From a meridian obtained from the sun's position at noon, the magnetic declination was 9° 30′ W., and the direction of the sastrugi S. 16° W.

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* The Near East Party had thus far been acting as a support for Madigan's East Coast Party.

At this position we were again on level country, with a high point to the south-east and another shallow gully-like depression before us. The view to the north was obscured by fog. There were light westerly winds again and we had the sail up, but it was helping us very little.

Just before noon a fog came up and enveloped us. It was only just possible to get the sun at noon. This fog deposited beautiful little crystals of ice in the form of rosettes and small fern fronds on the cordage of the sail and mast. The fog kept coming and going, one moment clear, and the next we could not see a quarter of a mile.

We saw our first sign of life at lunch time. A very inquisitive Skua Gull flew around the tent for some time, and settled on the snow several times quite close to the tent. At this point we said goodbye to Stillwell's Party. They turned off to the high rise to the north-east and were soon lost to sight in the fog.

After the noon halt the sastrugi became much larger and softer. The fog cleared about 2 p.m., and the sun came out again and shone very fiercely. In the calm we felt the heat excessively, and terrible thirst attacked us all the afternoon.

At 49½ miles a new and wonderful view opened up before us. The sea was again in sight on the east side of the high point for which Stillwell's Party had set out, and formed a bay in a great flat plain of barrier-ice below and in front of us. There was a small ice-capped island in the middle of this bay. The barrier face forming the east side of the bay ran right away to the north-east and disappeared in a sea fog near the horizon. Wilkes's Point Case is mapped in the longitude of this glacier tongue and almost in the same latitude as our present position. The glacier far over-runs the point. May not Point Case have been the northern limit of the floating glacier 70 years ago ? The barrier seemed to stretch right to the horizon in the east, but was bounded by the rising hinterland in the distance on the southern side. We could see no outlet for a glacier from this point, but the view directly south was obscured by the high rise in the foreground bearing a little east of south. It was the face of this barrier we had seen from the ridge of 25 miles.

We continued to 50¼ miles where a fairly steep down-grade commenced. The descent to the barrier we judged would be sure to be heavily crevassed, so that I decided to make to the high hill to the southward, from where it was expected we would obtain a good view, and be able to select the best course to continue on.

At this point I made a sketch and took a round of angles to all prominent points and the conspicuous tongues of the barrier. While I was doing this, McLean and Correll made a snow cairn 6 feet high to serve as a back-sight for angles to be taken from the top of the hill. We then set our course for the hill, and camped shortly afterwards, at 51 miles 1000 yards.

We all got very sunburnt during the day, as our skin was in a delicate condition after the long indoor life. Our faces were smarting painfully by the time we camped.

We awoke on November 20th to surface drift and a wind of 50 miles per hour with clear sky. We broke camp at 10 a.m. and continued towards the hill. At first there was a fall to a shallow valley, and then the ascent to the hill began. The sastrugi became higher, averaging about 2 feet and were lying south-by-west to north-by-east, making a small angle to our course. This always gives trouble. We had many capsizes of the sledge, sometimes having to take off the food tanks to get it out of a deeper furrow. All the time we were going east we had crossed the sastrugi at right angles, the sledge bridging across several, and we had no trouble. These were much bigger than the earlier ones.

This was the hardest day we had had up to this time. The drift was very troublesome. It was just low enough to keep our heads out of it while marching, and had the one advantage of making us disinclined to sit down and rest, thus it tended to cut these rests down to a minimum of duration.

By lunch time we had made only 2 miles. During the afternoon, as we neared the top of the hill, we saw due south of us, and apparently on the side of the hill, what appeared to be a small nunatak, a sharp ridge of ice running about north and south, showing rock along the top. Great excitement prevailed. Here was rock at last that none could dispute with us. It looked quite near, and I thought of going straight to it and camping there. As it seemed to get no nearer, we continued to the top of the hill, which was reached at 55 miles 1300 yards.

Our efforts of the day were amply rewarded by the splendid view that opened before us when we reached the summit. The sea was again visible to the north-east, showing a beautiful turquoise blue, with the low white barrier face running right out to the horizon. Below us, from north-east to south lay the glacier (the Mertz Glacier Tongue), and looking east across it there was visible another low line on the horizon like distant land.

Our mysterious nunatak (Plate LXVIII, fig. 1) reared its head up just into view in the foreground to the south-west in an embayment in the land. It was the southern side of this embayment which obscured the glacier outlet. There was another small nunatak in the glacier just off the main headland to the south, about 20 miles away. The distance of the near nunatak, the top only of which was visible, was still very questionable, but was certainly several miles. We wondered if it rose sheer out of the glacier, or if only a shallow valley separated us from it. Its top was almost on a level with our camp, which was at an altitude of 1870 feet. The tent was on the broad flat top of this hill, which at the time we called Mt. Outlook, but which was subsequently named Mt. Murchison.

We turned in at 8 p.m. expectant of a busy day on the morrow. I had decided to make this the first magnetic station, and to lay a depot here before descending to the barrier, to save dragging the food up to the plateau level again. We had also the nunatak to visit and the rock to examine: this I thought it best to make certain of now while the weather was fine.

We were all in rather a low condition this night after the hard day, and a halt to do magnetic and astronomical determinations would certainly do us good, so I decided to get these through before attempting the nunatak. Correll was rather strained in the back from hard pulling and was troubled by a bleeding nose. My face was very sore from sunburn, with one eye swollen and almost closed, and McLean's eyes had not yet recovered from his first attack of snow-blindness which he had contracted on the 11th.

According to our hopes, the next day was clear and sunny with a 10-mile breeze from the south-by-west and no drift. We spent the whole day at the camp making magnetic and other observations. For declination I used the needle on the 3-inch theodolite, which set to one degree, and would give a very good result with a mean of 32 settings, for a region with such a variable magnetic declination.*

At noon I got a latitude shot, and in the afternoon took a set of dip determinations. I then made a panoramic sketch from the camp and took a round of angles to all conspicuous points, including the cairn left at 50¼ miles, for mapping purposes. At 5.30 I got a sun observation for time and azimuth, and a series of readings of the magnetic needle for declination. Correll always acted as recorder.

Meanwhile McLean had built up an 8 ft. snow mound and erected our one depot flag on it. He had also taken several photographs.

The morning of November 22nd was clear and almost calm. We left the camp at 7.45 a.m., roped up for the climb and carrying food and necessary equipment. The mystery of the nunatak was about to be solved. We started down a steep descent and soon the tent was lost to sight. As we descended, the slope became less. The nunatak was exposed more and more (Plate LXVIII, fig. 2). It apparently rose from the glacier level. The patch of rock on the top and the eastern side continued down the side as the peak rose before us. For some distance it remained very steep, about 70°, then the grade lessened and sloped away almost to horizontal, when the top of a ridge of snow running off east appeared. The western side of the nunatak remained almost vertical.

As the ridge appeared, the valley narrowed down, and at a distance of about 3 miles we reached its bottom.

By aneroid we had descended 1190 feet, so the bottom of the valley was 675 feet above sea-level and at this point some 500 feet above the glacier (Mertz Glacier Tongue).

We took a course from the bottom of the valley to the patch of rock on the ridge where it joined the peak. As we climbed the ridge (Plate LXVIII, fig. 3) we saw that the northern side of

* The data relating to Terrestrial Magnetism obtained on this journey appears on page 34 of Vol. I, Series B of these Reports.

the peak terminated in a sheer face of ice, where a great mass of ice had fallen away. About half way up we crossed a small crevasse about 3 feet wide, which ran west to this face. At the bottom of the face was a huge basin in the slope, such as is seen on the leeward side of a sandhill, evidently kept clear by the wind eddies; in it were broken fragments from the cliff.

After a stiff climb we reached the top of the ridge and the bottom of the peak on that side. We hurried eagerly to the rock, which was in broken fragments at the bottom of the steep face of rock up the side of the peak. The boulders were all weathered a bright red and were much pitted where the more soluble iron-bearing minerals were leached out. Evidently there was often much thawing adjacent to the rocks.

The rock was found to be a very quartzose gneiss, with black dyke-like bands of a fissile schist running through it in about a north to south direction.

In the areas of gravel and small stones there was a good deal of moss and lichen, and McLean collected several specimens. We scrambled up amongst the talus debris till we reached the rock face, where the slope abruptly changed to about 70°. This strip of rock ran up the side of the peak to the ridge at the top near its northern end, and was about 80 feet wide and 300 feet high, with large vertical faces parallel to the ridge.

At first we managed to climb up the rock, but soon the faces became too steep so we had to change to the snow. This was actually a hard névé with patches of ice. I went first with the ice-axe cutting steps, and the others followed on the rope. We had a very exciting climb, and cut over a hundred steps. The face was almost vertical at the top.

The summit was reached at 11.30 a.m. (Plate LXVIII, fig. 4). By aneroid the level was only 114 feet below Mt. Murchison, or at an altitude of 1750 feet.

The top of the ridge was quite a knife-edge, with barely any standing room. It trended north and south and at the south end curved to westward, ending in a slightly higher peak. There was a large patch of rock at the bend. The peak at the south end was very broken and crevassed. We were unable to see the southern side of it. The northern end of the ridge terminated in the vertical ice face described above, and the western side was a sheer drop all along of a hundred feet and then sloped away more gradually, the slope being covered with great blocks of ice broken away from the face; no rock was exposed on this side.

Walking along the ridge so close to the sheer face was rather unpleasant.

We attached our flags to the bamboo and planted it on the ridge and named the peak Aurora Peak. Photographs were taken. No sooner was this done than cloud began to form rapidly in the hitherto clear sky; low threatening cloud moving from the south-east. The climb up had been difficult enough, and it would be more so negotiating the steps going down backwards, especially if the light became bad. We decided to have a look at the northern end of the ridge as we were nearer to it, and see if there were any kind of a snow ramp at the side of the steep face. Before the end was reached, the ridge became very steep and broken and "snow-blind" conditions had set in. I then decided it would be better to go the way we knew, difficult though it was, in preference to a way we had only seen in the distance, and which had looked an impossible vertical face, so we hurried back to where the ascent had been made.

McLean started off down the steps first, getting out of sight in a few steps. When the rope tightened Correll followed him, and then I came last. When we were all on the extended rope we arranged to proceed by my first going down one step and then driving the ice-axe in and holding fast. Then I called to Correll, who descended a step and in turn called to McLean. In this way none of us could take the others unawares by a slip.

It was very ticklish work finding the steps below one with the foot—they could not be seen. There was nothing to hold on to except the step above; the surface was hard and smooth. Two more ice-axes would have made a great difference. I felt comparatively safe with mine as the névé was firm but just soft enough to give a good grip with the axe.

Light snow had begun to fall so we hurriedly collected typical rock specimens and more mosses and then set out for the camp on Mt. Murchison. Before we were half way up the other side of the gully the snow-fall had become heavy, and we could only see a few hundred yards. Thankfully it was almost calm, so there was no drift. We kept advancing up the hill in what we thought the steepest direction, but got half way round it before we found we were out of our course. The top is broad and flat, and by the time we arrived there the snow was so thick we could not see 50 yards. We wandered round looking for the tent for some time, till at last I came across tracks in the snow, evidently made when we were walking round the tent on our first arrival. We followed them, and soon the tent loomed into sight out of the snow. It was then 4.30 p.m.

We decided to leave at the depot on Mt. Murchison a tin with $\frac{3}{4}$ gallon of kerosene, a bag containing a week's food as well as all the contents of the ready-food-bag. Also we left items of clothing that we felt could be spared. All these things were placed at the bottom of the mound of snow blocks.

On account of rising wind during the night and the following morning, camp was not struck until 2.30 p.m. on the next day. Then we continued taking with us as food stores three bags each containing a fortnight's ration for five men; also 4 gallons of kerosene.

We started off due south and then a little east of south, thinking to reach the bottom of the gully lower down and save distance. From Mt. Murchison the ice-falls appeared to begin some little distance east of where we had come down, so I thought this slight deviation would prove just as satisfactory, and also save a mile. The descent here was slightly steeper, and Correll and McLean unhitched from the hauling rope and held on to the alpine rope attached to the rear of the sledge to keep it from running away. I remained at the end of the hauling rope keeping the direction.

After about 2 miles in this way, near the bottom of the gully, the slope began to increase rapidly and the sledge overtook me. I had expected crevasses, and did not like all the loose rope behind me. I looked back enquiring if the others could hold the sledge, and proceeded a few steps while asking the question. The bow of the sledge was almost at my feet, when whizz! I was dropping down through space. The length of the hauling rope was 24 feet and I was at the end of it. I cannot say my past life flashed before me. I just had time to think "now for the jerk—will my harness hold?"—when there was a wrench, and I was hanging breathless over the blue depth. Then the most anxious moment came—I continued to descend. With a glance I saw that the crevasse was only about 4 feet wide so the sledge could not follow me, and I knew with a thankful heart that I was safe. I only descended about 2 feet and then stopped. I knew my companions had pulled up the sledge and would be anchoring it with the ice-axe. I had a few moments to take in my surroundings. I was hanging with my back against the near side of the crevasse, with my sledge belt up under my arms. Opposite me was a vertical wall of ice, and below that beautiful blue, darkening to black in unseen depth. On each side the crevasse extended as far as I could see, and above me was the small hole in the weak bridge through which I had shot.

The colour in a crevasse is indeed beautiful, but so much depends on the point of view, the best position, in my opinion, being face-downwards on a level surface, and attached to an alpine rope with several strong men at the other end.

Soon I heard McLean calling "Are you all right?", and I answered in what they thought a rather alarmingly distant voice. They then started enlarging the hole to pull me out; the lumps of snow fell on me with great force, and I had to yell for mercy. Then I felt they were hauling away, and slowly I rose to daylight again, covered with the little crystals of ice that cluster on the sides of a crevasse.

The crevasse ran along the side of the gully, curving downwards to the west. We had already crossed several smaller ones safely, but this one had a very thin bridge and was evidently new, and we could not see far ahead on account of the slope, so we decided to go west and get clear of the crevasses, after getting back on our tracks and clear of those we had already crossed as they looked wider to the west.

It was hard work pulling the sledge back up the slope, but we had not far to go. We then turned west for half a mile, got clear of the crevasses, and descended to the bottom of the snow-filled gully. The distance from the camp was just over 3 miles.

The gully ran a little south of east and we continued down it. We soon saw that it was a good thing we had abandoned our attempt to get down further along, for the last few hundred feet were very steep and broken into huge blocks by a maze of crossing chasms.

We camped in the gully at 60 miles 1200 yards, at what appeared about a mile from the outlet. The north side of the gully, to which we were close, was even more broken here. Great isolated pillars of ice stood out among yawning caves, some of them leaning over like the tower of Pisa, and some having fallen and rolled in shattered blocks to the bottom. It was a fine sight from the camp.

The snow in the gully was somewhat softer, and we did not look forward to hauling the sledge up on the return.

During the afternoon the sky became covered with cirrus cloud in a radiant from the south-west, which became denser till the sky was completely overcast. It looked very much like another snow-fall during the night. The drift had completely cleared soon after breaking camp.

I was rather comforted in a way by my fall down the crevasse, as it thoroughly tested my harness.

Our fears for bad weather were happily not realised, for November 24th proved a sunny day with only scattered cirro-cumulus cloud. We broke camp at 9 a.m. and continued down the gully towards the glacier.

On the north side of this gully, just at its end, there was a large vertical face of rock exposed. We left the sledge and walked over to it. The side of Mt. Murchison was here very steep and the rock face was framed in ice. Long icicles hung down in front of the rock from the overhanging ice above. The face was about 80 feet high, and the rock was exactly similar to the Aurora Peak exposures. McLean took two photographs here.

After leaving the gully the surface still sloped downwards for about a mile. In the gully the surface had been old crusty snow in which our feet would sink about 3 inches, but as we got out on to the glacier we found surfaces of hard ice here and there with a few wide well-filled crevasses crossing them. These we avoided easily at first.

As we got away further from the foot of Mt. Murchison numerous small outcrops of rock were seen up the very broken side.

From the summits of Mt. Murchison and Aurora Peak the surface had appeared perfectly flat and even in an easterly direction, though very broken to the south-east especially round the small nunatak. Our hopes of good barrier conditions were soon dashed to the ground, however, for as soon as we got clear of the margin of the glacier we got into a terribly crevassed region, and going became very slow and difficult. The glacier was here evidently still falling. The blue ice was crevassed in every direction, leaving great open chasms. There was very little snow on the ridges of ice, which were smooth and slippery, though some of the crevasses were snow-filled. We put on our finnesko-crampons as soon as we came upon the ice, and attached the alpine rope to the back of the sledge. In many places we had to guide the sledge along by hand on narrow ridges of ice amongst the great quarry-like chasms. It was the most trying afternoon of the outward journey.

We were thankful that the wind was only about 20 miles per hour. With any more wind we should never have been able to keep the sledge out of the open places on the hard ice, which was often at steep angles.

As the afternoon wore on it looked as if we were in for this kind of country right across the glacier, but we pushed on to find a place to camp, as there was scarcely safe standing room for a primus stove where we were.

Late in the evening, at 70 miles, we suddenly came to the end of the ice-fall country, and came on a comparatively level surface of hard sastrugi dotted all over with small mounds of ice about 4 feet high. These mounds are typical of crevassed country, and many of them were split across by small crevasses, but with the exception of the ice mounds, the surface was covered by deep, hard, furrowed snow and was quite safe.

Camp was pitched at 70¼ miles. We had travelled 9½ miles but made only about 6 miles of easting owing to our zig-zag course in the difficult country.

A friendly little Wilson Petrel flew about the tent for some time, and we considered him as a good omen.

On Mt. Murchison we had experienced our last temperature below zero, — 2° F. On this lower level, about 200 feet above the sea, our temperatures were much higher, approaching very near the freezing point in the early afternoons. At 7 p.m. this evening it was 22°F. and the minimum for the night 7°F.

I felt the effects of my fall of the day before in great stiffness and soreness of the back, all day, and it took several days more before I was quite right again.

The next day, November 25th, we soon got clear of the region of ice mounds and had a good flat barrier (shelf-ice) surface all day, and made 11¼ miles east. The wind blew about 40 miles per hour in the early part of the morning, without drift, but calmed down before noon.

At 11 a.m. four Snow Petrels flew round us for some time. The presence of birds is always cheering as they wheel round in the graceful flight of petrels. It takes much from the inhospitality of the lone ice regions.

At noon I took an altitude of the sun for latitude, an approximate declination and a round of angles. Mt. Murchison with the depot mound, Aurora Peak and all the western coastline were visible, and also the mainland to the south of us, with a break to the south-west where the glacier came down.

Occasionally during the day we met with areas of rubbly snow and even blue ice, and always in these regions the crevasses were visible. They were of prodigious dimensions, 200 to 300 yards wide and running as far as the eye could see. They were evidently completely filled with snow, which was always at a lower level than the sides, sometimes as much as 2 feet lower. The snow in them was hard and furrowed out into sastrugi and it was impossible to drive an ice-axe down into it. There were always openings along the sides of these wide crevasses, sometimes bridged over with snow, through which we often put a foot, but once fairly on the crevasse it was perfectly firm. The trend of the crevasses was towards the north-east and parallel to the east side of the glacier tongue, as we afterwards found.

This part of the glacier was probably afloat.

Our Wilson Petrel visited us again in the evening.

Camp was not broken till 10.30 a.m. on November 26th. The sky was evenly overcast and the light extremely bad. We marched for an hour, when we met with more blue ice and crevasses. We picked our way for a short time, but the crevasses became indistinguishable and I considered it unsafe to proceed, so we pitched camp again.

At 5.30 p.m. the sky cleared somewhat and we again broke camp. We found we were quite close to an open chasm directly in our path, which we had not seen before, with another a short distance further.

We pitched again at 8 p.m. at 87 miles. We had only made 5½ miles. Our Wilson Petrel flew around the tent again for the third evening in succession, and we began to look on him as a mascot.

Next day, November 27th, we were again rather late in starting. We broke camp at 10 a.m. and continued our march east. The surface was sensibly level all the morning, with occasional rubbly ice on the top of low rises and the huge snow-filled crevasses with marginal openings. The day was perfect, clear, sunny and calm, with a temperature at noon of 26°F. At 6 p.m. we noticed shallow valleys running east and the grade seemed to descend. We followed down the bottom of one of these valleys for 1½ miles. The sides got steeper and showed broken blocks of ice and crevasses. In one smooth place we mounted to the ridge on the south side of the gully and soon came to an abrupt termination at 87½ miles in a steep ice bluff. Before us lay a perfectly flat snow-covered plain as far as the eye could see. The sides of the bluff were steep and broken, and we had to go back ¼ mile where the gully we had been following turned slightly to the north and led down steeply into a larger valley, the bottom of which was evidently almost on a level with the plain below. We lowered the sledge down this fall with the alpine rope and again proceeded down the larger valley, which ran east and west, gradually rising in the west to the barrier level and disappearing.

Pushing on down the valley the sides became steeper and broken into blocks and pinnacles of ice. The exit of the valley was reached at exactly 100 miles and camp pitched. We had descended 160 feet by aneroid from the ridge to the plain.

The edge of the barrier (shelf-ice) here ran north-east and south-west and was serrated by many points and valleys similar to the one we had just come down. We wondered whatever sort of surface we were on, it seemed so smooth and flat, with no sastrugi, and so low, apparently getting near the sea-level.

Across this plain to the south-south-east was the extremity of the high land seen from Mt. Murchison. The land ice-cap ended in a high point here, and the coast evidently ran off in a southerly direction from the point.

From the camp we could see drift snow running like rivers in the sunlight down the high ice slopes of the land to the south, but at the camp it was clear with light breezes.

A splendid surface lay before us, though we were rather puzzled as to its nature. We turned in, all in good spirits at having completed the first 100 miles, and relieved at having left behind the treacherous glacier.

It was then time for more magnetic determinations, as I had arranged to take them every 50 miles, but the next day proved overcast, and as we were anxious to try the new surface conditions, we decided to push on in the morning and take dips in the afternoon, hoping for sun on the following morning to obtain the declination.

We got away at 8 a.m. and reached 107 miles by 1 p.m. over a perfectly smooth, hard, snow surface.

About noon we noticed a black speck on the snow to the north, which seemed to grow larger as if approaching us. Great excitement prevailed. We brought our field glasses to bear on it, and to our intense surprise, there was an Adelie Penguin tobogganing towards us on its breast at a great rate. It seemed equally surprised to see us, and came straight up to the sledge with loud croaks of astonishment, which increased to those of alarm when we caught it. We had plenty of food if all went well, and could not find it in our hearts to slay the poor beast, which seemed equally alone on the great snow plain.

McLean took a photograph of it by the sledge for which it posed very nicely, but as soon as the photograph was taken, with a few loud croaks, it tobogganed away off south towards the point and was out of sight in a quarter of an hour. We reckoned it was travelling at at least 8 miles per hour.

The point, the farthest part of the highland seen from Mt. Murchison, then showed two faces of rock, and right at the point, what appeared to be a low rocky island, but this latter afterwards proved to be a flat mass of rock extending from the ice-cap. The glacier wall ran away north-east and disappeared on the horizon; to the east the same flat surface continued; the top of Aurora Peak was just visible over the glacier.

We wondered greatly at what the penguin could be doing here as there was no water in sight anywhere, and the sea could not even be seen from the glacier, some 200 feet high—and then to be travelling south ?

In the afternoon I took a set of magnetic dips and a round of angles.

We had not seen the sun all day and the light had been extremely bad.

This evening our Wilson Petrel visited us again. Of course we could not be sure it was always the same one, but we were pleased to consider it so. A Silver Petrel also flew around the tent for some time.

On the morning of November 29th there was only a little cloud around the horizon, and the sun was strong. At 8.45 a.m. I got a sun observation for time and azimuth, and a number of readings of the compass needle for declination. We broke camp at 9 a.m.

The surface was a little softer, but very good. At the noon camp, 112 miles 600 yards, a latitude determination proved to be 67° 24′ S.

As we continued in the afternoon we noticed a line of broken slabs of ice sticking up out of the snow to the north, looking like a number of tumbling grave-stones, and these trended in towards us. At 115¼ miles they were quite close, and we left the sledge and walked across to them. We found they rose out of a depression like a water-course in flat Australian country, some 100 feet wide and 10 feet feep with low sloping sides. In the bottom of this was a crack, and walking down to it we saw water! This was a great surprise. We had been travelling for two days on sea-ice and did not know it! Of course, now it seemed quite evident —the flat even surface without a sign of a crevasse, the penguin, and the birds were all explained.

The crack was only a few inches wide. We tried to get a sounding with the fishing-line, but the weight would not sink past the irregularities in the crack.

The crack trended south of east, so we changed the course to E. 30° S. to keep clear of it.

This sea-ice was very old and thick, and we saw no more tide-cracks in the afternoon.

Camp was pitched at 120 miles. From the camp we could see two huge flat bergs to the north on the horizon, which had been visible across the glacier from Mt. Murchison.

Again tonight our Wilson Petrel came, this time accompanied by a Skua Gull. It was most remarkable how this bird visited us so regularly each evening.

During the evening meal, the programme for the future was discussed. Penguin Point, which name we gave to the rocky point to the south towards which the penguin went, was a place well worth visiting, but was at present very much out of our course. We determined to continue the outward journey till December 18th and to visit Penguin Point on the return. It was also about time to lay another depot if we were to return this way.

On the morning of November 30th, we found the wind had risen to 40 miles per hour blowing from the south-east, with a moderate surface drift, which latter continued all day.

We did not get away till 10 a.m., and with the wind almost in our faces, only made 5 miles by lunch time and after lunch, as we seemed to have lost the tide-crack, the course was changed to due east again so that the wind troubled us less. We only managed to add another 5 miles to our distance, and camped at 7.30 p.m. at 130 miles, having had a hard day.

During the day we caught occasional glimpses of the coast to the south of us. Another bay opened up on the east side of Penguin Point, from which the land disappeared below the horizon to the south-east. We could see nothing ahead of us but the flat sea-ice.

In the afternoon we crossed the toboggan trails of two penguins coming from Penguin Point, and two Snow Petrels flew around us for some time, and also our faithful friend the little black Wilson.

Our average daily temperatures were steadily rising. The minimum for the night of November 30th was 11° F.

The next day, December 1st, brought us better weather and gave us a good view of our surroundings. The course was continued due east till 3 p.m., at 137 miles, when we met with the tide-crack again with its line of ice pinnacles and sloping sides. The thickness of the sea-ice was still about 10 feet.

The crack here ran E. 20° S. and we followed along it and camped at 143 miles, at which point the crack had deviated east and was out of sight. Before us, some 10 miles to the east, now appeared a low indented line like the glacier we had left at 100 miles, off the end of which, to the north-north-east was a large separate mass of ice like a berg. This line of low " land " disappeared below the horizon of sea-ice to the south-east, there being a break between this point and the mainland. We appeared to be crossing a bay, and this low coast ahead might be a cape running out from the land to the south, or perhaps another glacier. We determined to continue on our course and mount this rise. There was a heavy water-sky on the northern horizon as far as the north-north-east, but ice-blink in the eastern sky, so for a considerable distance at least there was no open sea in the direction we were going.

For the first time for a week our Wilson Petrel failed us. We saw no signs of life during the day.

On December 2nd we arrived at and mounted the ridge and camped on a level plain at 152¼ miles, 170 feet above the sea-ice by aneroid. To all appearance we were on a huge island. We could see no junction with the mainland, there being a break to the south-east. We had met the elevated ice formation at a prominent headland of its outline and there mounted up a gully-like depression in its surface. From the sides of this depression the high-level ice surface ran away to the north-east and a little south of east respectively, making a large bay on the southern side. From the camp we could see the mainland to the south and south-west but Penguin Point was cut off from view by the rising ice on that side of the depression. There was still a dark water-sky in the north, but the sky was clear to the north-east.

Here was a very interesting situation, and there was much speculation as to the nature of the surface we were on. The plain was evidently of great extent, with no open water to the east. We could push on in an easterly direction and return to this point on the way to Penguin Point. It was an excellent place for a depot, recognizable from the sea-ice up to 20 miles away.

We were busy at 6 a.m. on December 3rd. There was a dense fog over the whole "snow-scape." Our finnesko and socks hanging on the sledge-mast to dry, and the stays of the mast and all projecting objects were covered with delicate little fern-like aggregates of crystals of ice, which were also seen on the rubbly ice near the camp where the angles were taken in the afternoon.

Soon the mist cleared away and left a clear sky, which enabled me to get a sun observation at 8.30 a.m. During the morning I took a full set of dips and got a latitude at noon.

The dip here was 87° 44′, the minimum obtained on the journey—it was our most northerly station. At Mt. Murchison the declination (the angle between true north and magnetic north) was over 20° on the western side, 7° west at the 107 miles and here 3° east. The easterly declination and the dip steadily increased as we proceeded from the depot roughly in a south-east direction. We were curving round the magnetic pole and approaching it.

After lunch Correll and I took the theodolite to the rise on the south side of the gully, three-quarters of a mile from the camp, and across a bend in the gully, from which a good view of the mainland was obtained, and we took a round of angles. From Penguin Point the mainland disappeared to the south, and some 30 miles away and just off the coast to the south was a big berg or island in the sea-ice. From this island a broken line of low land ran round in a great curve to the point we were on, enclosing a bay of sea-ice. To the north-west was visible a big berg in the sea-ice, and commencing just in front of this an open lead ran out in a north-east direction, the end being obscured by the north side of the gully. We could see no open sea.

The top of this rise was of rubbly ice almost free of new snow, and crossed by small crevasses. This was the only spot not deeply covered with snow in this region. Being on a point it was more wind-swept.

We arrived back at the tent at 3.30 p.m., where McLean had been busy putting up an 8-ft. snow mound for a depot (Plate LXXIII, fig. 1). On the top of this we put one of the dark food-tanks with one week's provisions and a gallon tin of kerosene, a tin of toffee and a pound of raisins, finally standing the pick up on the summit. We had used the pick only once, at the camp just after leaving Aladdin's Cave, and since then had had nothing but snow surfaces, the snow for piling on the tent skirt being easily dug out with the light spade which we carried.

We reckoned to reach the depot about New Year's Day on the return. There was now exactly 4 weeks' provisions on the sledge, for full rations.

We got away from the depot at 4 p.m. and set a course E. 30° N., wondering greatly what lay before us.

On a coastal journey in a new land interest never flags. One never knows what the morrow will bring forth, or in what direction one will next be travelling, and especially is this the case in a frozen land, where the coastline is difficult to define, and one may be on moving sea-ice, a huge iceberg, an island, glacier, barrier, or mainland, to determine the exact nature often requiring careful study.

The surface continued flat, with softer pie-crust snow through which our feet sank about 6 inches, but the surface supported the sledge. We camped at 156 miles, no nearer the solution of the problem. The country looked the same in all directions, an even plain of snow stretching for miles around.

We added 12 miles to our distance over this mysterious country on the next day. The surface was comparatively level, with long undulations trending approximately east and west, and showed no traces of sastrugi, and was covered with deep new snow in which we sank up to the depth of a foot. There was a thin crust on the surface which would break through when half the weight was on it, which was very annoying, as one could not keep from considering each step and wondering if the crust would hold, which, relieving the tension by so doing, it did about once in a hundred paces.

This was evidently a region of calms, which was a wonderful thing considering we were not 200 miles from the windiest place in the world, on the same coast and in almost the same latitude.

It was densely overcast all day and the light very bad. We had hitherto had a lot of sunny weather, and our faces were all badly sunburnt. Lanoline was applied thickly when we camped at nights. The steam from the cooker make the cheeks smart very painfully.

McLean and I have badly cracked lips by this time, though Correll remained immune from this affliction for the whole journey. It had often been remarked at the Hut that the standard of humour greatly depreciated during the winter, and this caused McLean and me many a physical pang while sledging, as we would laugh at the least provocation and open all the cracks in our lips. There was blood spilled over many of those sledging jokes. Before we had reduced an extra stubborn piece of plasmon biscuit, it was often a bright red colour.

The next day, December 5th, brought a great change. The day was overcast again, and we continued the same course over the same country for 9 miles. In the late afternoon the weather cleared somewhat, and we saw what appeared to be bergs on the horizon ahead. At the top of a rise at 178¼ miles we were suddenly confronted by an entirely new view—" thalatta " was our cry, the Sea !—but a very different sea from that which brought such joy to the hearts of the wandering Greeks. Before us, stretching to the horizon, was a great plain of pack-ice thickly studded with bergs, with here and there leads of open water, and on the horizon to the north-east a patch of open sea. There was a strong water-sky to the north, but very faint to the north-east and east.

We had come on the pack at the north end of a bay in the glacier tongue. The side of the tongue ran off north on the one hand and south-east on the other as far as the eye could see. There was no land in sight. It seems probable that Wilkes marked as coastline the limit of the pack-ice at that time.

From that height the consolidated pack seemed fairly smooth, with lines of broken ice at the pressure ridges, and we at once decided to try it as a travelling surface. The next problem was to find a good way down to it. The slope was steep where we were and we could not see far down. From experience we knew that all descents of this kind should be made down snow-filled depressions for sure safety, so we started off for a higher mound to the south-south-east which we reached at 178¼ miles. We were evidently then far from the real coastline as this was last seen trending south-east from Penguin Point, and it was necessary to get in touch with it again. The east side of the tongue trended south-east and we decided to follow this on the sea-ice if possible till land was again sighted. It was now camping time, and we put off the testing of the pack-ice till next day. We were some half mile from the edge of the tongue at this camp, and a little south of us a long gully-like depression ran west into the tongue, just what we required for a descent.

Before turning in we saw some bird life again, a Snow Petrel flying round for a time, and three squawking Skuas settling a few yards from the tent.

But the excitement of testing the consolidated pack-ice was to be deferred, for a heavy blizzard set in during the night and raged all through the 6th, 7th, 8th and most of the 9th of December.

The temperature outside during this blizzard ranged from 30° to 32°F., and inside the tent there was a considerable thaw and we were all fairly wet. For young men in the prime of activity it is no small trial to lie still in a sleeping bag for four consecutive days.

On the morning of the 9th there was a dense fog but only light surface drift and wind 25 miles per hour. At noon it commenced to clear, and we had lunch at 12.30 and sallied forth, all attached to the alpine rope, to reconnoitre the descent to the pack-ice. A small depression just south of the camp ran down into the gully. All possible crevasses were well covered with soft snow and the way seemed good. We returned to the tent and broke camp. While Correll and McLean were folding the tent and building a snow mound, on which they placed an empty kerosene tin, I made a rough panoramic sketch and took a round of angles.

Just before leaving we saw a large flock of birds circling over the pack-ice, probably Snow Petrels. Three Snow Petrels and three Cape Pigeons flew past near us.

We were soon down into the large gully. The light then began to fail us again, and "snow-blind" conditions set in. We could not distinguish the ground at our feet, much less the pack-ice before us. When we had gone half a mile and judged we must be getting very near the junction of the glacier and the consolidated pack, we left the sledge and proceeded on the alpine rope. I had not gone 10 yards when I came to a steep descent down which I stumbled. It was impossible to see anything, although it was calm without a trace of snow or drift. I went forward on hands and knees, and found a small crevasse and then a large one partly open. It was clearly impossible to do anything in that light and indeed would be difficult enough to get a sledge down in any conditions. We returned to the sledge and waited an hour, hoping for an improvement in the light, but none came, so we pitched camp again at 5.30 p.m. Thus ended our shortest day's march, half a mile.

The light continued the same till 10 a.m. next morning, December 10th, when the sky cleared with wonderful rapidity and the sun came out. No time was lost in getting under way. The mysterious fall in front of us was only about 30 feet after all, but very steep and of granular névé. There were several small open crevasses, and one wide snow-filled one running at an angle to the slope, and down this we safely took the sledge. We were then on a flat surface, and proceeding another 600 yards we came to another drop of 6 feet which took us on to the pack-ice. The surface was of fairly firm snow traversed by small cracks showing water about a foot down. There were frequent pressure ridges running mainly east and west, with slabs of ice forced up into all manner of positions to heights of 20 feet. We could always cross them by snow ramps.

In certain areas the ice was newer, apparently large cracks recently frozen over, and in these our feet would sink into slushy ice, and we got our finnesko soaked with water.

We started off due south-east, but soon the ice got too thin for our liking, so we made more southing to keep nearer to the edge of the glacier tongue where the surface was firmer.

During the afternoon I thought I heard a croaking sound, and began to think dreamily of hot Australian summers and crows. The sound got nearer and louder, and at last I roused myself from my deep sledging revery and halted to investigate. Away over in the west I discerned a black speck on the snow and we got the glasses to bear on it—another Adelie Penguin was hurrying towards us just as the one came on the other side of the glacier. We had not long to wait before he came up and greeted us warmly, and seemed loth to part with his new friends, for when we started he followed us for some 200 yards, croaking loudly at our indifference. Finally he gave us up, probably as undesirable vagrants, and hurried away in a northerly direction. Later on we saw the toboggan tracks of an Emperor Penguin.

In the evening at 189 miles, we came to a very high and broken pressure ridge across our track. We followed along it for a quarter of a mile to try to find a pass, but it seemed to stretch on for miles unbroken, and soon we were stopped by a wide open lead running off from the ridge north-north-west, about 50 yards wide and almost covered with thin new ice. A young female Weddell Seal was lying beside it, the first we had seen. As it was about camping time, we pitched and had the evening meal.

It was an almost calm evening, though overcast. After the ever-glorious hoosh, we lighted our pipes and strolled out into our wonderful surroundings, to explore for some opening through the piled-up ice through which to pass. First we examined the seal, which in the usual manner of seals, seemed mildly surprised at our presence, but quite undisturbed. With many pokes with the ice-axe and pulls at the tail

flippers, we managed to coax it into a good position for a photograph. After that we scrambled round amongst the ice of the pressure ridge (Plate LXXI, fig. 2) to find a pass. Some of the pinnacles rose to over 20 feet and up one of these we climbed to get a view. The ridge was backed up by several others, and the whole area south of us was much broken up. We chose what we thought the best track to start on, which was a succession of snow ramps, some very steep. It would be slow work, but we hoped for an improvement before long. There were many large bergs just to the east of this camp.

The next day, December 11th, was calm and sunny, and we got out of our present difficulties very happily. The first half mile was troublesome enough, the sledge at times having to be lifted, lowered, or guided along sharp ridges. The country was very like that so commonly depicted in the accounts of sledging on the north Polar sea-ice.

After the first half mile the pressure ridges became smaller and further apart, and we were again able to keep a straight course.

At 195 miles we had crossed the first big bay in the glacier tongue and were close to the tongue again. We crossed many open cracks during the day, and saw four Weddell Seals by their blow-holes. It was encouraging to see so much food about, but we did not kill a seal. None of us looked on seal meat exactly as a luxury, and we showed no signs of needing an antiscorbutic.

At 199 miles we got to flatter ice with low pressure ridges, and this gave us a better view ahead. We saw the glacier again disappearing to the south-east, and so changed the course to more easterly. We then seemed to be getting further from the open sea and on to older ice. The latter part of the day was splendid going, and the 11th was one of the most enjoyable day's travelling we experienced.

The tent was pitched just across a small crack about 6 inches wide, at 200 miles.

The next morning I took the regular observations. We found that the crack had opened to about 18 inches, which fact was not at all pleasant. We did not want to go out to sea, and at once commenced to keep a sharp lookout for any further signs of movement of the ice, but happily we saw none in the succeeding days.

While Correll and I were engaged on the observations McLean walked over to the nearest iceberg, about 4 miles away. He managed to climb it by a snow ramp. It was fast in the sea-ice, with no open water near it.

During the morning Correll and I were surprised by a loud snorting sound near us, and saw a seal thrusting its head out of the crack to blow, within a few yards of the tent. Correll baited the fishing-line and had it in the crack all the morning, but he got no bites. He could get no bottom with the 16 fathoms of line.

We left the camp at 3 p.m., after putting some ski preparation on the sledge runners which made a great difference to the pulling.

The sledge-meter was now completely incapacitated, so we estimated the distance during the afternoon, and camped at 208 miles. Correll opened the meter up and made it again serviceable.

December 13th brought snow and drift again with a 40-mile wind, and we were obliged to remain in the camp all day. The thought of that crack opening was a skeleton in my brain cupboard. It was decidedly unpleasant to think of while confined to the tent and not being able to see what might be going on outside.

The wind moderated during the early hours of the next morning, and although light snow was still falling, the light was fair, and we got away from camp at 6.30 a.m. and continued our march south-east.

The surface was rather different in the morning. There was less snow covering the ice, and the surface was sticky and pulling very hard. At 210 miles we were quite near a projecting point of the glacier, and Correll and I walked over to it. We found it much lower here, only about 30 feet: we climbed up over some broken blocks of ice to the top, which was a level plain. The vertical faces where bergs had calved off showed horizontal bands of ice about 2 feet wide. There were several short open leads where we left the sledge, and by one of these was a Weddell Seal, with which McLean entertained himself while we were away.

At this point the glacier tongue ran off abruptly west-south-west, and to the south of it, as far as we could see there was flat ice thickly studded with huge bergs.

For the next miles we had a very troublesome surface, all small cracks and jagged pieces of ice protruding from the snow in which the sledge continually got caught.

By lunch time we had only made 5½ miles, in spite of the earliest start we had ever made. However, the surface improved, and by camping time we had reached 220 miles. The glacier tongue, which we had kept close on our right since 179 miles, had now receded, and to the west was a mass of bergs with a line of distant highlands on the western horizon.

On the morning of the 15th, I took another set of observations. Proceeding from the camp, we encountered frequent small pressure ridges trending mainly north-east and south-west. Soft new snow covered up the hard pieces of broken ice, and often our feet sank down between these slabs and the sharp pieces hurt our finnesko-clad feet.

After lunch we decided to try to get out of the rough country by making over towards the west, where it looked much flatter. We were then evidently in an area of recent movement, a junction between shifting consolidated pack and fast bay-ice to the west and south, as there were several wide open leads and many recently frozen patches of ice.

Just after breaking the lunch camp we saw an Emperor Penguin by some open water, and decided to kill it and carry some meat in case of emergency. We took about 10 lbs. of meat. McLean found the stomach full of fish, and also discovered cestodes in the intestines. We saw three tiny fish-like minnows and a larger fish like a whiting swimming round in the beautifully clear water. McLean put out the line baited with penguin meat for a short time, but could not get a bite. It was one of our greatest desires to catch a fish while on the sea-ice, but we were unsuccessful to the end.

After killing the penguin, we made west for a quarter of a mile, crossing two leads, and found ourselves on a splendid surface, almost as good as the bay-ice off Penguin Point.

We pitched the night camp at 228 miles. From this point we could see high land to the south of us across the fast ice, but only bergs to the west.

December 16th was an overcast day with a light snow-fall at intervals, but almost calm. We made 12 miles south-east, with the pack-ice on our left all day, about a quarter of a mile away, very broken, with many bergs. We were travelling over a smooth, hard, snow-covered surface, with a few scattered bergs on our right.

The real coastline became clearer as the day wore on, and high rocky outcrops became dimly visible from the west to south-west along the edge of the highland. In the bad light we could not get any good idea of the distance of the coastline.

We kept the course during the day by the direction of the sastrugi. At 240 miles the edge of the pack-ice deviated to the east and was lost to sight.

December 17th was another overcast day, but there was no snow, so we got a better view of the mainland. This now showed a huge rocky bluff to the south, with a cap of ice. It seemed to stand out from the shore, and we took it for an island. From this bluff (Horn Bluff), which at that time we called Dreadnought Bluff from its likeness to a battleship, standing dark and lowering out of the level snow plain and having a ram-shaped bow, the coast trended west-north-west and showed many smaller outcrops of rock, some high up the sides of the slopes. On the east side of the Bluff the land looked lower, and we could see little of it.

We camped at 254 miles, having made a run of 14 miles south-east. We had arranged at the start to each take three days' cooking in rotation. A week is the usual thing on sledging journeys, but we thought it rather long. The cooking is a rather pleasant change for three days, but for a longer time is it liable to pall. I was cook on this night, and we arranged to make a special effort to get things done quickly, and to time ourselves. From the halt to drinking hoosh, with everything fast for the night, it was just 27 minutes.

December 18th was our last day of the outward march, and our best distance on the outward journey. We made 8 miles in the morning, going E. 40° S. (true), and 8 miles after lunch E. 23° S. and camped at 270 miles. The light was bad again, with an overcast sky all day. It became a little clearer at noon, and we were able to get an idea of the contour of the coastline to the south of us. We had left the Bluff to the south-west, and we now saw that on the east side of it there was a wide bay, the eastern extremity of which bore E. 23° S. (true). To the north of us several large bergs were visible, but we could see none of the pressure ridges. The surface was flat bay-ice as far as we could see.

The course after lunch was for the eastern side of the bay. At 263 miles we came on a deep tide-crack, the first we had met with on the bay-ice. It ran in the direction of the course, and we had to cross it several times in its windings. In some places there were 6 feet of open water. At 265 miles there was a seal lying beside the rift, the first one seen since 210 miles. The last camp was just on the southern side of the rift. That evening we held a council, and decided that as the far side of the bay was still 20 to 30 miles off over the bay-ice, and we could not do it in one day, we would turn back on the morrow after magnetic observations, and make for Horn Bluff and have a day there instead of another profitless day onwards. The Bluff was considerably out of our course for the return and would take us further south, but from it we could take a course to the 152½-mile depot further inland than the outward journey, where we had every hope there would be more surface like that we were then on and less of the pressure-ice.

We need not have debated whether we should travel on another day or not, as it would have been impossible in any case. It was densely overcast on the morning of the 19th with sago-snow falling and the usual impenetrable wall of white on every side. Correll and I proceeded to take a set of dips inside the tent, after clearing out and putting everything on the sledge, while McLean took the line and went fishing to the tide-crack.

At 1 o'clock Correll and I had finished and had everything ready for lunch, but McLean had not returned. We waited for half an hour, and at last he turned up with quite an exciting tale. In the thick snow he had taken the wrong direction for the tide-crack, and had only found it about 2 miles from the camp. After half an hour's unsuccessful fishing he started back and could not find the tent. He wandered about for three hours and finally found himself on the south side of the tent, which he saw in a momentary lifting of the snow. The wind, which usually served us as a compass, had failed on this occasion, as it was almost calm.

After lunch the snow ceased and the sky began to clear rapidly. Soon the Bluff loomed up to the west-south-west, and we broke camp and got away at 3 p.m., making for the Bluff. The sun's disc became visible at 5.30 p.m. and I took an observation. We were then 5 miles from the last camp. On the return we always reckoned the distance from this camp. The dip at the last camp was 88° 17′, our maximum, and the declination at 5 miles was 16° 04′ E., our greatest easterly declination. The position of the latter place was 68° 18′ S. lat. and 150° 12′ E. longt.

We camped that night at 8 miles. The surface was flat and hard, with a covering of one inch of new snow. We crossed two tide-cracks in the afternoon, which were in shallow depressions. Here the ice was about 6 feet thick. By camping time the sky had completely cleared and it was bright and sunny.

We were away early next morning, pushing on to the Bluff. I thought we would reach the rock by noon, it looked so close. As we approached, we began to realise that the cliffs were of immense height, and excitement ran high.

At noon we halted for a latitude shot and lunch, wasting as little time as possible as we were anxious to examine the rocks while the good weather lasted. As we neared the Bluff the ice got thinner and there was very little snow on it. The cracks became more numerous, and some were wide and covered with a thin new crust of snow rendering them unnoticeable till trodden on. My feet went through into the water several times and once I went right in to the thighs and got thoroughly wet.

The Bluff towered up higher and higher as we approached its foot. We could see its shadow on the ice before us at a great distance, and at last entered it out of the warm sunshine, and we were still more than a mile from the foot.

At 5 p.m., when at 18 miles we were close up under the cliffs. We were awed and amazed. The vastness and lone grandeur of the place left us mute. Rising out of the flat plain of ice on which we had lived for the past week, a huge vertical barrier of rock reared its massive height to the very skies above us. The whole face was one magnificent series of organ pipes (Plate LXXIV, fig. 2).

The place was in deep shade, the effect heightened by the glare on the ice beyond the shadow. Here was indeed a Cathedral of Nature, whose " dim religious light " and vast stillness would have invoked a prayer in the most careless heart to its Maker in the presence of His wondrous works.

Far up the face of the Bluff we could see Snow Petrels flitting about like white butterflies in the distance.

It was wonderful to think that these majestic heights had gazed out across the wastes of snow and ice for countless ages, and never before had the voices of human beings echoed in the great stillness, nor human eyes surveyed the wondrous scene.

At the bottom of the organ pipes there was a talus slope of debris, broken blocks of rock of all sizes, and at the foot of this there were broken ice and pressure ridges, before which we pitched the tent (Plate LXXV, fig. 2).

Standing out of the talus slope at the top there were several white beacons, which looked quite small, we thought about the height of a man, as against the great height of the organ pipes. We did not realise that the top of the debris was over 400 feet above us.

As soon as the tent was pitched we started to climb up the talus slope, and soon found this was a great deal higher than we expected. It was hard work scrambling up. All the stones were ready to slide down at the least touch, and often we were carried down several yards by a general movement. We ran rather a risk of getting a crushed foot among the large boulders, especially as we wore finnesko. Great care had to be used.

There was much clay among the small stones. Thaw water was trickling down the slope into a narrow lake at the foot which was frozen over.

When at last we reached the foot of the white beacons we found they towered above us to a height that proved to be 128 feet. The organ pipes were basaltic, but to my great joy I found these beacons were of sedimentary rock, which under present circumstances was of much greater interest geologically. I made only a casual examination of the base of the beacons, leaving the detail for the morrow.

It took a very short time to slide down to the sea-ice again, and after a festive meal we turned in early, to be ready for a busy morning.

During the night we were several times awakened by the crash of falling stones.

We had seen a lot of Snow Petrels flying to the beacons, which were weathered out into small caves and crannies. It was evidently a nesting place. From the camp we could hear their harsh cries.

Our December 21st breakfast was at 7 a.m. The scene looked very different in the morning sun. Where we were the great rampart of organ pipes ran almost north and south, and the camp was on the eastern side, so what was dense shadow on the day before was now brilliant sunshine.

We climbed the talus and then on between two of the beacons which were close together, forming a very steep ravine between them. There was some snow still left in the bottom of this, and we had to cut a few steps in the steepest place. The ravine was only about 6 feet wide and we could examine each side as we climbed up. The beacons were a portion of a horizontal stratified series of sandstones underlying the igneous organ pipe formation. There were bands of coarse gravel and fine examples of current bedding. Some of the strata contained much more clay, which was often discoloured by the remains of vegetable matter. In some places the carbonaceous matter was rich enough to form coal. Amongst the debris I discovered flat pieces of sandstone, on the white surfaces of which were black fossil plant remains which on further examination may prove recognizable. See text-figure 22 for a geological sketch section of the face.

At the top of the ravine we arrived at the top of the talus and bottom of the organ pipes. From here the beacons jutted out, with narrow, flat tops about 50 feet long, like the first span of a bridge built out from the steep side of a valley. The tops of the beacons were very hard-baked by contact with the volcanic rock. Here the sandstone had managed to resist the weathering agents which had removed the rest of the sedimentary formation.

After examining this first beacon we scrambled along at the bottom of the organ pipes and the top of the talus, to the next beacon, about quarter of a mile away. The organ pipes towered above us a sheer 665 feet, roughly hexagonal and bright red in colour. Each single column could be traced right to the top.

The next beacon was exactly similar to the first two. By this time I had worn out a pair of finnesko and my feet were getting sore, and McLean was in much the same state.

We took a dozen photographs, mostly of geological interest, during the climb, and went down the slope at the next beacon. We were some distance south of the camp by that time, and made back over the fresh-water lake, which was frozen over, but beginning to thaw. The water was running under the cover of ice, and when we reached the starting point I easily broke through the surface with the ice-axe and got about three gallons of water in the cooker cover, which lasted all next day and saved a good deal of kerosene.

McLean had collected several samples of earths, and I had a number of typical rock specimens.

After lunch we labelled our specimens, and broke camp at 4 p.m., to say goodbye to the Bluff for ever. We went back on our tracks for about a mile, to get clear of the pressure ridges close in-shore, and then turned north-west. For about 4 miles we ran almost parallel to the Bluff. In one place there was a break in the wall of rock, down which a small glacier crept. The top of the cliffs was capped with ice which sloped back into the plateau ice-cap behind.

About 3 miles from the rock face we found a small block of stone resting on the ice, which showed that there must be considerable movement of the ice near there, as the stone had not had time to sink into the ice, which it would do in a few summers.

At 5 miles from the camp we left the new bare ice and came on the snow surface again. We crossed several narrow open tide-cracks. Camp was pitched at 25 miles (on the return journey) at 7 miles from the Bluff camp.

We were very tired that night, and did not wake until 9 a.m. next morning. The spell of fine weather was broken. The glories of the sunny day at the Bluff were soon forgotten in the everlasting snow and drift of the succeeding days. The sky was overcast, and snow was falling. The Bluff was only dimly visible at intervals. We marched on north-west steering by the wind, which was blowing from the south-east. I continually kicked up the loose snow with my feet and followed the little rolling balls.

We met with some nasty tide-cracks in the morning, some very wide and covered with thin new ice. In one place I went through to the waist and the others had to haul me out by the rope. Luckily I was wearing burberries, so only got wet feet, in which state I marched to the lunch camp.

After lunch the wind rose to 30 miles per hour and the drift became dense. We put up the sail, and made very good pace. In the smoother places the sledge would over-run us, and McLean had to walk behind with the alpine rope to keep it under control.

Soon we could not see a yard in front of us, but we knew the surface would be good for another 50 miles, till we struck the glacier tongue again, so we went blindly on, and made 17 miles that day, our record up till then.

There were a few minutes of sun in the morning of December 23rd, and we got a view of our surroundings again. The Bluff was in sight with the coast trending west-north-west from it and showing numerous big rock exposures. I made a rough panoramic sketch and took a round of angles, hoping to get another set of angles from a point further on to fix the prominent points, but this I was never able to do, as before we had got away from the camp the snow and drift came on again and continued till we were out of sight of this par of the coastline.

We could see scattered bergs ahead, but the glacier was not yet in sight. I got the direction of the wind with the shadow compass before the sun disappeared, and found it still due south-east, so that we could march on in the same way down wind.

We used the sail again all day and made 15 miles. The snow had collected to a depth of 6 inches and walking was more tiring than on the previous day—still 15 miles was a nice distance to be so much nearer home by, and we were all eager to amass more days' runs of a similar sort.

We passed close to several bergs during the day, though unable to see them. Their presence was indicated by the snow ramps at their sides; we walked around these, keeping on the level.

The night camp was at 57 miles, and by our rough plot of the course, the depot at 152¼ miles was then 56 miles off, and bearing W. 30° N. I decided to keep on the north-west course for a while, to cut down the distance on the glacier tongue, where the going would probably be heavier, and also because it would be difficult to keep any other course in the present weather.

December 24th was another day of drift, but happily the last for a good interval. We still had nothing to steer by but the wind, as the magnetic compass has very low sensitivity.

In the afternoon the sun was gleaming dimly through the drift, and we could see our way better. We passed between bergs all the morning, with the sledge under sail and a 30-mile wind. The bergs had long ramps of snow leading right to their tops on the windward side, and deep moats on the leeward. We all but had the sledge down one of these moats, about 30 feet deep. We were making about 4 knots an hour under all our canvas, and the drift was very thick, so that I did not see the moat till right on the edge, when I shouted to my companions, and we just managed to slew the sledge round and stop it on the very edge. The surface was smooth and slippery, and we would have gone over with it, dragged by our harness.

Some of the bergs were arranged in almost continuous lines like a ridge of hills, and we had some difficulty in finding openings. In one place we could see no opening, and so went up the snow ramp, and were confronted by a sheer 80 feet drop on the far side. We sledged along the edge of the ridge for some quarter of a mile before we could find a ramp to take us down.

At 5 p.m. (December 24th) the wind dropped, the sky cleared, and the sun came out for the first time for three days. We had just passed through a line of bergs and found ourselves on a flat plain of sea-ice free from bergs, with the coast showing far away on the horizon to the west, and a line of rising ground ahead of us, which proved to be the edge of the glacier tongue. We made another 3 miles across the plain, and camped still some miles from the glacier, at 72 miles, having made another day's run of 15 miles.

On the following morning, December 25th, we soon mounted the ridge in front of us, and found it backed by a series of ridges trending north-east and south-west, about half a mile from crest to crest with shallow valleys between. In some places in northern sides of these valleys showed broken ice and steep faces, and we had to walk along the ridges for some distance to find a way down. In the main the surface was of fairly hard snow. The wind-swept tops of the ridges were of half-consolidated ice with occasional crevasses, all well bridged.

At 80 miles we mounted from the last valley and found ourselves on a flat undulating snow plain, exactly similar to the country round the depot. We called it "typical depot country," and were glad to be out of the bergs and on the flat again, expecting this surface to continue right to the depot. During the afternoon a water-sky was seen to the north. We were able to use the shadow-compass again, and set the course straight for the depot. We pitched the tent at 84 miles, and prepared for Christmas dinner.

McLean who was cook, prepared a wonderful banquet from the ordinary sledge rations augmented with Emperor Penguin steak fried in pemmican lard and followed by a preparation of dried fruit. The meal which was voted delicious was topped off with a tot of whisky from the medical kit. Toasts were drunk and speeches delivered. We then drew on our meagre supply of cigarettes and lay in our bags, feeling as comfortable as the greatest epicure after a twelve-course dinner.

Boxing Day was another fine day, and things looked brighter than ever when we camped again at night.

We continued on the same course during the morning over the undulating snow-covered surface of the glacier tongue. At noon I took a latitude shot, and found we were not as far north as we expected. The wind we had been steering by during the three days' blizzard had evidently been somewhat east of south-east and we had been making too much westing.

At 93 miles the surface became more broken, and was of half consolidated ice with small crevasses. We mounted an ice ridge trending north-east and south-west and at 94 miles reached the top of this ridge, when we were overjoyed to find a familiar view suddenly presented before us. We had reached the western side of the glacier tongue. In front of us stretched the bay of sea-ice in the tongue which we had seen from the point of observation near the 152¼-mile depot. Across the bay could be distinctly seen the point at which we had mounted up the glacier tongue on the outward journey. To the west lay the mainland, bordered by many rock outcrops, and joined away to the south-west by the glacier. Penguin Point was just hidden by a huge berg embedded in the sea-ice quite close in. Between the Point and the opposite side of the Bay, the sea-ice ran right out to the northern horizon.

We were on the right course for the depot, which was then about 20 miles off. The next thing to do was to get down on to the sea-ice, some 180 feet below. We descended from the ridge for a short distance and found the way barred by a sheer fall, but could see a steep snow ramp some distance to the right. The sledge was hauled up near the top of the ridge again and sidled along to the ramp and then we commenced to lower it down this. We feared a crevasse at the junction of the ramp and the glacier, and indeed some distance off this could be seen open; but at the point we chose it was covered over, and after creeping down for some distance with great care, we flung discretion to the winds and let the sledge go at a run for the remainder of the distance. It landed on firm, smooth sea-ice. Before leaving the edge we took a photograph of part of the vertical face showing the stratification, and then covered 2 miles on the sea-ice and camped near the berg.

On December 27th there was light surface drift, but it was clear and sunny, with a 25-mile south-east wind. We made an early start and put the sail up, which kept the sledge moving without any exertion on our part beyond steering. Three wide tide-cracks during the day, two filled with snow, and one newer open one, along which we went for some distance before finding a snow bridge to cross by. The water was about 12 feet down.

It was unfortunate that we had laid that depot and now had to go back to it. Otherwise we could have made in to the coast and followed along it, examining the many rock outcrops and getting in all the details, right round to Penguin Point; also much distance would have been saved. Of course, when we laid the depot, it was not expected that we would return to it from this direction.

We had made 10 miles by lunch time, and by 5.30 had crossed the bay and were climbing the glacier tongue again. We proceeded about a mile on the level, when suddenly we saw the depot mound about a mile to the east of us, shining white in the evening sun. We were then close to the spot where I took the angles on the outward journey. The mound was soon reached and found intact. Long snow ramps had formed on the north-west and south-east sides of the mound, which was itself much ablated, but the welcome food tank was still perched on the top. The surface had hardened considerably in the vicinity during our absence.

We reached the depot at 6.20 p.m., having made a day's run of 18¼ miles. We all thought it would be nice to go on and make a record day's run of it, but I wanted another time shot at the station to rate the watch, for which it was necessary to await the morning sun, so we reluctantly pitched the tent, and prepared a special dinner to celebrate the picking up of the depot—the reluctance does not apply to the dinner. We divided a tin of toffee which had been carried as a "perk" and again had Emperor Penguin and raisin pudding.

The next morning I got a time shot. We left the depot immediately afterwards and descended to the sea-ice by the gully we had come up on the outward journey. There had been a big deposit of snow since our outward journey so there were no signs of our old tracks.

We set the course for Penguin Point, which bore W. 15° S. The surface was very uniform between the two glacier tongues (the Ninnis and the Mertz Glacier Tongues)—smooth, hard and snow-covered. No tide-cracks were seen during the day. There was a strong water-sky to the north.

There were now 11 full days' rations on the sledge to take us to Mt. Murchison, which was about 90 miles away by the route we intended taking. Thus the commissariat department seemed to be in a very satisfactory condition. The day was completed with 16 miles to our credit.

The next day was December 29th, and a very pleasant Sunday it proved to be. It was calm all day and sunny in the morning, but the sky became overcast soon after noon. Before leaving the camp I took a round of angles to the coastline. Many rock faces were visible. We were as near the coast just south of us as to Penguin Point. There was a lot of rock to the south, but we kept straight on for the Point.

At 3 miles from the coast the surface became broken by ridges of ice and small bergs and high pinnacles of ice surrounded by moats about 15 feet deep. One of these was of very striking appearance. It rose up out of a wind-swept hole to a height of 50 feet, and was just the shape of an ancient Athenian helmet.

As we approached the Point the sea-ice got thinner and was without a covering of snow, as was the case at the Horn Bluff (Plate LXXVI, fig. 1). We arrived at the Point at 7 p.m. and found a rocky point (Plate LXX, fig. 1) about 300 feet high jutting out from the slopes of ice at the back, from which the coast ran almost south on the one side and north-west on the other. To the southward there was a series of faces of rock capped with ice. For a sketch of this portion of the coast see text-figure 23.

We pitched the tent about 100 yards from the shore, and then walked in to have a look at the rock. The ice was very thin close to the ice-foot, which latter was about 4 feet high and formed a narrow platform all along the coast, from which the rock faces or steep slopes of ice rose (Plate LXIX, fig. 4).

Just near the camp, which was on the south side of the Point, there was a small inlet and glacier up which we, next day, were able to climb to the top of the rocks. At the nearest point to the camp there was a small inlet in the rock at the level of the ice-foot, in which there was a small fresh-water lake, frozen over at the time. We walked over this and round it, examining the rock. There was a lot of freshly-fallen blocks of rock lying in the inlet, many shattered into small pieces, and I was enabled to get some good specimens. The rock was a coarse-grained granite, and everywhere presented vertical faces to the sea-ice.

A few Skua Gulls and some hundreds of Snow Petrels disported themselves about the rocks.

Just after returning to the camp we heard the familiar squawking of penguins, and saw two Adelies waddling about on the ice between us and the shore. They had just come up out of the cracks in the sea-ice. We killed one of the penguins and took off the breast steaks. The Skuas were soon down on the carcase.

Celebration dinners were now the rule. We had another that night in honour of Penguin Point, and finished up the rest of the Emperor meat.

The next day was sunny and comparatively calm. We were out early to make a thorough examination of the vicinity. The flags were hoisted and a photograph taken of the camp with the rocks in the background. Then we collected the ruck-sack, ice-axe, camera, etc., and set out for a walk south along the shore on the sea-ice. The ice was thin and there were many open cracks, so progress was rather slow. Near the camp, on some thicker ice, we found several large blocks of granite which had been carried out from the shore and lay, each in its pool of thaw water; and covered with serpulae and lace coral.

Another Adelie Penguin was seen swimming about in a lead, and soon afterwards a Weddell Seal came out on to the ice close by.

Correll, our Isaac Walton, had brought the fishing-line and penguin bait, and he stayed there to fish, while McLean and I continued on down the coast.

The rock was exactly the same granite all along, vertical faces framed in ice. I had noticed a continuous rustling sound for some time, and found at length that it was caused by little streams of ice crystals running down the steep ice slopes with numerous cascades, just like a mountain torrent, finally

pouring out in piles on the ice at the foot. The partial thaw in the sunlight causes the half-consolidated ice to break up into separate grains and crystals in this way. Sometimes whole areas of the surface, just on the point of equilibrium, in the less steep places, would start down.

We walked about 3 miles, keeping about a hundred yards from the shore on the firmer ice, and made several crossings in to the rock fronts where we were able, and took a number of specimens and photographs (Plate LXX, fig. 2). It was reckoned that we could see another 4 miles of exactly the same coastline, but beyond that there were a lot of broken ice and bergs which obscured the sea front as the coast trended more to the east.

When we got back to the tent we found Correll had seen us coming and had prepared lunch. He had had no luck at fishing, and had been unable to reach bottom with the 16 fathoms of line.

After lunch we climbed up the small glacier near the camp between the rock of the Point and the first face of rock to the south, and got on the bare top of the Point. Here there was an uneven rocky area about a quarter of a mile wide, at the back of which the ice-cap rose steeply up the plateau (Plate LXXV, fig. 2). The surface was very broken and weathered, and there was a lot of gravel and sand. Mosses and lichens were in abundance, of which McLean took a number of specimens.

Fossicking round in the gravel, Correll found colonies of tiny red insect-like creatures living on the moist under-side of the small stones. We secured a number of specimens in wisps of paper and put them in spirit when we got back to the tent. Under the microscope these were found to be of two distinct species.

From the top of the rock we could see the other large rock mass round the point to the north-west, which we decided to visit on the morrow. No open sea was visible to the north, but several big bergs were visible. Across the sea-ice to the north-west was the first (Mertz) glacier tongue, backed up by the mainland. Mt. Murchison was obscured by the immediate coast, but the highland where we had parted from Stillwell was plainly visible to the north of it. The Mertz Glacier ran right out to the horizon in the north.

A rapid toboggan down the ice slope again brought us back to the camp late in the evening.

The last day of the old year was dull and lowering. The sky was heavily overcast and snow was falling lightly nearly all day. This rather cheerless aspect greeted us at 6.30 a.m. when we crawled out of our warm sleeping bags and commenced the daily round of sledging life.

The sea-ice in this direction was quite smooth, with none of the pressure ridges and piled ice so plentiful near the coast to the south, and we were able to keep close in-shore. Between the Point and our destination there was only one face of rock in the ice front, which we did not approach closely. The distance was rather less than we expected, and we arrived at the rocks at noon after sledging $3\frac{3}{4}$ miles.

This is the last rock outcrop along the coast before reaching the Mertz Glacier Tongue. It is much the biggest near Penguin Point. The rocks form the west side of an angle in the ice front, and consist of two main ridges, rising to a height of 250 feet, and running back into the ice-cap for about a mile west, with a small glacier between.

As soon as we arrived we pitched the tent on the sea-ice about a hundred yards from the ice-foot and opposite the gap between the ridges, and had lunch. Then, armed with the usual paraphernalia, we set out for a scramble amongst the rocks.

A wide open crack ran along the ice-foot which gave us some trouble in crossing—we had to jump across on several pieces of floe. A Weddell Seal was lying on the ice nearby.

We soon found this small region to be a regular menagerie of almost every kind of animal and bird life known along that coast. Adelie Penguins were walking in procession up and down the little glacier to and from the tide-crack at the ice-foot. It was very amusing to see them coming out. The ice-foot rose a sheer 4 feet from the water and they leapt up this, swimming swiftly to the surface of the water from below, and shooting out clean and straight for the top of the ledge. Often they would fail and fall back into the water with a splash, but always came at it again immediately. We saw one indomitable little creature fall back five times in quick succession before succeeding in reaching the top.

The foot of the southern ridge was visited first. Though very steep, the rock was not here in sheer faces as it was on the southern side of the Point, but was very broken and weathered, and the sides were scaleable everywhere. The rock was in the main a granite similar to that at the Point.

After examining the rock, we climbed up the glacier on its northern side, close against the northern ridge, and on following the penguins, found two small rookeries near the top. The rookeries were about 150 feet up, and steep climbing at that.

There is no accounting for some of the ways of the penguin. As far as we could see, they might just as well have had their village nearer sea-level, excepting the advantage of a better view.

There were only about 50 penguins on the nests at the time. The young were hatched but still very small. We looked in all the nests for eggs, and found only one, which was probably addled; anyway, we had no opportunity of trying it, for I put it down on the snow while I climbed some rocks later on, and a Skua Gull was down on it almost immediately.

On the top of this ridge there were everywhere traces of old rookeries in the form of guano, penguins' bones, moss and lichens. Skua Gulls were nesting on these and attacked us fiercely when we got near their nests. I carried my ice-axe held above my head to keep them off. There were several Skua Gull nests with eggs and newly-hatched nestlings.

Correll and I went along the top of the ridge to its extremity, while McLean crossed a patch of snow to an outcrop at a lower level where the coastline bent round east again. Here he found Silver-grey Petrels and Cape Pigeons nesting in hundreds among the rocks. Two specimens of each with several eggs were secured. This was indeed a find, as Silver-grey Petrels have never before been found nesting, and Cape Pigeon eggs have hitherto been found only by the Scottish National Antarctic Expedition.

Correll and I examined the top of the ridge and took numerous specimens of rock and mineral. We found the same little red mites as seen at the Point. They exist in thousands in the moist gravel. We then crossed the top of the ice slope between the ridges and came down on the southern ridge, where we met McLean again with his news of the petrels. Nesting under boulders on this ridge we found Wilson Petrels with feathered nestlings.

At the end of the ridge, overlooking the little bay, there was a small fresh-water lake about 20 yards across.

McLean and I decided to climb down the rock face from here instead of going back and down the glacier. Correll elected to take the latter route for he was not fond of climbing. As it was he got down before us. During the descent we found more nests in the crannies—Cape Pigeons, Snow Petrels and Silver-grey Petrels. It was wonderfully amusing to scramble about among these nests. The birds took no notice of us, except to vomit at us occasionally when we became too familiar, and they submitted to being pushed off their nests like a setting hen while we looked at their eggs, none of which were yet hatched.

It was late in the evening when we reached the camp again, and after a meal we turned in.

New Year's Day was another dull day, but there was, for about half an hour, sun at 8.30 in the morning and again luckily at noon, so that I was able to get the latitude and longitude observations. I also took a set of magnetic dips in the morning. While Correll and I were taking the observations, McLean went off among the rocks again with his camera and took some fine photographs in the petrel rookeries, and secured some more specimens of the mites. He got a sounding of 8 fathoms in the marginal crack. McLean also killed two penguins and added the breast meat to our depleted store of rations.

I decided that on the return journey it would be best to cross the glacier at the same place as on the outgoing track instead of setting a course from this camp straight for Mt. Murchison. The glacier was an unpleasant proposition, especially near the mainland on the western side, but where we had crossed once we could probably cross again safely. After working up the observations just taken and marking the position on the map, I got the bearing of the point where we had descended from the barrier onto the sea-ice, the old 100-Mile Camp, which bore approximately north-west. At 5 p.m we had our specimens packed and were ready to start again for this point.

The marginal sea-ice was about half-a-mile wide here, and we were soon on to the hard, smooth snow again. We passed several large bergs close in to shore, and from the top of the ridges had seen a large number in the angle between the coastline and the glacier.

We made 5 miles and then camped at 152 miles. The New Year was celebrated this night, the dinner including penguin and "plum-duff" as usual. We had postponed the occasion from New Year's Eve, considering it too soon after the Penguin Point celebration and we did not think we could stand so much high living. By the time of camping it was heavily overcast again and looked like more snow.

Next morning, January 2nd, our worst fears about the weather were realised, for it was densely overcast and snowing lightly. The field of view was limited to a few hundred yards, but we had the wind, which was blowing about 30 miles per hour, to steer by, and so sail was hoisted. At noon we obtained a few fleeting glimpses of the sun and were able to adjust the course.

As the afternoon wore on, the falling snow became thicker. By our reckoning, a day's run of 14¼ miles should bring us to the old 100-Mile Camp, and when this distance was accomplished we would have reached the side of the glacier, but the weather was so thick we could not distinguish its outline clearly enough to recognise the gully in which the camp had been. There were small spurs with gullies between all along the glacier front. At 14¼ miles we came right opposite one of the gullies and went into it before we discovered it was not the right one. We then proceeded about a mile along the glacier front, passing two more gullies and going into the third one, which I thought I recognised. We pitched camp here, as it was late in the evening, and turned in hoping for a clear-up on the morrow to make sure of our surroundings. The identity of the gully was considered very doubtful.

During the day we had crossed two cracks in the sea-ice, which, however, were snow-filled, mere depressions in the surface. We saw no water.

Next day the snow was thicker than ever. A blizzard raged all day, and we were obliged to remain in the tent. There remained five more days' food, on a slightly reduced ration, and about 40 miles to go to reach the Mt. Murchison depot, so that there was no need for alarm yet, though the delay was decidedly unpleasant.

At 7 p.m. the snow and drift ceased and we all sallied forth to examine the country and find the right gully. It was immediately obvious that we had come to the wrong place. I set off north-east thinking we had not come far enough, and walked for about 4 miles, passing many gullies but never the right one. At the end of this distance I was convinced we had passed the place, as my reckoning could not be out as much as that, so I returned, to find that Correll had got a meal ready for us and McLean was just approaching the tent with the news that the gully was the first one to the south-west, only about three-quarters of a mile away. It was still heavily overcast and the light was bad, so I decided to put off the start till the morning. I had a lurking dread of this badly crevassed glacier, and did not relish the idea of travelling on it in anything but clear weather. Before turning in we dug the sledge out of the snow, which had covered it during the blizzard, and cleared everything ready for the morning.

The sky was still overcast next morning, but was clearing from the south-east, and the light was comparatively good. We got away from the camp at 9 a.m. and had soon reached the gully. A lot of snow had been deposited here and there were no signs of the old camp, but we easily recognised the spot by the particular arrangement of the broken blocks of ice on the north side of the gully. The outgoing track was followed as nearly as possible. After travelling 3 miles we were on the top of the undulating glacier surface.

On reaching the flat Aurora Peak and Mt. Murchison loomed up ahead and soon the whole coastline on the western side of the glacier. With great joy we recognised these familiar peaks. Aurora Peak was our compass and our goal, beckoning to us across the 30 miles of inhospitable glacier.

The ridges in the glacier on its eastern side ran about east and west and we kept to the valleys between them where possible, as the snow had collected more there and crevasses were well covered.

The sun came out soon after midday and it was sunny all the afternoon. We ran 14¼ miles for the day and only crossed four crevasses to our knowledge. The snow-fall had evidently been considerable, and the crevasses were more hidden than on the outward journey.

The old saying "out of sight, out of mind" does not hold for crevasses, when they are known to exist. Under the conditions I think we all enjoyed ourselves considerably less than on the outward journey. At any rate I personally had a decidedly thinner time.

All the next day, January 5th, it snowed lightly. We were surrounded by a shifting spectral chaos of drifting whiteness. Yesterday we had passed two open crevasses, and as we neared the western side of the glacier we knew the ground became more treacherous. While it was still possible to wait for better weather we did so, and spent yet another day in camp.

It ceased snowing during the night, and we got away at 6 a.m. on the 6th. The sky was still heavily overcast and the light was by no means good, but it was becoming imperative to push on to the depot. By lunch time we had made 10 miles. As we approached the mainland the recent snow deposit became thicker. There was no sign of the high hard sastrugi met with earlier in this region.

Every half hour or so one of us would pitch forward on the snow with his feet down hidden in a crevasse, sometimes going through to the waist, but no one went right down. It is usually possible to avoid this by throwing oneself forward and spreading the arms out, unless a considerable area of the snow bridge falls in.

The travelling was most nerve-racking. When a foot went through the snow crust it was impossible to tell on which side of the crevasse one was, or which way it ran. The only thing was to go ahead and trust in Providence. By 3 p.m. the light was again very bad. We found ourselves on a narrow ridge of hard snow, surrounded on every side except the way we had come, by dimly-seen open chasms and points of ice sticking out of the snow. There was nothing for it but to pitch the tent again till the weather cleared or we were forced to move by shortage of provisions. It was not until the tent was pitched that we noticed an open hole not 10 yards from the tent opening.

We had made 12½ miles that day. It was about 14 miles to the depot on the top of Mt. Murchison, and we had only two more days' rations and the 1½ lb. of penguin meat. However, we anticipated that one fine day would take us to the depot. I took a set of magnetic dip readings, and at 5.30 there was a brief half hour's sunshine, which allowed me to complete the observations. The light showed us how we were situated. We were on a slight eminence, the sides of which were very broken and crevassed, but to the south the snow surface looked level about a quarter of a mile away, and appeared to give a flat run from there to the entrance to the gully between Aurora Peak and Mt. Murchison, which was only 6 miles away. Almost before I had put the instruments away the surroundings became once more enveloped in that same impenetrable whiteness, so we turned into our bags for the night.

On the morning of January 7th the light was worse than ever and snow was falling. We remained in the tent all day, keeping a careful watch on the weather and ready to hurry away on the first opportunity, to get over the 6 miles of broken country between us and the gully. Late in the evening a small rift appeared in the clouds along the southern horizon, and we knew that at midnight the sun would just be in this. Everything was got ready and at 11 p.m. the edge of the sun's disc entered the rift and at last there was light, but of what a spectral nature, dim and cold and fleeting! The smallest irregularity in the surface threw a shadow hundreds of yards long. What appeared a high hill proved to be a mound a few feet in height. The plain around us was a dim blue-grey chequer-board of light and shade, but ahead, rising sharp and clear against the leaden sky, stood beautiful, snow-clad Aurora Peak, bathed in glorious golden light. Well indeed did the name suit it. It might have been the chariot of the Goddess herself.

The awful splendour of the scene, though we could not but remark it, tended to depress us and make our task more trying. I have never felt more nervous that I did in that ghostly light in the great lone silence, surrounded by the hidden horror of fathomless frozen depths. I prodded the snow ahead with my ice-axe at every step, which was of little use, as a snow bridge that will not support a man may resist the thrust of an ice-axe. Once on the level again we proceeded faster, but the crevasses were still there,

though uniformly covered by the snow. I was in the lead, and went through eight times in about 4 miles. The danger lay in getting the sledge and one, two or all of us on a weak snow bridge at the same time. As long as the sledge did not go down we were comparatively safe.

At 1.30 a.m. the sun disappeared behind the clouds again and the light became bad, but we went on, as we could see the gully entrance clearly and we were anxious to reach it and get out of the crevasses at once, lest a snow-storm should come on.

The further we went, the thicker and softer the snow became. At 5.30 a.m., guided by the Hand of God, we safely reached the gully entrance, having made $5\frac{3}{4}$ miles in 6 hours. Then, tired out with the strain on muscles and nerves, felt most of all when we knew we were out of the danger area, we pitched the tent, had a meal and turned in for a short sleep.

We awoke soon after noon on the 8th and at 2.30 were again on the march up the gully. There were only 8 miles to go to the depot, 5 miles up the gully and 3 from the gully to the summit of Mt. Murchison, and we expected to do it that day; but what a change there was since we were last here! We had noticed, far out on the glacier, that there seemed very little rock showing on the Peak, and when closer in I had failed to pick up the depot mound with the glasses, though it had been seen 25 miles away on the outward journey. This I put down to the bad light, but thought it strange.

As we advanced up the gully the snow became softer and softer, and soon we were sinking to the knees at every step. The sledge runners, too, sank till the decking rested on the snow, and it was as much as we could do to shift the sledge with a series of jerks at every step. At 6 p.m. we decided, in order to lighten the load, to make a depot of everything that could possibly be spared. Accordingly the sledge-meter, all clogged with snow, sunk past the centre and quite useless, was taken off and stood up on end to mark the depot, while we made a pile of the dip-circle, theodolite and tripod, pick, alpine rope, ice-axe, most of the kerosene, all the mineral and biological specimens, and all excess clothing. Even with all this load off, we could scarcely move the sledge. Soon afterwards snow began to fall and we could not see where we were going. There was a light wind blowing up the gully, and the sail was a little help.

At 7 p.m. the tent was pitched for a meal, when all the pemmican and cocoa was finished. The biscuit and sugar and glaxo had given out at the noon meal. We still had the $1\frac{1}{2}$ lb. of penguin meat, several infusions of tea, and plenty of kerosene. After the meal we staggered on till 10.30 p.m., when the weather was so thick we could not see the sides of the gully. We pitched the tent again, tired out, and after boiling up some tea, without milk or sugar, we turned in. We had only made $4\frac{1}{2}$ miles in 8 hours.

In our exhausted state we slept till 11 a.m. of the next day, January 9th, when we awoke to find the sky densely overcast and a light fog in the air, but we could see the rock on the side of Mt. Aurora. Two-thirds of our penguin meat was shredded and boiled in the cooker pot, making a thick broth that we thought so excellent that we decided to have stewed penguin every day when we got back to the Hut—needless to say, we never tried it again. After this and some more tea we started at 1.30 p.m. to struggle on with the sledge. Snow began to fall, and soon everything was hidden again. Our direction up the gully could not even be kept with any certainty. McLean and I had left our burberry blouses at the cache, wearing only the thick pyjama coats, which rapidly became wet. In an hour's time we reckoned we had made half a mile and were in a position to start up Mt. Murchison. Any attempt at this was impossible in the thick snow. The only thing was to wait for a clear-up. We pitched the tent in the thick snow and got inside and sat till 4.30, but the snow-storm only became worse. The heavy flakes sounded like a tropical rain on the tent. There was nothing for it but to bring in the sleeping bags and lie up till it cleared.

It was very difficult to get at all comfortable in the tent with the snow knee-deep. Before the tent was pitched the surface inside was a series of deep holes where we had been standing. I tried to press the snow down evenly by rolling about on the floorcloth, but the middle got much deeper than the sides, and when we got into the bags we gravitated in a confused heap to the centre.

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It was evident that without any more food, and in the deep soft snow, we could never drag the sledge up to the depot, a rise of 1,200 feet in 3 miles. One of us must go up alone and bring back food, and I decided to do this as soon as it cleared enough to make finding the depot possible.

The wait for fine weather was long and trying, especially on empty stomachs. McLean and I obtained great solace from our pipes, as the tobacco supply, though at very low ebb, still held out. We considered that a man must indeed be in utter extremity before he cast from him his pipe.

We waited and watched, with intervals of sleep, all the rest of the day and till 5 p.m. of the next day, January 10th. Then, to our intense joy and relief, the snow stopped, the clouds commenced to roll away, and in half an hour there was a cloudless sky with bright sunshine! Another broth was at once made with our half pound of penguin meat. Of this I had the lion's share, and then, taking the food bag and the shovel, I left the tent at 5.30 for the climb up to the depot.

As I slowly mounted the side of the gully the snow became even deeper. I sank sometimes to the thighs. I felt rather faint at first and had to rest at frequent intervals. The tent seemed never to get further behind as I toiled onwards. The heavy covering of snow seemed to have altered the contours of the gully side, and I was not sure of the exact direction of the top of the mountain, but I kept advancing in what I thought the steepest direction.

I floundered along hour after hour, counting my steps and having a rest at every hundred, which was the utmost I could do between rests. At last, at 11 o'clock, I reached the top of the rise in front of me, and saw a little shining mound of snow on a higher point a good mile to the east. I had climbed to the wrong place, and given myself another mile to go.

At 12.30, after seven hours' wading in snow, I reached the depot. What was my surprise to find only 2 feet of our 8 feet mound projecting above the surface, with the bamboo flag-pole, stripped of its flag, rising another 18 inches! There had been an accumulated fall of 6 feet of snow on the very top of the highest point along the coastline. How thankful I was that I had brought the shovel, else my journey had been in vain.

After a rest I started to dig down over the place where I reckoned the food bag to be. It had been placed in a trench about 18 inches deep, at the edge of the mound. It was a great labour to dig this hole in my exhausted condition. At last I bottomed on the hard old snow, over 7 feet down, but there was no bag. I excavated a tunnel at the bottom in the most probable direction, and driving the shovel forward, felt it strike against the kerosene tin, which was on top of the bag. Soon I had dug along to the bag, hauled it out, opened it, found the sugar first, then the butter and biscuit, and the next quarter of an hour in the bottom of that hole I shall never forget. I had an intense thirst, which I seemed only to aggravate with snow partially thawed in my hands.

I made a swag with five days' provisions, and started back at 1 a.m., this time taking the direct route, guided by the top of Aurora Peak. It was rather easier going down the hill, and I was fortified by the food. Rests were not so frequent; I lengthened the interval to 150 steps, thawing some snow in my hands at every halt to drink.

The snow was wonderfully soft, a flocculent mass of little sago-like balls. The first foot or so could be kicked up and scattered with the feet.

At last I was in sight of the tent again, and could hail my companions, calling to them to get some water thawed for a drink. So slow was progress that I could speak to them a quarter of an hour before I reached the tent. At last I was inside again at 5 a.m., having been 11½ hours going 7 miles.

As expected, I found McLean and Correll were getting anxious about me. They had got cold and had been unable to sleep. Soon a scalding hoosh was made. The other two had had only half a mug of penguin broth each in three days, and I had broken my fast only a few hours before them.

After a good meal I got into my bag for a sound sleep, first making a list of the things I thought it was most necessary to bring on from the cache down the valley, chiefly the more important rock specimens. After giving an hour for their food to digest, McLean and Correll started for the cache, 2 miles away, to carry back the selected specimens, biological and mineral, our burberries and a few other articles of clothing. They left the instruments, a large part of the specimens, the crampons, sledge-meter, and other odds and ends.

I awoke just before noon and saw them coming, and had another meal ready for them when they arrived. They found great advantage of stepping in the old foot-steps and got back in much quicker time than they took to reach the cache. We all had another long sleep then, and did not stir again till about 8 p.m. of that day, January 11th. It took some time to dig the sledge out of the snow and clear the tent. We took all the unessential fittings off the sledge to reduce the weight still further, and started the climb to the depot with the sledge at 10 p.m. I went ahead in my old trail, Correll stepping in the marks after me. McLean broke a trail for himself. It was heavy and slow work, but we accomplished the 3 miles in 5½ hours, arriving at the depot at 3.30 a.m. The tent was then pitched and McLean, who was cook, made our last celebration dinner, which was large and lavish. We had ten days' food with us now, and only 53 miles to go over comparatively flat country. The snow was just as deep at the top of the mountain, but we had every hope of it becoming a better surface ahead.

A week was considered to be an outside estimate for the time we would take to reach the Hut, which would make us four days late, not a serious period.

Just before we reached the depot a few small clouds appeared in the hitherto cloudless sky, then more and more moving from the south-east, till in less than an hour the sky was completely overcast and conditions looked very threatening. When we awoke at noon there was a strong south-east wind and heavy snow was falling again. So we had arrived at the depot only just in time.

The blizzard continued all next day, the 13th. After midnight the weather rapidly cleared up, and at 5 a.m. we got out and started packing up. To our joy we found that time and the wind had already hardened the surface a great deal, and we only sank about a foot in it.

The first 2 miles were heavy going, but luxury to what we expected. After this the surface rapidly improved. The wind rose to 40 miles per hour from the south-east but was rather a help than a hindrance. Soon our feet only sank to 6 inches in the snow, and we made rapid progress. Our spirits rose as we hurried along, for we realised that if the weather remained only moderate, three days would bring us to the end of our journey.

Soon after noon we came in sight of the nunatak (Madigan Nunatak) mentioned on the outward journey and the sea in the first bay east of Commonwealth Bay. The surface was smooth and evidently deeply covered with new snow as there were no signs of the old sastrugi.

The sky cleared in the afternoon and the sun came out, though a surface drift blew all day. Everything looked propitious for a happy ending to our journey. By the time we camped it was reckoned that we had made 15 miles.

January 15th was an overcast day with a fresh south-easter and surface drift. The surface now was firm enough to support our weight entirely. We could see the heavy water-sky over Commonwealth Bay, and I steered for the edge of it. The drift ceased at 7 p.m. and at 8 p.m. we had crossed the ridge and were on the down-grade towards the Hut. We stopped and I got out the glasses to look for any land marks, and as soon as I got them to my eyes I saw a bamboo flag-pole only half-a-mile away and directly ahead. I thought it was Ninnis's old 18-mile depot, and could scarcely believe we had come so far, but as soon as we reached it we found it was his 13-mile flag, as there was no food bag. Camp was pitched here with only an easy stage left.

Forty miles had been covered in the two days, and about 25 miles in 12 hours on the day. We ate as much as we wanted that night, as saving food was now no longer necessary. This was the day we were to be back at the Hut; we would only be one day late after all.

We were out early on the next morning. There was a strong wind and we had rather an unpleasant time on the smooth ice slopes in our finnesko. The camp was just on the edge of the great snow-field.

It took till noon to reach the Cave. There we found fresh fruit indicating that the ship had returned. Stillwell had the day before we arrived come up from the Hut with the fruit and left a note with the latest news. Also Bage's party had passed through and left a note.

We left the Cave on the way to the Hut at 2 p.m. It was rather an awkward trip down the steep ice as we had no crampons and the wind was fairly strong. On nearing the Hut, we were sighted and a small crowd swarmed out to greet us.

THE NEAR EAST COAST SURVEY PARTY.

Report by F. L. STILLWELL, Leader.

On November 8th we set out from the Hut at Cape Denison on the first section of our summer operations. This journey was to give some assistance in the transport of their stores to the sledge parties working further to the east, and to make a preliminary reconnaissance of the near-east region. In addition to myself, the party on this occasion included A. J. Hodgeman and J. H. Close.

Heavy wind and thick drift* delayed departure from Aladdin's Cave till November 10th. The course then taken was to the south-east; but owing to further bad weather it was not till the 16th that we met Dr. Mawson's party; that was 18½ miles out on the snow fields of the plateau. It was thereabouts that Lieut. Ninnis on his spring journey had laid a depot, which now could not be found. Two hundred pounds of food and 30 pounds of kerosene were transferred to Dr. Mawson's sledges, and 80 lb. of food and one tin of kerosene to Madigan's; then our supporting party received instructions to do what mapping and general scientific work they could in the area immediately to the east.

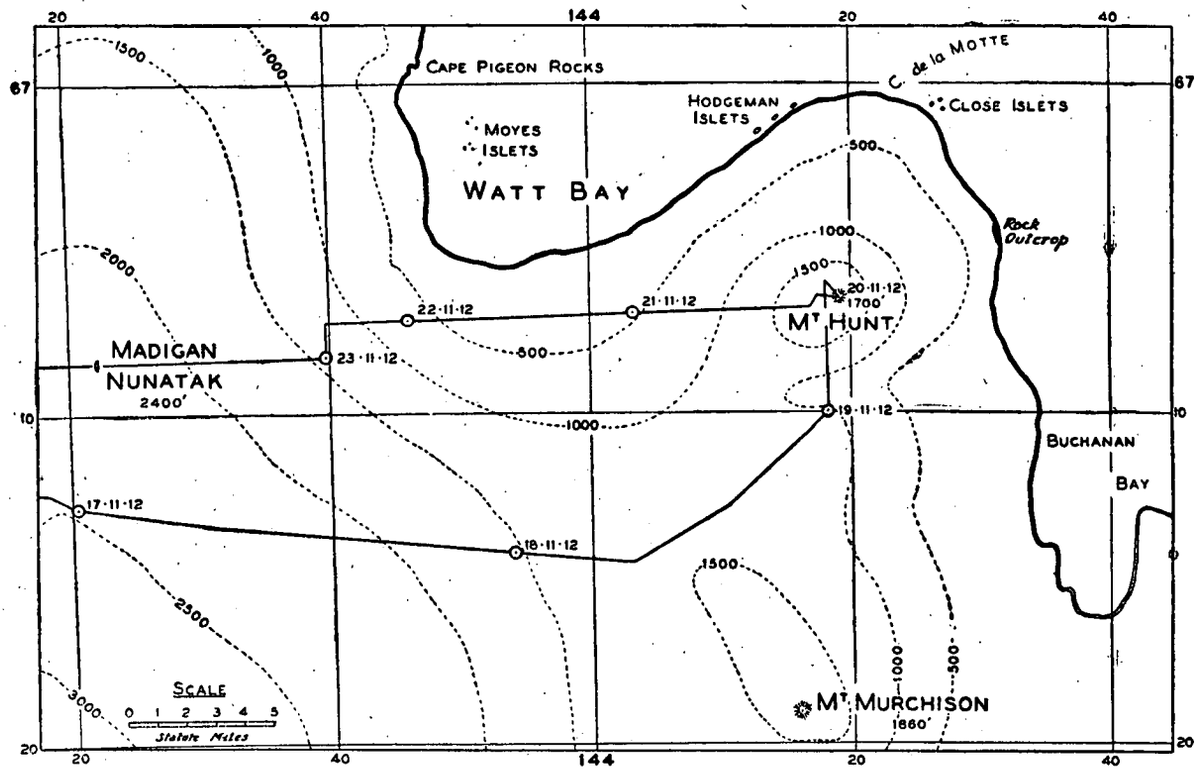

FIG. 13. Map showing the track of Stillwell's reconnaissance journey to Mt. Hunt.

On the 17th we said good-bye to Dr. Mawson, 7 miles further on, and then followed a course due east with Madigan whom we left on midday of the 19th at 46 miles out, in lat. 67° 14′. Meanwhile a nunatak (Madigan Nunatak) had been sighted some miles to the north, and we decided to make it on the return journey. Hitherto it had been the only object on the snow plain, but now a broad dome-shaped hill entirely encased in ice appeared to the north-west; we set out to investigate this. Our track is shown in text figure 13.

There was a broad valley between our position on the plateau and the domed hill (Mt. Hunt) and in crossing it we descended some 1,500 feet. The snow in the valley was soft and made heavy going after the hard polished snow surface of the plateau. A gale of wind which had sprung up behind us fortunately

* The tabulated meteorological data from this journey appears in these Reports on pages 225-236, Vol. V, Series B.

made the ascent easy. The hill was reached on the evening of November 20th and was found to form the summit of an ice-clad promontory reaching an elevation of about 2,000 feet above sea-level. To the west, the eastern headland seen from Commonwealth Bay could be observed. Trending away to the north-east was the glacier tongue (Ninnis Glacier Tongue). True bearings to the glacier headlands were obtained from our camp. Sketches of the view from this camp and from the preceding one were made by Hodgeman. The magnetic declination on the summit of Mt. Hunt was ascertained to be 16° 26′ W.

The return journey was commenced just before midday on November 21st. The nunatak lay a little to the south of west of our position, and we attempted to hold a direct course to it. After descending for some 7 miles, we found ourselves on a plain at the level of the barrier-ice wall of Watt Bay. We crossed this and climbed over some ice spurs. The country beyond was badly crevassed—some of the crevasses were estimated to be 50 yards wide. Delayed by these and by unfavourable weather, we did not arrive at the nunatak till the evening of the 24th. The nunatak was found to be an outcrop of rock 160 yards long and 30 yards wide situated 2,400 feet above sea-level (Plate LXXX, figs. 3 and 4). The following morning was spent in further examination of it and in the collecting of specimens; after lunch we broke camp, leaving a small supply of food as a depot and hurried on back to the Base at Cape Denison. The weather was favourable and we reached the Hut all well shortly after midday on November 27th, and remained there for some days preparing for further work.

The second section of our undertaking was to be a detailed examination of the coast east of Winter Quarters where islands and rock outcrops had been observed from the *Aurora*. On this journey I was assisted by C. F. Laseron and J. H. Close.

On the afternoon of December 9th, 1912, we set out for Aladdin's Cave. The weather was threatening and moderate drift was encountered from the 2-mile post onward. In consequence of this and of a small westerly error in the course, some little time and trouble were spent in finding the cave, and it was rather late when we crawled into our sleeping-bags. The entrance to the cave was arranged so that a ready exit could be made, if, as was expected, the opening became sealed with snow drift. This did happen, and though everything seemed alright the next morning, the whole party was suddenly overpowered during the breakfast by foul air the presence of which was quite unexpected. Hoosh was finished and about to be served when I, having just completed the cooking, collapsed. Close thrust the ice-axe through the choked entrance, made a small hole, and then collapsed. Laseron succumbed immediately afterwards. An hour and a half later—so it was reckoned—the party revived and cleared the opening. However, a day's march was lost because we were too weak and exhausted to travel. The tent was pitched and another night was spent at Aladdin's Cave. On December 11th the sledge was loaded and we marched off, first due south and then due east, setting a course for the nunatak (Madigan Nunatak).

The nunatak was sought as a definite point, to which a survey of the adjacent coast could be profitably referred. It was reached on the 14th, the party having been held in camp on the 13th by a blizzard, and was determined* to be in latitude 67° 08·5′ (by observation) and in longitude 143° 18′ (by dead reckoning). The route followed on this journey is shown on map-plate V.

Part of the 15th was spent in making observations, taking photographs, and collecting specimens of rocks and lichens. Breaking camp, we set out on a northerly course towards the coast and, steering by sun compass, held this course down gently falling snow fields. There gradually opened up a beautiful vista of the sea, dotted with ice-floes and rocky islands many of which were ice-capped. On December 16th, when 18 miles from the nunatak, camp was pitched near the coast on a stretch of firm, unbroken ice, which enabled one to venture close enough to the edge to discover a small rocky island (Cape Gray) referred to as Locality B in our survey, which was connected by a snow ramp with the land ice-cap. Lying further off the coast was a thick fringe of islands, among them and beyond them a large quantity of heavy floe-ice (Plate LXXXI, fig. 1). The floes stood some 10 or 15 feet above the water level, and the length of some was estimated to be over a quarter of a mile. These floes had drifted away to the east before the party had left the coast on December 29th (Plate LXXX, fig. 1).

Cape Gray was photographed and sketched on the following day, December 17th (Plate LXXXIII, fig. 4). The rocky island forming the Cape, together with every accessible island and rock was covered

* Final check observations made the following year found the position of Madigan Nunatak to be lat. 67° 8½′ S. and longt. 143° 22½′ E.

with rookeries of Adelie Penguins; the first chicks were just hatched. The island is formed of a highly garnetiferous, cordierite-gneiss, and traversed by a dyke of pyroxene-granulite (Plate LXXXII, fig. 2).

To fix the position of each island it was decided to run a theodolite traverse and measure the distances between the stations of the traverse with the sledge-meter. Sights were obtained from each station on to the islands of which the position and, to a certain extent, the size were thereby fixed. The traverse line was carried close to the barrier so that the number of islands hidden from view were as few as possible. In addition, offsets were placed from the stations to the barrier cliff whenever they could be made. The ordinary method of back and fore sights was adopted in the traverse and snow or ice mounds were used as station marks. When travelling on ice, one man went ahead to build a snow mound for the fore station, while the man with the instrument took a round of angles from the back station. The former would then return and help to drag the sledge on the next station. Later on, when dangerous ground was crossed, the whole party, attached to the sledge, would advance to the fore station to test the ground, and then the instrument man would return to his station following the sledge track. Thus the ground had always to be covered three times and progress was necessarily slow. The average distance between the stations was about five-eighths of a mile. The bearings of the lines between the first two and between the last two stations were determined astronomically in each case. The traverse was taken first west from Cape Gray because there seemed to be good ground in that direction, while to the east there were many breaks and crevasses.

We travelled west for $7\frac{1}{4}$ miles round the promontory, at which point Cape Denison was sighted. We passed over first a short stretch of uncrevassed ice and then a succession of ice spurs and broad shallow snow valleys. The stations were on the ice spurs which were uniformly about three-quarters of a mile apart. The snow in the valleys was quite hard and safe, while the spurs were broken by a series of crevasses, which, fortunately, ran in the direction the party was travelling. An ice spur could therefore be crossed between two parallel crevasses and only a few transverse ones were met. The crevasse gradually narrowed, and finally disappeared under the snow of the valleys.

The locality of the Main Base having been sighted, we returned east across the peninsula and met the coast again on December 20th, some 3 miles to the east of where we first struck it. Again numerous islands were seen, and the previous method of traversing was adopted. Here, however, the surface was for the most part covered with snow, and crevasses were often hidden; the country was therefore more dangerous and treacherous. So far, fortunately, only two out of eleven days had been lost. The weather had been very favourable. This could not last and the next 3 miles were not covered till December 26th. Then the sledge-meter collapsed and on it the work of the party depended as it was our only means of measuring distances. It took half a day to bind together the broken pieces of the wheel rim using strips of bamboo and copper wire. The repaired rim lasted till the journey was nearly finished when a new break occurred.

On December 27th another accessible rocky promontory (Garnet Point), referred to as locality D in our survey, was discovered. It was reached from the ice-cap by a very steep ice slope; it was found to be a garnet-gneiss (Plate LXXXII, fig. 1) outcrop traversed by black dykes similar to those of Cape Gray (Plate LXXXIII, fig. 1).

The continuation of the traverse south over the ice along the margin of the bay became easier for the country there was safer. The islands were mapped and fixed in their relative positions. Two more rocky promontories (Cape Pigeons Rocks) adjoining one another, referred to localities E and F in our survey, composed of a formation similar to the other rock areas visited, were discovered (Plate LXXXI, fig. 3). The rocks rose sharply out of the water, and were connected by an ice causeway. Penguin rookeries were as numerous as usual, and on the seaward face of the northern outcrop we found a large rookery of sea birds comprising Snow Petrels, Cape Pigeons and a few Silver-grey Petrels. Cape Pigeons were there in the greatest numbers and all the birds were nesting (Plate LXXXIII, fig. 3). The embryos in the eggs were well developed. We secured ten Cape Pigeons, two Silver-grey Petrels, forty Cape Pigeon eggs, six Snow Petrel eggs, two Silver-grey Petrel eggs and one Skua Gull egg; these were safely delivered to the biologist at headquarters.

The bad country beyond the valley on the side of which the camp had been pitched made it advisable to leave the coast and to carry the traverse line on to the nunatak by means of snow mounds. This was commenced on December 30th. After 7 miles had been covered the party was held up by a blizzard for three and a half days. We were then four days overdue and pushed on as quickly as possible, steering by sun compass. We sighted the nunatak and calculated, from measured angles and base, its bearing and distance. The Hut was reached at 10.45 p.m. on January 5th.

REPORT BY C. F. LASERON ON THE BIRD LIFE MET WITH ON THIS COAST SURVEY.

Adelie Penguins.—These were found in abundance right along the coast, and on all the peninsulas there were numerous rookeries. Viewed through binoculars, many of the islands off the coast were seen to be covered with their rookeries. One feature that was particularly striking about these interesting birds, was their ability to ascend and descend the precipitous rocks lying between their rookeries and the sea. Some of their regular highways were so steep, that it was considerable work for a human being to ascend them, yet these small birds hopped from rock to rock with the greatest ease and noncbalence. We saw the first penguin chicks at Cape Gray on the morning of December 17th and as on the previous day we had seen none, this date marks approximately the first arrivals.

Skua Gulls.—We found these birds nesting in several places along the coast, associated in every case with Adelie Penguins. Their nests, like those of the penguins, merely consisted of a few stones laid carelessly together in the open. Usually there were two eggs in each nest, and already on December 16th they were in an advanced state of incubation. As a rule the position of the nest of a Skua Gull was well advertised by the angry cries of the parent birds, which circled continually overhead, occasionally making savage swoops downwards towards the intruders. Whether they would actually attack a human being seems open to doubt, for always at the last moment of their swoop, possibly owing to attitude of defence instinctively taken up at their approach, they would swerve or raise just above the head. So close do they come in fact, that on one occasion while stooping to rob the nest, Stillwell stunned one with his ice-axe, as it passed over my head.

Giant Petrels.—At Cape Gray we saw about a dozen of these resting on an ice-foot, one of which was an albino; but at none of the rookeries visited did we find any trace of nests, in fact these were the only ones seen during our sledging.

Cape Pigeons.—On Cape Pigeon Rocks we came on a large rookery of Cape Pigeons, the high cliffs bordering the sea being covered by their nests. The nests were quite in the open, on exposed ledges or in fissures among the rocks. About half had one egg in each, and we collected about four dozen for specimens, and also several of the birds, which were quite easily caught. The eggs were white in colour, somewhat smaller than a hen's egg.

A most peculiar feature of these birds, together with the other petrels, is their remarkable spitting habit, for they are capable of repeatedly ejecting their oily vomit, consisting of half digested crustaceans, etc., with unerring aim a distance of 2 or 3 yards. This they do at the slightest disturbance, which makes the task of robbing their nests a very disagreeable one.

Snow Petrels.—These were about equally common with the Cape Pigeons at Cape Pigeon Rocks and their nests were indiscriminately mixed at the rookery in this place. Unlike the Cape Pigeon, however, they usually seek a more sheltered situation, preferring the crevices among the rocks to the open ledges. The egg is like that of the Cape Pigeon in shape and colour, but is on the average slightly smaller. On December 27th all the embryos were in a fair state of advancement. As with the Cape Pigeons, the spitting habits of these birds were very disagreeable. On the 15th, while camping at Madigan Nunatak 18 miles from the sea, a Snow Petrel was seen flying westwards.

Silver-grey Petrels.—At Cape Pigeon Rocks, though we saw several of these birds, we only found two nests, both on a high ledge overlooking the sea, and quite in the open. In addition to two eggs, we succeeded without much trouble in capturing two birds for specimens. The eggs are somewhat elongated, about the size of a hen's egg and white in colour. Their spitting habit was not quite so pronounced as with either the Snow Petrel or Cape Pigeons. On December 14th also, two of these birds hovered for a few minutes over our camp at Madigan Nunatak.

Wilson Petrels.—We found no nests of these birds in the course of our sledging, but we saw odd birds at Cape Gray and Cape Pigeon Rocks and were several times visited by them even when at considerable distance from the sea. On January 3rd when about 12 miles from the coast, one hovered around the camp for a while, in spite of the fact that at this time it was snowing fairly heavily, and the weather was bad enough to confine us to our tent for three days.

THE SOUTHERN SLEDGE JOURNEY

Report by ROBERT BAGE, Leader.

ON the afternoon of November 10th, Webb, Hurley and I said good-bye to Dr. Mawson's party at Aladdin's Cave and made off south for the 11¾-mile cave, where our Supporting Party (Plate LXXVII, fig. 2), Murphy, Hunter and Laseron, were to wait for us. We started off at 7 p.m., almost at a run over the smooth ice to the accompaniment of a cheer from Dr. Mawson, Ninnis and Mertz.

Half a mile of this easy going, and we were on snow for the first time with a loaded sledge. Up-hill snow too, and the wind rising, so it was with no small relief that we finally made the "Cathedral Grotto" at 11.30 p.m., and found Murphy's tent pitched alongside it. The wind by this time was about 45 miles per hour, and it was also nearly dusk so that crevasses were fairly difficult to negotiate.

From about 8 miles south of the Hut one crosses a 5-mile belt of crevasses, occasionally up to 15 feet wide, but we found that nearly all were well bridged, having only the top (southern side) 3 or 4 feet rotten.

We soon had the cave clear of snow and after a good meal slept the sleep of the just, feeling well content with our first day's work—11½ miles from home and 1,900 feet up. We slept on in the cave till 10.30 in the morning when Hunter had a hoosh ready for us in the tent. Some time was spent re-arranging our loads, but about 2 p.m. both parties moved off south into heavy wind and fairly thick drift.

What with the ground rising steadily, the wind, and also no doubt our lack of condition, we found after 2¼ hours' solid work we had only travelled 2½ miles, and so decided to camp.* All night it blew hard, between 70 and 80 miles per hour, and next day it was still blowing and drifting heavily. Our tent was a good deal smaller than Murphy's and as Webb and Hurley are both six-footers, we always had to put all gear outside when the sleeping-bags were down. This is really a good thing when the weather is bad, as one is not tempted to stay in the bag all the time. Early in the afternoon as we were all feeling hungry, and had been in bag long enough to feel cold although the weather was quite warm (10° F.), we rolled bags, and, after our frozen burberries were once fairly on, quite enjoyed ourselves. We had a boil-up and a few minutes "run" round in the drift and wind. After that we did some stitching on our light drill tent which was making very heavy weather of it, although pitched close under the lee of Murphy's strong japara tent. A little reading, some shouted conversation with the other tent (quite unintelligible owing to the wind), another boil-up, and last but not least a smoke, found us quite ready for another sleep.

Next day (November 13th), the wind having dropped to 35 miles per hour we set out about 11 a.m. in light drift. The sky was still overcast, so the light was very trying. Only those who have travelled over a snow-field in cloudy weather can realise what this means. In the worst fogs at home one can at any rate see something of the ground one is treading on; here, even when the air is clear of snow, it is easy to bump against a 4-ft. sastrugi without seeing it. It always reminds me most of a fog at sea—a ship creeping "o'er the hueless, viewless deep."

By 6 p.m. we had only covered 5½ miles but were all thoroughly exhausted and glad to camp. We had taken lunch *alfresco* in the lee of the sledge. Meals such as this are uncomfortable enough for everyone to be eager to start again as soon as possible. By 9 o'clock that night the wind had increased to a full gale and by morning was heavier. We were in camp all the 14th and 15th, the wind rising to 85 miles per hour with very heavy drift, during the small hours of the 15th. This was its maximum, and by the afternoon it was down to about 70 miles per hour with a clear sky and light drift. We donned our burberries and dug out our sledges both of which were completely buried in a ramp 40 yards long.

The exercise, a good hoosh and above all the clear sky made us take a less morbid view of the fact that we were six days out from the hut and only 19½ miles away.

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* Details of the track followed by Bage's party appear in text figure 14. The meteorological observations are printed in tabular form in these Reports, Series B, vol. V, pp. 237–246.

On the 16th, we could hear above the roar of the wind the drift still hissing against the tent, but it soon diminished and at 9 a.m. we turned out for breakfast. It had become evident that our loads up to the present were too heavy for the conditions, and that we would do better to lighten our sledges even at the expense of sending back the Supporting Party earlier than anticipated. I accordingly decided to drop a fortnight's food here. Already nearly one week's food for three men had been saved, as we had spent so much time in bag, and also had not yet worked up full sledging appetites. We built a 6-ft. snow mound and placed the bag on top, setting up a thermograph alongside. We had carried this instrument on from the 5-mile cave, where it had been recording all the winter, intending to set it up when the supports left us. With a snow-tight outer case made from a kerosene tin, three wooden legs and wire lashings, it weighed over 20 lb., so had to go. Hunter had taken charge of it so far and had found its clock very unwilling to work, so we had not much hope of getting a good record from it in any case.

We had not seen ice for the last few miles and seemed to be fairly on plateau snow, so we also depoted a pick-axe, and I left my heavy boots and Swiss crampons.

It was a great relief to have good light and, still better, the wind dropped to a light breeze by 4 p.m. It was very slow work as we were rising rapidly, and at 6 o'clock clouds came up quickly from the south-east and snow began to fall, so we camped at 7·30 p.m. thoroughly tired out. We were now 24½ miles out and 3,200 feet up.* Text-figure 14 is a map of the route followed on this journey.

The snow was a false alarm, as by 9 p.m. it ceased and the wind dropped completely. Dead calm ! ! !

A strong breeze was blowing on the morning of the 17th and a very dull sky made falls frequent until the clouds broke a little in the afternoon. We were making good headway when Webb happened to notice a strap dangling from the rear of the supports' sledge as it passed us while we were having a spell-oh. It turned out that two 1-gallon tins of kerosene were missing, so Murphy and Laseron had to follow our tracks back—no easy task over hard snow. They found the tins over 2 miles behind us, in fact only a short distance from our lunch camp. Meanwhile the rest of us had relayed the two sledges on a little way and then pitched both tents 30 miles from home. The delay was very annoying but the time was not wasted as the sun came out about 5.30 p.m. and Webb was able to get a magnetic declination while I took sun observations for time and azimuth. Hurley and Hunter started a big snow mound as a mark, as we wanted to re-occupy the site on our return and make it a complete magnetic station.†

We were off early on November 18th and for the first time were able to appreciate the "scenery." Glorious sunshine overhead and all around snow—gorgeous light and shadow in the sunshine. Here and there indeed were smooth patches which we called bowling greens, but these were hard and as slippery as polished marble with much the same translucent appearance. Practically all the country, however, was a jumbled mass of small sastrugi averaging perhaps a foot in height with here and there an old gnarled veteran twice as high. The smaller sastrugi were evidently newer, but were already hard enough to resist anything less than the sharpest blow from a pointed shovel, upon which large pieces would break off. To either side the snow rolled away for miles; behind, perhaps a mile away, was the top of the last rise we had come up, while in front we made our first acquaintance with the accursed next ridge that is always ahead of you on the plateau. Generally we passed from one ridge to another so gradually that we could never say for certain just when we had topped one: still the next ridge was always there.

On we went gaily enough with but little clothing as there was nothing more than a light breeze all day, though it had lately been getting colder with our increased altitude (now 3,700 feet). Our daily temperature range was now from about −10° F. to +9° F., roughly 20° lower than the temperature at the Hut at this time.

At noon we halted for a latitude shot to check our sledge-meters, and a little later we stopped for lunch. We pitched the tent to shelter the primus (very quick work when there is only a light breeze), and had lunch in the shadow of it, as it was too hot inside with the strong sun beating down. As we went on after lunch the country changed in a wonderful manner, the sastrugi gradually becoming smaller and finally

* The altitude determinations of the various camps were the result of hypsometric observations.

† For the magnetic data obtained, see these Reports, Series B, vol. I, p. 40.

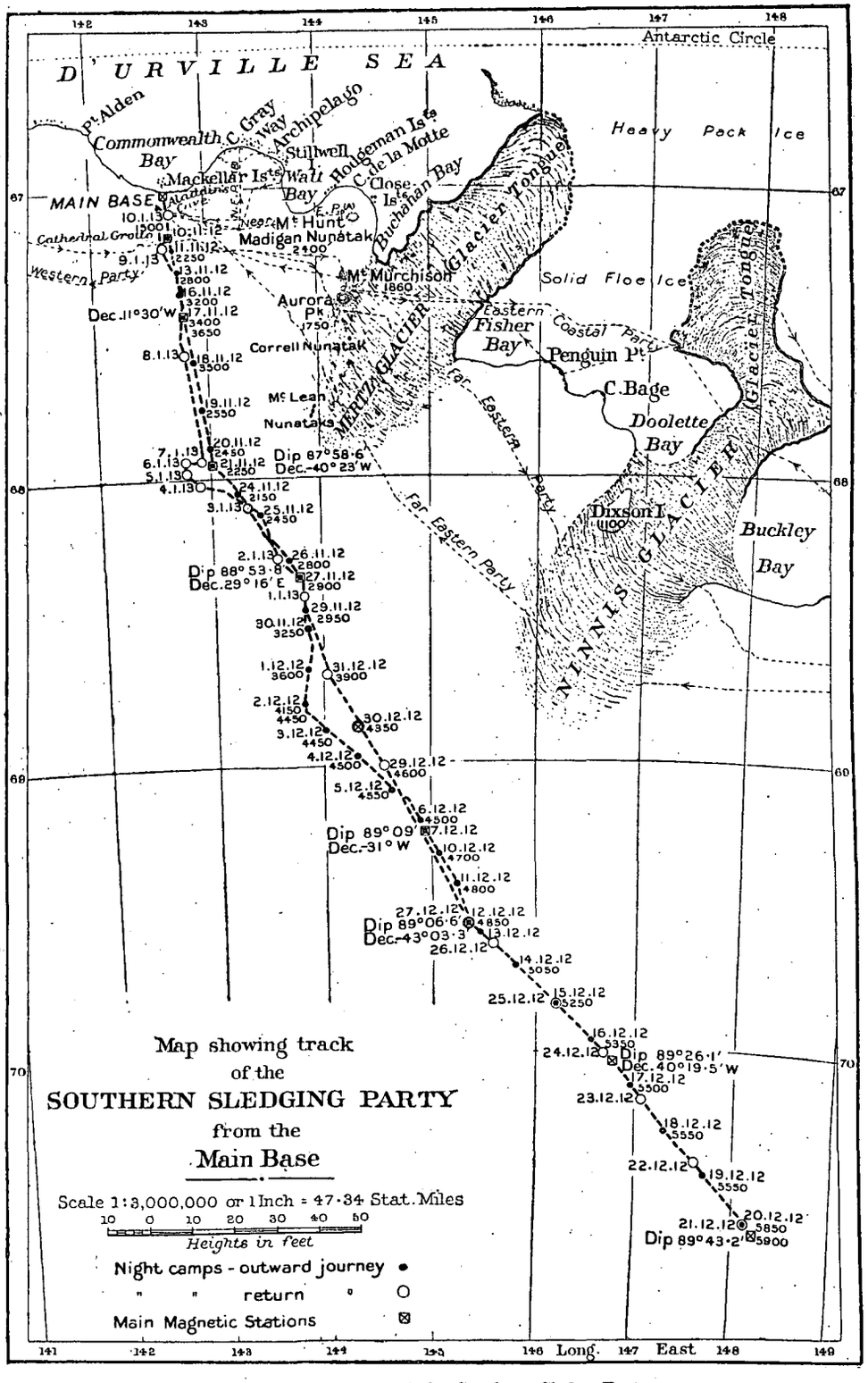

Fig. 14. Route map of the Southern Sledge Party.

all disappearing, and that night we camped on a surface totally different from anything we had seen before or met later. It was soft enough to push a bamboo in anywhere about a foot. It was evidently fairly old and laid down in calm weather, as on digging down, it gradually became more compact without any hard wind-swept layers marking each successive snow-fall, such as we met with elsewhere.

It proved later that we were commencing a gradual descent of 1,500 feet down the north side of the valley feeding the glacier (Mertz Glacier) which both eastern parties crossed on the east side of Mt. Murchison. It is possible that there is a cushion of dead air more or less permanently over the north side of this valley.

The surface was in places a little soft for our heavy sledges, but this was more than compensated for by the fact that we could now march without our crampons. Hitherto it had proved quite impracticable to haul into a head-wind with finnesko on the slippery surface, more especially as all the sastrugi were heading straight up wind in the same direction as we were going—south-by-east. Now we felt as light as air and cheered ourselves up vastly when someone calculated that the six of us were saving I don't know how many thousand foot-lb. of work every mile. A run of 12 miles for the day had brought us to a total of 42 miles out.

Another glorious day on the 19th. We travelled in all 12 miles over the same smooth surface up and down small undulations but falling on the whole. We had lunch in a curious cup-shaped depression estimated at about 2 miles wide and 150 feet deep, and Webb obtained an approximate dip (magnetic) of 88° 44′, a very promising increase from the Hut (87° 27′).

Snow-blindness had now begun to make itself felt for the first time and I had my first experience of it.

That afternoon was very hot. The thermometer stood at 10° F. at 4 p.m. but the dead calm made it almost unbearable and, by the time we had hauled up out of the basin, our clothing would hardly have passed muster on a surfing beach. Before we halted that night we could see ahead of us to the south a dark distant ridge which we proved later to be about 30 miles away. A darker shadow patch on this made it much easier to keep a good course. Our extravagant hopes of finding a permanent calm region had been dwindling for the last few miles, as a hard bottom a few inches under the surface had become evident. They were finally dispelled by a south-west wind springing up in the night bringing a fair amount of drift with it. This day (November 20th) was one of only two occasions during the whole journey when we had as much work was now beginning to tell, and this afternoon Hunter, who was acting incidentally as honorary physician of burberries again and had nothing to complain of except heat and the usual overpowering thirst. The hard as a breeze from anywhere other than south to south-east. By 4 in the afternoon, however, we were out to our parties, reported that Laseron was suffering from over-exhaustion, and advised a halt.

We had covered 10 miles, bringing us well down into the valley 63 miles out. The last mile or two had been over familiar hard sastrugi again.

That night it was decided that we should have an easy march next day and build our depot. We had hoped, of course, to be much further on our way before the supports left us, but the hard weather had settled the question. Time was going on fast and it was essential for us to push forward as rapidly as possible.

A 35-mile wind blew all day on the 21st and soon had us all slipping and sliding about on the polished sastrugi so we put on our crampons after the first half mile. We halted at noon and a latitude shot proved that our sledge-meter error so far was less than 1 mile.

Taking things as easily as the wind would permit, we pulled on up and down small undulations till 4 p.m. when we found ourselves on a small rise with the next ridge a considerable distance ahead. It was decided that this must suffice for the depot under the circumstances, and we made camp (Plate LXXVII, fig. 1). The tents were pitched some distance apart so that one could be used for magnetic observations without interference. Webb at once proceeded to take full magnetic declination, time and azimuth observations, Laseron recording for him. Murphy who was rather snow-blind put in a miserable hour over the primus filling empty food bags with snow slush. It was wonderful how quickly the fumes of combustion of the lamp affect snow-blind eyes. These food bags when filled with snow wetted and rammed tight soon froze solid and were buried with wire slings round them forming excellent holdfasts for our depot flag.

Depot flags had been exercising our ingenuity for months before we set out on this journey, ordinary forms being destroyed by the wind in a few hours. Webb had finally built the perfect flag—a wind vane type—a V of pieces of blackened venesta board with light struts at the back and a piece of aeroplane tubing at the apex which slipped over the bamboo pole. (This made a flag much lighter than a fixed metal cylinder of the same visibility—the only other alternative in such high winds—and had far less windage.) Two bamboos fished together formed the flag-pole and we soon had a good mark up, standing 16 feet from the ground (Plate LXXVIII, fig. 1). Two sets of flexible steel stays made it safe against even the worst wind. Meanwhile a little way off the others had built a snow mound some 10 feet in diameter and about 10 feet in height. It was finished off before we left with a capping of snow blocks wrapped in black bunting.

Next day it was blowing a little harder and the sky was overcast, snow falling all day. What bad light means can be gathered from the fact that Laseron, on crawling out of the tent in the morning, raised an alarm that our tent had been blown away in the night. It turned out that our tent was hidden by the mound which he could not see though only about 10 yards from it. Webb tried to take a dip set in the morning but had to wait for the afternoon with its calmer magnetic conditions. I checked over food and oil and wrote notes, etc., for Murphy to take back. Thanks to their early return we had ample food for the time we should be out and I was able to give Murphy a week's food and to leave five days' full rations and oil for ourselves at the depot. Many small things had to be decided on. I had been given the option of relieving the supports of any of their gear I coveted and I used it freely. Their sledge-meter was the first thing commandeered, ours, made by Correll, having developed some slight complaint in its interior. Then the cookers were carefully compared and theirs selected as in better condition. We all cast longing eyes at their roomy wind-proof tent, but finally decided that it was too heavy—40 lb. against 26 lb. for tent and poles Every article was inspected and we even accepted Hunter's generous offer of a new burberry blouse in exchange for one of ours which had a stiff japara collar with a habit of freezing exceptionally hard.

At 7 p.m. that night we said good-bye to our supports. Hurley exposed the last plate of his big reflex camera which they carried back to the Hut, and a few minutes later we three were standing alone watching three black specks disappearing in the drift, a stiff wind helping them along in great style. We were left to our own resources now for better or for worse. " Weird " is how I described my feelings in my diary.

That night it blew a full hurricane, and only dropped to 60 miles per hour during the 23rd, so we had to stay in camp.

This, the first of the two " auspicious occasions " we had on the journey, was celebrated by a generous meal.

We had now been carefully through our gear to see if, in the light of our experience, anything could be left out. We decided to leave the pick-axe as we were unlikely to meet ice again, also one pair of big spiked boots and some odd clothing. We also decided that we should each leave our reading matter behind. We saw that even if held up for some time there would usually be plenty to do without reading. I must say that it was with regret that I added my little " Virginibus Puerisque " to the small pile of " rejects." We now had a permanent load of 353¾ lb. (which included the weight of the sledge and sledge-meter) and a load of consumable food and kerosene of 394 lb.; a total load of 748 lb.

Of the above load very little need be specially mentioned. Of the permanent load the clothes bag is variable from day to day according to the weather, wearing of crampons, etc. The saving of labour and time in use of a heavy shovel fully compensated for the 2 to 3 lb. extra weight. With our light tent the spring journeys had proved it wise to take a spare tent fabric. This lessens the advantage over the heavy pattern, but the spare tent can be depoted if the original stands well. The floor-cloth weighing 8 lb. we soon left behind, as we found the japara sail ample protection from damp in low temperatures such as we found on the plateau.

Our " computation bag " contained two notebooks, one for general log and meteorology, etc., and the other for magnetic and other observations, pencils, rubber, small protractor, " Hints to Travellers " with necessary pages from the nautical almanac pasted in back, and lastly a slide rule. This last proved well worth taking, its 4½ oz. weight very appreciably lessening cold fingers working up positions, etc.

The dip circle which was to yield the most important result of our journey was housed after much thought on a specially shaped tray between the tins of kerosene oil. Four light leather straps made a solid mass of tray, oil tins and dip circle, very safe and very easy to undo. The Dover Dip Circle, lent by the Department of Terrestrial Magnetism, Carnegie Institute, was fitted with a declinometer with a 5-inch trough needle; four dip and two intensity needles were used with it throughout. Its head and also the camera had been adapted by Correll during the winter to fit the theodolite legs, this arrangement of course saving much weight. It was quite satisfactory except that occasionally a set of magnetic observations would have to be interrupted to take sun observations with the theodolite.

My orders were to proceed inland due south or magnetic south, taking magnetic, geographical, meteorological and such other observations as possible, returning to the Hut not later than January 15th. Dr. Mawson had left it to my discretion to go either true or magnetic south in the event of the declination changing much. At the Hut and up to about 60 miles the declination had proved fairly constant (roughly 10° W., i.e., the south end of the needle pointing a little to the east of south) but now at the Southern Cross Depot, as we had christened our 67-mile camp, the compass was found to be pointing 40° E. of south. The dip too was a good deal less than that obtained at 48 miles, so it became evident that there was considerable local magnetic disturbance in the country over which we were travelling. Whether we went south or south-east seemed (from what we had seen so far) unlikely to affect the value of geographical and other information we might gather, while Webb was of the opinion that the best magnetic results would be obtained by marching directly towards the pole, especially if the country were disturbed. For these reasons it was decided to go magnetic south in future unless some special features cropped up.

On the morning of November 24th, it was still blowing hard, but dropped to about 50 miles per hour by 11 a.m. when we moved off to the south-east after a final look at our depot. There was a good deal of drift and we lost sight of the depot immediately. The light was bad, too, so we had to steer by sastrugi and wind. The sun, however, gleamed through the clouds a few times so we were able to check our course. The wind decreased a good deal in the afternoon and we hoped we were in for a calm. Our lunch camp was 5 miles from the depot and we left a good mound with a black top there. At almost every halt so far we had gathered up into a mound the snow blocks cut and utilised for pitching the tent. This, in addition to forming a landmark, we could often use as a back mark for checking our course. Our depot thus had a mound 4 miles on one side of it and 5 miles on the other side. It was not marked as well as I had hoped but under the circumstances we could not do better. Moreover, at intervals during the day we had some very distinctive snow ramps in the valley some 5 miles to the north-east and had been able to fix their position relative to our course.

Our hopes for a good afternoon were disappointed as the wind and drift came up again as strong as ever. Moreover the surface became worse, nothing but sastrugi 18 inches to 30 inches high and very close together. We were marching a little to the east of the wind and the sledge was continually blown sideways, making considerable leeway. By 8.30 p.m. it was blowing 60 miles per hour so we halted thoroughly tired out, having hauled our third of a ton 8¾ miles. When it is blowing hard the end of the day's march is not the end of the day's work. When a camping spot has been chosen (and often we had to level one), the sledge is pulled round head to wind. The straps are loosened carefully, the shovel and tent removed and straps retightened. One man starts breaking out chunks of snow, trying until he finds a place where large pieces come away readily. Pieces about 40 lb. weight are the handiest and quickest, but often only smaller ones can be obtained. These are arranged in a circle round the tent site while the man with the tent places it on the ground pointing up wind, the bottom of the poles being just where the middle windward leg will be, and makes a hole for that leg. When all is ready all three get hold of the tent, one man crawling half into it and getting a good grip on the leather loop on the windward leg. The others sort out and grip their two side legs. "All ready? Up!" It almost takes one's breath away, the roar and the flap! The side legs are quickly separated as the tent rises and before it can blow over, the lee legs are more or less in position and taking the strain. The centre man is throwing all his weight on to the leather loop keeping his pole in its hole while those outside hold down their windward pole with one hand, and with the other pull snow blocks on to the skirt to windward. Once this is done the rest is simple, making holes in just the right positions for the other legs, pulling the skirt well out and making it snug all round. Then in goes the floor-cloth and by the time that is spread out properly the primus and cooker are passed in. The cooker is dissected and the two

water vessels passed out to be filled. The man inside (the cook) will have hard work to get the primus started if he does not shield the spirit flame from the wind which blows through the tent, by putting the whole lamp inside the big cooker lid. In come the pots filled with lumps of snow. (It takes some practice to judge the right amount of snow, as it varies so much in density.) The food tank is placed just outside the tent entrance and the proper food bags for the meal are passed in to the cook, and the tank retied to keep out drift. The cooker will now be in full blast and the cook is ready to receive the gear. Sleeping bags, "computation bag," hypsometer, "meat block" (a little 3-inch square paper pad on which we took meteorological notes); clothes bag opened, three ditty bags passed in and bag retied; a final temperature taken and aneroid read; sledge anchored securely by tow-ropes to the ice-axe and a final look round to see that all gear is safely strapped down and snow-tight.

In calm weather camping is a very different thing—so simple as to be almost a pleasure. For instance by the time the snow is ready for the tent the cooker is filled and all gear waiting in a pile ready to go into the tent. One can leave the sledge without doing up straps, etc., in fact on a fine day half an hour after the halt would usually find us carefully scraping the last of our hoosh out of our pannikins, ready for the cocoa.

This particular night at the 76-mile camp we tried the experiment of a breakwind. When we decided to keep our small light tent we knew we would have to protect it from heavy winds, so when the tent was up Webb started cooking while Hurley and I built a breakwind. This first one took us a considerable time, about three-quarters of an hour, but later on we improved, finding out just how much was needed and getting into the knack of breaking out snow blocks. In a few days, as a matter of fact, the cook had to be very smart to have hoosh ready by the time the breakwind was finished. That night in bag I wrote: "The result of the breakwind is that for once we have the wind bluffed. It is blowing 75 miles per hour, a full hurricane, but all the viciousness is taken out of the flapping and there will be no damage done to the tent by morning."

Turning out next morning, the 25th, we got a sun compass bearing to our lunch camp 4 miles back, thus checking our course, but the wind was too strong to travel in, so we put in some time mending the tent in the lee of the breakwind. While we were thus engaged two Snow Petrels paid us a visit. I dashed inside to get our fishing line ready, while Hurley got the camera. They were a beautiful sight hovering with outspread wings just above the snow; tipping it with their feet now and then so that they kept quite stationary without a movement of their wings in a 65-mile gale. They flew away to the north-east just as I came out with the line hooked and baited, so it was good-bye to our visions of fresh meat. After this experience of course we always had the line ready.

Late in the afternoon the wind dropped suddenly to about 20 miles per hour and we got a good view. Our camp (76½ miles) was on the southern side of the large valley we had been in since the 18th and we could see the ridge we had then crossed blue and dim, 40 miles away to the north. Just to our north were the big snow ramps standing out very sharply while away to the north-east we could see a distinct dip in the skyline indicating the bed of the valley. On its northern side this dip met the higher skyline in a steep bluff some 25 miles away from us. With the aid of glasses we could clearly make out that it was very heavily crevassed blue ice. The wind did not rise much again until 10 p.m. when we had moved on 7½ miles rising about 300 feet over several ridges and practically losing our view to the north. Next day (26th), we made just over 12 miles. Each day now Webb took an approximate magnetic dip and declination in the lee of the breakwind. This was necessary in order to get some idea of local disturbances; otherwise it would be impossible to determine which of our main magnetic stations were disturbed. Also it gave us some vague idea as to the proper direction to the magnetic pole. For instance at the 83¾-mile camp the needle showed the pole to be 18° E. of true south, while at our lunch camp that day 6 miles further on the declination gave it as 50° E. of south. The dip was so great that our prismatic compass would not set closer than about 15° but the long compass needle of the dip circle, though of course sluggish, continued to give excellent results.

Under these conditions it is obvious that the magnetic needle is quite useless for steering purposes. The sun-compass adopted from Captain R. F. Scott proved itself a more than efficient substitute. Ours* consisted of a small disc of venesta board carrying a pin at its centre. Times and directions were marked

*It was Bage who designed this sun-compass. Each of our sledging parties was provided with one.—Ed.

round the circumference in such a manner that when the compass was held level in the hand and the shadow of the pin allowed to fall on the correct time mark, the direction marks gave true bearings. This simple instrument is invaluable in high latitudes where it gives courses quite as accurately as they can be adhered to. On a snow-field there is usually a total absence of landmarks of any sort, so the direction of wind, sastrugi, or perhaps a low cloud is found with the sun compass and frequently checked and the course kept accordingly. Sometimes we would be able to check the course by mounds we had left behind us or very occasionally we would be able to see our tracks for half a mile or so in our rear, but this latter would be only when there was soft snow about and no drift.

On camping we would generally carefully note the direction in which the sledge was left, so that if the next day proved overcast we could get the wind direction in the morning by which we would march till the sun, gleaming through for a few minutes, enabled us to use the compass again.

During the afternoon of November 26th we met with some very smooth surface, the sastrugi only averaging about 6 inches in height. A great number of them showed a very beautiful wind erosion effect. The windward end was completely undercut for 6 or 9 inches leaving a hard crust sometimes only $\frac{1}{8}$ inch in thickness and a couple of inches wide. This would sag downwards under its own weight in beautiful curves till the tip rested on the snow beneath. It is marvellous how such a delicate structure can withstand the heavy wind.

November 27th proved a very hard day. The wind which was rising when we camped at midnight blew hard during the night and was doing a good 60 in the morning. It kept this up all day so, when we had marched for four hours altogether, including a 5-minute rest every half hour, we had done only $4\frac{3}{4}$ miles but were all thoroughly exhausted. Not much for a day's run but we could go no further. However, it gave us our century, for we were now $100\frac{3}{4}$ miles out by sledge-meter and 2,900 feet above sea-level.

The next day the light was very bad and the wind was 50 miles per hour, so we decided to use the bad weather for observations. Hurley recorded for Webb while he took a full set of dip readings. A tent is rather crowded with a dip circle, observer and recorder. The third man has to make himself scarce, so I spent the three hours digging a hole in the snow. I only managed to get down 8 feet as after the first 3 or 4 feet the snow was very compact and I had to use the ice-axe in default of a pick. I took temperatures of the snow at each foot. On the surface it was 9·5° F., for the first 2 or 3 feet dropping rapidly but at 8 feet it was —13° F. and decreasing very slowly. These temperatures when plotted as a graph indicate that the minimum temperature reached in a deeper shaft would be about —16° F. which would be the mean annual temperature of the snow here. A more immediate value of this shaft was that it kept me out of the wind and warm with exercise until Webb and Hurley had finished their cheerless job. The dip proved to be 88° 54′, certainly rather too large a rise from 88° 20′ of 20 miles back. Still we were very cheerful that night as we were apparently well on the track of the pole, though we were still distinctly doubtful as to the direction in which that track was running, for the declination had actually changed about 80° in the last 10 miles. It was evident that this 100-mile station was badly disturbed. It would have been very interesting to follow up such a strong disturbance, but we had no time for side tracking. It is possible that a subsidiary " pole " or area of almost vertical dip may exist close by this spot to its west or south-west.

On the morning of the 29th it was blowing hard and stayed between 40 and 50 miles per hour all day. We were fresher after the day's rest, however, and managed to make good 8 miles, going straight up wind almost due south. At 5 p.m. when we halted for lunch, it was blowing too hard to risk pitching the tent without a breakwind so we broke out a hole about 5 feet square and 2 feet deep, stacking up the snow to windward. This took about 15 minutes, but served three purposes. First, it gave a good shelter for a longitude observation with the theodolite; secondly, with the mast, yard and floor-cloth we converted it into a shelter snug enough to light the primus and have lunch more or less in comfort; and thirdly, a couple of minutes' work left a small mound as a back-mark which we picked up on the return journey.

A warm lunch is a most important thing when man-hauling, especially in heavy weather. Without shelter from the wind and some warm food it is almost impossible to remain still long enough to get a genuine rest, while a good rest in the middle of the day's run will always enable one to peg along a good deal further than would otherwise be possible. In other words, it considerably increases the efficiency of the

body as an engine. After lunch the going became harder. The wind remained the same but the gradient increased. The " scenery " became if possible more desolate—very few new sastrugi, the surface appearing generally old and pitted. In some places it was rotten and blown away, disclosing coarse granulated substrata. As the ridge was mounted, we crossed numbers of miniature crevasses, tiny cracks about an inch wide, regular and all running east and west. Wherever a sastrugi crossed one of them it was itself cracked across, showing a clean fresh fracture and evidently denoting very recent movement. As the top of the ridge was reached the surface merged into névé ice, while the cracks changed to small but genuine crevasses about 9 inches wide and 4 or 5 yards apart. The complete absence of fresh sastrugi gave the impression of a very heavy wind area. A ridge of rock closely underlying the snow surface and causing this disturbed ridge is possibly also accountable for the local attraction at our 100-mile camp.

We camped on the brow of this ridge at 11 p.m. and were surprised to see our old friend the 34-mile ridge just showing up again 60 miles to the north. We were now in latitude 68° 32′, and we saw the midnight sun for the first time that summer, about a quarter of its rim remaining above the horizon.

That night it blew a full hurricane, and kept up between 50 and 60 miles an hour all day on the 30th so we did not get under way till 2 p.m. Before we moved off Webb found the magnetic needle had waltzed back 60° since the 100-mile, and now pointed 30° E. of south again. However, we went straight into the wind, to give the needle a chance to make up its mind. We soon lost the névé ice, meeting country rougher than any we had previously seen. Sastrugi, themselves a foot or so high, running north and south, rising out of ramps about 4 feet high, very regular and running east and west. By 6 p.m. we had made only 4 miles and were nearly played out. We had halted for a spell and were discussing the possibility of going further when the matter was settled for us by the discovery that the theodolite legs were missing. They had evidently worked out from under the straps as a result of some of the numerous overturns. It was my fault for I was in the lead this day and I had taken the usual look over the sledge at each " spell " but had not noticed anything loose. There was nothing for it but to return for them. The solemn rites of "shuteye" determined that Webb was to stay and make camp while Hurley and I retraced our steps. Though it was very pleasant to be walking down-wind for a change, this was no easy task, as sledge runners leave no marks on hard snow. The only tracks are the small holes made by the spikes on our crampons and on the wheel of the sledge-meter. About 2½ miles back, however, we found the legs and after a hard plug up-wind again arrived at the sledge where Webb had a good breakwind up; in a few minutes we were enjoying our hoosh and cocoa. While we were lying half toggled into our sleeping bags writing our diaries, Hurley spent some time alternately imprecating the wind and invoking it for a calm next day. As he said, once behind a breakwind one could safely defy it, but on the trail one is much more humble.

Whether it was in honour of Queen Alexandra's birthday or whether Hurley's pious efforts of the evening before had taken effect, December 1st proved a good day for us. By noon the wind had dropped sufficiently for us to hoist our Jack and Commonwealth Ensign for the occasion. We felt the effects of the last few days' battling and only did 4 miles before lunch halt. We now saw a very distinct ridge about 10 miles to our west and south—quite the most definitely rising ground we had seen since leaving the coast. In one place there was a patch of immense crevasses easily visible to the naked eye. Almost due-south also we could see some very distinct black shadows on it. As these were almost on our course we marched straight for them, and, thanks to occasional slight down-grades and a fairly good surface on which we could discard our crampons, made another 6 miles by 11.30 p.m.

During this march we were visited by a Skua. It alighted a few yards off and I immediately commenced stalking it with a fishing-line which this time was all ready and baited with a piece of pemmican. However, it was quite as contemptuous of the line as of me and flew off south-south-east as far as we could follow it. Was it taking a short cut to the Ross Sea ?

On the 2nd there was but little wind. The country became distinctly undulating and we had hard work up some of the slopes. In one little valley known to us afterwards as " Dead-Beat Gully," we came on a fine patch of sastrugi, very sharp and hard, and from 3 to 4½ feet high, through which it was quite difficult to work the sledge. We had been marching in the direction of the shadows we had seen the day before, and suddenly late in the evening, as we topped one ridge, they appeared only a couple of miles away over the sky-line. It was a weird sight—just like the edge of the moon seen through a large telescope. We

then saw that the shadows were due to large mounds of snow on the south side of a steep ridge. There were three main mounds cross-connected with regular lines of small mounds, giving the impression of a subdivided town site. The low evening sun threw everything up in the most wonderful relief. We pushed on and soon descended about 100 feet into the valley lying immediately to the north of the ridge. We camped on a patch of snow on rising ground just beyond the floor of the valley, which was mostly névé ice.

We turned out on the morning of the 3rd and got a better view of our surroundings than we had had by the deceptive evening light. We were in a valley running roughly west-north-west and east-south-east, the gently sloping northern side of which we had descended last night. The southern side rose much more steeply and from it three large mounds projected northwards about 200 feet above the bottom of the valley, into which they fell just like tailings heaps from a mine. At 100 yards east of our camp was a smaller mound or "nodule" as we christened them. It was of snow almost but not quite converted to ice. A crevasse about 8 feet wide ran under its southern end parallel to the valley, and from this crevasse it rose in 70 yards northwards to a height of 40 feet and then fell gently to valley bed again in about 200 yards. Both sides were very steep as it was only about 20 yards wide at the base. We went due south up the ridge on a névé ice surface and found ourselves in a very regular network of crevasses. One set ran almost up the slope south-westwards and another almost parallel to the slope south-eastwards. They were about 10 feet wide and fairly well bridged. A most noticeable feature was the presence of "hedges" of ice on either side of the former up to a height of about 6 feet, continuous except for gaps at each intersection with a south-easterly crevasse. It was now nearly calm and in every crack or air-hole in the crevasse-bridges beautiful fern-like ice crystals were seen. These must have just been forming as a very light puff would destroy them. A thousand yards from our camp we anchored the sledge and spent three hours exploring the locality. The slope from here to our camp site was almost 4 degrees, the steepest grade being about 1 in 8. We were just level with the top of the easternmost nodule while the other two were considerably higher. We roped ourselves together and walked up the ridge (Plate LXXVIII, fig. 2), finding as we neared the top that the crevasses were becoming much wider, while the "hedges" were disappearing. Making our way towards the centre nodule we found that it was immediately to the north or leeward of the intersection of two crevasses each about 40 feet wide. The bridge of the south-easterly crevasse had dropped some 30 feet for a length of 80 yards. Doubtless an eddy from this hole accounts for the deposit of snow and the building up of the nodule. Webb went down at the end of the alpine rope and found the bridge below quite solid. Possibly later in the season the crevasses are much more open. The walls were vertical and very clean cut of compacted snow. For about half a mile the top of the ridge was practically level, 300 feet above the valley bed. The surface was still of névé ice intersected by canals 40, 60 and 80 feet wide in which the snow bridge was generally 4 or 5 feet from the top. We followed one of these three-quarters of a mile in a dead straight line south-westwards and found it became gradually obscured by sastrugi, and finally lost itself in ordinary plateau surface without, however, any appreciable variation in width. From this point the surface sloped downwards very gradually to the southward. On the south-west horizon, perhaps 20 miles away, was a ridge on which three dark vertical bars were plainly visible, evidently another crevassed area. It was only to the south-east that the land anywhere within 15 miles was as high as our ridge. In this direction, our ridge and valley gradually merged into the general surface of somewhat higher land. On our return journey we passed 11 miles east of this spot and found the surface quite normal and undisturbed. Returning to our sledge we toggled on and worked it up over the top of the ridge, much regretting that time would not allow us to examine the other two large nodules. Hurley was in the lead and lengthened his line by 30 feet of alpine rope, but even then all three of us and the sledge were often on the bridge of a crevasse. Luckily, however, they were pretty sound and none of us went in beyond the waist. Finally, we got on to ordinary sastrugi surface again and halted for lunch. We were all glad to have seen the place but I think none of us have any wish to see another like it.

The evening was fine and after a boil-up we struck off south-east as the magnetic needle had been pointing more or less that way for the last day or two. We camped that night with a total of 140 miles and 4,400 feet above sea-level so we were by this time fairly on the plateau. We were, however, very much worried about the dip which had steadily decreased since the 100-mile station and now stood at only 88° 30′, a loss of nearly half a degree in 40 miles. We consoled ourselves with the hope that a big sudden rise was being stored up for us somewhere along the way.

December 4th and 5th were fine days but gave us only 22 miles, as we met with fairly rough surface, a great quantity of very hard razor-backed sastrugi, generally about 2 feet high. These give the sledge a very rough passage, in fact we were continually marvelling that it could stand such usage. The sledge-meter, too, gets knocked about badly, coming down with a crash from the crest of each sastrugi. The sharp crests cut into the feet rather badly, while the wheelers (the two men hauling close to the sledge) get a rough time. The sledge balances itself on the top of a sastrugi for a moment with an ominous bend in the runners and then crashes down the slope jamming its bows into the next one, from which it has to be lifted clear. If it does not jam it is quite likely to catch one or both of the wheelers just above the heels giving them a sudden and undignified rest. The man in the lead knows nothing of this, and looks round very indignantly when he feels the full drag of the sledge on his rope. To-day, however, we had the advantage that we were crossing the sastrugi at about 45 degrees and so could get along without crampons as there was but little wind. Going directly along big sastrugi is much more difficult; in that case one has to wear crampons even in a calm if the sledge is heavy, and overturns are still more frequent.

During this run the needle again misbehaved itself, once changing its direction some 85 degrees in 10 miles, but by the night of December 5th we were getting past the disturbed locality and the dip had increased considerably. It was overcast that evening and snowed during the night. In the morning we were surprised to find the wind was round to south-east for the first time on the trip. The light was very bad and the previous night's snow was drifted in long ramps diagonally across the sastrugi, making going difficult but we did 10 miles. On the 7th we found that more snow was falling and the drift was very dense. In $2\frac{1}{2}$ hours we covered $2\frac{1}{4}$ miles practically blindly, blundering over sastrugi and into ramps of soft, new snow. There was nothing to be done but camp, so Webb filled in the afternoon with a full set of dip observations, a very unpleasant job at the best of times and rendered more so when the air is saturated with snow.

That night our breakwind at last played us its one possible trick. When we woke on the 8th we found that the heavy snow-fall with only a moderate wind had drifted us up. Of course, Hurley and I, who slept on the outsides, had known it most of the night. Before we could get out of our bags, Webb had to turn out from the middle to dig away the drift which was weighing down the tent walls on top of us. It was hopeless to think of travelling, so we turned to and dug out a snow cave in the afternoon. A hole about 7 feet deep was sunk 50 yards from the tent and covered with the mast, yard and sail. The hole was then enlarged to about 7 feet square at the bottom making a snug residence. It was snug in appearance at any rate, but we soon found there were two objections to the "Sarcophagus" as we named it. It was very dark, only a ghastly blue half tone filtering through the snow; also, being newly opened, its walls were very much colder than the surface snow warmed by summer temperatures. In the meantime Webb had started a declination "quick-run" consisting of half-hourly observations of the direction in which the compass was pointing. In ordinary latitudes during the day the compass needle moves over a few minutes of arc, but here, being so close to the magnetic pole the movement is greatly magnified, the range being about 5 degrees on this occasion.

Webb carried on until midnight and at 4 a.m. on December 9th I turned out, being relieved at 8 a.m. by Hurley who carried on until the 24 hours were completed. This observation should be especially valuable when it is compared with continuous magnetic records obtained at the same time at our winter quarters and by Scott at McMurdo Sound. As soon as the instrument was put away we moved back into the tent. It took the three of us some considerable time and all our strength to get the sledge through the 50 yards of soft snow, so travelling was out of the question. All we could do was to lie in bag and keep warm so as to save food, congratulating ourselves that we were finished with the "Sarcophagus."

In the morning (December 10th) the wind was blowing a good 60 miles per hour but by 1.30 p.m. it had dropped somewhat and we got under way. Very little of the hard old sastrugi was exposed, for it was mostly covered with two sets of new ones. The first were in long ramps lying south-east and north-west just as they were deposited during the last few days' snowfall, while the second were being formed from them by the wind which had worked back during the night to its usual south-by-east direction. We did 7 miles in all but it was hard going. Although the wind dropped as low as 15 miles per hour for an hour or so, our fastest spell of half an hour gave us only three-quarters of a mile while the first 200 yards took just 12 minutes. We passed a fine example of the typical old sastrugi. It was only about 3 feet above the general

surface but was 8 feet wide near the head and 30 feet long, while a trench 2 feet deep was cut in the surface round its head. To get a photograph of this veteran with its fine old pitted face, Hurley had to waste 18 films before he could persuade one to pull into place correctly. This loss following several other similar ones left us very short of films. We had treated the film packs very carefully keeping them in an air-tight tin but the cold was too much for them. The tags which should pull each film round from the back to the front of the pack usually came away with a small piece of film. In fact out of 120 films we only got 45 exposures.*

On the 11th we did 8½ miles over country much the same as the day before but we also met a good deal of "pie-crust" which hitherto we had scarcely seen. This in general is smooth and usually hard enough to support the sledge runners safely, but one's feet break through in a most annoying and tiring manner.

The drift eased off for a few hours and we managed to dry off some of our gear a little. During our detention at the 174-mile camp, things which had all been wet enough before became absolutely saturated with drift which of course turns to ice when they are worn. Felt mitts are perhaps the worst in this respect. You could easily brain a man with one after it had been worn during a couple of days' drift. Sleeping bags, too, become very uncomfortable and heavy; they can very seldom be dried in this part of the world as there is nearly always at least some surface drift. Socks, mitts, finnesko, etc., are small enough to be lashed to the mast-head above surface drift, and so can be dried more frequently.

That night I decided that one more day must see us at our depot. We would then be 33 days out and my orders, both written and verbal, were explicit in that we should return not later than January 15th. Allowing three days' grace as necessary for contingencies there were 31 days for us to get to our furthest point and back to the Hut. I did not think we could count on travelling home at more than twice our outward speed, especially as more magnetic stations were required, so we must be back at the depot on December 27th unless we found we could travel exceedingly easily with a light sledge. By depoting on the 12th therefore we would about halve our remaining food and so get a good distribution of load.

On the 12th we plugged away over rather more undulating country, but the surface was even more difficult, pie-crust becoming more in evidence. We planned to get our depot 200 miles out and by 11.30 p.m. we came on a fine site for it 199¾ miles by sledge-meter from the Hut in latitude 69° 33·1′ E. and longitude 145° 20′, altitude 4,850 feet. A ramp about 5 feet above the general level and just on the crest of a ridge gave a fine view nearly all round. To the south-east (the direction from which we would approach it on return) it was apparently about 4 miles to the sky-line, so we camped for the night, and put in most of the next day preparing the depot. All our gear was overhauled, one broken bracket on the sledge relashed; old socks, worn out finnesko, spare mitts and spare tent fabric were depoted. Even the hypsometer was transferred to an empty food bag and its leather case, the thought of whose 6 oz. weight had grown to be quite a source of irritation, was discarded together with some odd instrument straps we had not previously replaced by lamp-wick. Also, as our loads would now be lighter, we cut away a large proportion of the sledge decking, leaving only three light bamboo slats. A tin of exposed films, some of the repair and medical kits, and last but not least about ¾ oz. of tobacco for me and 15 cigarettes for Hurley were added. Ten days' food, 1 gallon of oil and a little alcohol completed the pile, and the whole was placed on a small mound to prevent it being drifted over. Some few yards away a solid 9-ft. mound was built surmounted with a black canvas and wire flag, about 6 feet higher, well stayed with steel wire. Meanwhile a jury spoke of bamboo was fitted in the sledge-meter which was showing signs of damage.

I took on food for 17 days, 3 days more than I intended to be out, partly so that we could keep on longer if we found we could make very fast time and also as a safeguard against thick weather when returning to the depot.

We set off late in the evening against only a stiff breeze. It was very different pulling the light sledge; very seldom was it necessary for one of the wheelers to break the sledge out, for in most cases when it jammed a sudden jerk from all three of us would now start it. We camped 3½ miles south-east of our depot which

* These were film packs. The film stiffened at low temperatures.—Ed.

showed up well as a bright golden spot in the low midnight sunlight. The wind as usual blew stronger during the early morning hours, but was down to a still breeze again by midday. After building a good mound here as it was even a better site than our depot, we set off. The day, however, proved very disappointing for, the pie-crust becoming very bad, we only managed to cover 12 miles in spite of our light sledge. The surface was exceedingly polished and either we crashed through it from 4 inches to a depth of even a foot, or else we slipped and came down heavily on knees, elbows or head; new finnesko no doubt helped this slipping. We were thankful, however, that with the light load crampons were not necessary.

At 11 p.m. we came on a remarkable ramp lying north and south about 5 chains long. From the west it rose smoothly at a grade of 1 in 5 to a height of 12 feet above the general level, so gradually that we did not see it in the evening light until we were right on it. On the eastern side there was a straight drop of 6 feet on to a ledge and then a fairly steep slope down to general level. This ramp fell away evenly to the north and appeared to be a deposit in the lee of a tangled mass of large sastrugi immediately at its southern end. These sastrugi were extremely hard but of quite a different type from the ordinary old pitted ones with overhanging heads. They rather give the impression that the wind, infuriated at finding a block of snow by some freak or other standing up to oppose it, had run amok with a giant gouge and endeavoured to pare it down. Every now and then the gouge, missing its aim, has taken huge scoops out of the surface to each side, leaving trenches 2 and 3 feet deep.

We camped on the top of the ramp and that night had a talk (not the first by any means) over our prospects. Up to our 174-mile camp, relying on improving weather and surface we had put down 400 miles as dimly possible, but with the snow-fall there and the consequent delay and heavy going since, every day, had clipped a bit off this and now we saw we would be lucky if we could reach 300 miles. Moreover, the dip here was 89° 11′, practically what it had been ever since 150 miles—65 miles before. "65 miles for nothing! How far for the 49 more that we needed for a vertical dip?" This problem was apparently insoluble, so each of us toggled himself into his bag in a rather depressed state of mind. We had determined, however, to have a jolly good try for the 300 miles.

On the 15th we moved off after converting our breakwind into a good mound (215 miles) which showed up well till we lost it in the drift.

The ramp of the previous night proved to be merely an outpost of some extremely rough country. Ramp after ramp followed in quick succession, the visible horizon being often limited to 50 or 100 yards. At intervals between the ramps, the pie-crust competed with the snow dumped during our 174-mile fall, still soft enough to impede us considerably. Also a 30-mile wind helped to keep our run down to 12 miles again.

December 16th, however, proved a glorious day; only a 15-mile wind against us and for 10 miles a distinctly improved surface. The ramps which were still very numerous decreased to about 5 or 6 feet in height. Best of all, there was no drift, and for the second time since we left the Hut we were able to turn our sleeping bags inside out. They needed it too. The upper parts were not so bad as we had been able occasionally to prop them up open, above low light drift, but the lower halves were simply solid ice. Also for the first time for weeks we did not wear our burberries at all during the day which was a great relief. When we camped at 11 p.m. we were 14 miles to the good, and a lot of the ice had evaporated from our bags which had been strapped inside out on the top of the sledge. That night we opened our last food tank (14 days' ration) which had to see us back to the 200-mile depot and, all being well, a little beyond it. All three of us were having considerable trouble with snow-blindness about this time, the zinc sulphate and cocaine tabloids being in great demand. We were rather anxious as to how our eyes would fare on the return journey when we would be facing into the sun much more.

On the 17th we crossed into latitude 70° S. We again did 14 miles including a long lunch halt for longitude, azimuth and a complete declination observation. The declination was 40° E. It had been fairly steady round that direction for some days and our course had been generally south-east from the depot. The dip also was on the increase, 89° 25′. During this halt the sky clouded over from the south-east and a light snow-fall commenced. Luckily the clouds cleared again almost as rapidly as they had formed and we halted for the night 256 miles out at an altitude of 5,500 feet. The last 3 or 4 miles having been very

hard going and as it was well after midnight when we had stopped, we did not get on the move next day till fairly late. It was another splendid day. We aired our bags again, getting them nearly dry and, still better, after the first mile or so we met very little pie-crust. The wind was south-south-east all day, and it is evidently not uncommon in this locality as there were two distinct sets of hard sastrugi, one north and south and the other south-south-east. It augured well for sailing on our return as a south-south-east wind would be nearly behind us. In this stretch we passed some splendid sastrugi formations on the north side of a well marked undulation; this was so well defined as to be almost a valley, for we descended probably 50 feet into it in $\frac{3}{4}$ of a mile. The whole northern slope was one jumbled mass of ramps and sastrugi and we much regretted our lack of photographic material. We halted earlier that night with only 13 miles up and for once we were not all played out. It had been getting colder lately (— 21° F. the night before and 3° F. maximum during the day), and although we got the best wind conditions by travelling late, still it is better to stop a little earlier and pitch camp before the temperature gets down near the minimum.

Though the dip here had increased only $1\frac{1}{2}$ minutes in the last 19 miles, the luck certainly seemed to have changed, for on the 19th the weather was even finer. We had a dead calm and experienced a regular heat wave. As the sun rose higher and higher the tent became absolutely oppressive. The rime inside the tent had thawed, and water had actually trickled into our finnesko. The last thing to be done at night is to shape finnesko ready for the next day while they are still warm and limp, and hang them up out of the way on a lamp-wick stretched across the tent. On this morning, instead of being frozen stiff as the proverbial poker, they were hanging limp and wet. They looked rather pathetic but became revolting when we had to put them on. We were not used to this sort of thing and struggled out hurriedly for a breadth of fresh air. The temperature was 66° F. inside the tent, heated, of course, by the sun's rays which showed 105° F. on our black bulb thermometer. As the air temperature at the time was 3° F., some idea can be obtained of the heating effect of the sun when there is absolutely no wind. As soon as we got into harness we too began to feel it. Bit by bit we got rid of our clothing but unfortunately we soon came to bedrock in that respect as our underclothing was sewn on and was immovable. At lunch time with the thermometer at 12° F. we reluctantly dressed again as we knew we would cool off as soon as we stopped. Later about 9 p.m. clouds moved rapidly over from the south-east and the landscape faded into a blank shadowless nothing as usual on a cloudy day.

I was in the lead and thought I was picking a splendid course through the sastrugi. At last, however, at 11 p.m., just when leading the way over a particularly well chosen ramp, I felt the tow rope straining harder than usual and heard someone saying, "Isn't it about time to stop?" I looked round and just caught sight of the bow of the sledge pointing upwards out of a 6-ft. trench when I slipped down into another trench on the further side of the ramp. When we had all picked ourselves up we extricated the sledge and camped on the ramp, falling several times down the invisible slopes during the process. We had covered almost 14 miles during the day, bringing the total to 283 miles and also to our great satisfaction raising the dip to 89° 35′. Our bags were now nearly dry and it was a pleasure to be in them without being splashed with crystals of last night (and last month's) frozen breath.

In the morning we found it blowing 30 miles per hour again, which certainly seemed more natural, but by the time we were on the move it had dropped to a nice sailing breeze—a good omen for the return journey. At the time, however, we were not very appreciative as it was against us and we were going up-hill. It had to be our last day's run so we were "all out" when we halted after a good 15 miles, our longest day's march on the outward journey. Nevertheless, Webb turned out of the tent after hoosh and took an altitude of the sun at midnight. In spite of the low altitude, about 4 degrees and a temperature of —16° F. the resulting latitude differed less than half a mile from that obtained at noon next day.

On December 21st we stripped down the sledge load to tent, dip circle, theodolite, cooker and a little food, leaving everything else by our camping place. There was little chance of our missing it as there was only a 15-mile wind and scarcely any drift. For $2\frac{1}{2}$ miles we went south-east over rising ground, remarkably smooth, very few of the sastrugi being over 2 feet high, until the sledge-meter showed 301 miles.

While Hurley and I pitched the tent (Plate LXXIX, fig. 1) Webb built a breakwind 50 yards away for his instrument. Then followed a long set of magnetic observations. Owing to our extremely high magnetic latitude particular care was necessary. Dip was taken by Webb in two directions at right angles with four needles. By this method the true dip can be calculated without determining the magnetic meridian, which it was now difficult to obtain accurately. Total intensity observations with loaded dip needle and by deflections were taken and also a declination set with the 6-seconds trough needle. Meanwhile Hurley recorded for him. About 5 p.m. the magnetic work was interrupted, the theodolite replacing the dip circle on the legs, while I took a longitude shot. I was seeing double, being slightly snow-blind, and had some difficulty in choosing the correct combination from the assortment of suns and cross-wires visible in the telescope. Setting the vertical and horizontal wires simultaneously on the sun was beyond me so Webb had to take the observations for the true meridian which also checked my longitude shot. I returned to the sledge and continued some odd jobs, fitting up the sailing gear, boiling a thermometer, writing up our log, etc. Later I relieved Hurley, who had lunch ready for us by the time Webb had finished at 6·30 p.m.

Taking magnetic observations under these conditions is an extremely uncomfortable operation. Even a light wind will eddy round the breakwind, and it is wind that makes low temperatures formidable. Nearly all the work has to be done with bare fingers or thin instrument gloves, and the time taken is far greater than in temperate climates, owing chiefly to the necessity of preventing the fingers from "going" altogether and of very frequently freeing the instrument of moisture condensed from fingers and body. As the temperature was —12° F. when he had finished his four hours' work, it may be imagined that Webb was ready for his hot tea.

The dip proved to be 89° 43½′ or 16½′ off the vertical. We were in latitude 70° 36½′ and longitude 148° 10′ and altitude just over 5,900 feet.

After lunch we hoisted our Union Jack and Commonwealth Ensign, giving three cheers for the King—willing, but rather lonesome away in here. We searched the horizon with our glasses but could see nothing but snow, undulating and sastrugi-covered. To the south-east our horizon was limited by our old enemy "the next ridge" only some 2 miles away. We wondered what could be beyond although we knew it was only the same endless repetition, for 175 miles on the same course would bring us to the spot where David, Mawson and MacKay stood in 1909.

After Hurley had taken a photograph of the camp we struck the tent and repacked the sledge. Our two flag-poles at last assumed their real duties of mast and yard, sail was rigged, and after a final glance round we turned our backs to the plateau and faced homeward.

The wind was now very light, but was almost sufficient to move our skeleton load so we covered the 2½ miles back to our camp in an hour, hardly feeling the drag on our harness, and by 10 p.m. we were pitching our tent for the first time on the return journey. To quote from my diary of that night: "We have now been exactly six weeks on the tramp and somehow feel rather sad at turning back, even though it has not been quite a Sunday-school picnic all along. It is a great disappointment not to see a 90° dip but the time is too short with this 'climate.' It was higher than we expected to get after the unsatisfactory dips obtained near our 200-mile depot. The rate of increase since that spot has been fairly uniform and indicates that 90° might be reached in another 50 to 60 miles, if the same rate held and that means at least another week. It is no good thinking about it for 'orders are orders.' We'll have our work cut out to get back on time as it is. Twenty-five days till we become overdue. Certainly we have 23 days' food, 8 days' with us, 10 days' at 200 miles, and 5 days' at 67 miles, so with luck we should not go hungry, but Webb wants to get five more full dip sets on the way back if possible and this means 2½ days."

During the night our minimum thermometer registered — 25° F., our lowest temperature for the journey. December 21st is Midsummer Day too, so this must be a fairly chilly spot in winter. The temperatures while we were beyond the 200 miles as a rule varied each day between a little above zero Fahrenheit about 2 p.m. and about — 15° F. or — 20° F. during the night. At lower altitudes of course we found it considerably warmer.

By this time we were very short of finnesko. The new ones we had worn since the 200-mile had moulted exceptionally badly and were now almost "bald." The stitching wears badly as soon as the hair comes off and frequent mending is necessary. Hurley and I both used our sleeping finnesko for walking in, and found that plenty of good sleeping socks, with a pair of stockings over them to keep all snug, were quite warm enough even at — 25° F. and more restful to the feet. The only disadvantage is that foot-gear cannot be changed until sleeping bags are opened as stockings pick up the least trace of snow.

We rose earlier than usual on the 22nd so as to get more advantage from the wind which each evening had always tended to die down somewhat. We had a nice sailing wind 20 miles per hour and south-south-east, so it was only 20 degrees off our course. Even this proved too much for our large sail area (7 feet by 6 feet), the sledge capsizing on the smallest pretext. We tried several experiments during the day and finally got a very simple arrangement. Instead of hanging the yard from the top of the mast, we placed it across the load, reversing the sail and hooking the clews over the top of the mast. Three or four bits of lamp-wick at intervals up the mast served as reefing points by which we could quickly cut down our sail area, bunching the upper part of the sail as much as necessary. To the ends of the yard braces had been attached fitted with tent guy-rope tighteners. They had merely to be slipped over a hook at the back of the sledge so making sail was quite a simple process.

During the day we frequently saw our tracks in residual patches of hardened snow, all that was left from the snow which fell when we were 174 miles out. However, the tracks were much eroded, although only three days old. In this country it is hard to realise that on the Ross Barrier tracks a year old can often be found.

In the evening we sighted and passed our 283-mile mound, halting for the night about 3 miles beyond it, a run of nearly 19 miles (Plate LXXIX, fig. 2).

Our sledge-meter was now very sickly. Spoke after spoke had parted and we saw that nothing we could do would make it last very much longer. I purposed leaving our outward course at one stage and taking a cross country run of about 70 miles so as to cut off the slight detour we had made to the Nodules. The sledge-meter would be particularly useful there, while here we had mounds every now and then to check our distances. Accordingly the meter was removed and carried on the sledge.

The next day (December 23rd), I found my eyes rather bad. I tied a patch over one eye but walking proved very difficult as the surface was rough. A good wind was blowing so I tried a ride on the sledge with both eyes covered. It was not a success, however. Although the wind would almost move the sledge in good places it would frequently pull up with a jerk. I tried jumping off and pushing whenever it rolled more than usual but I realised that it was putting a lot of strain on Webb and Hurley though they strenuously denied it.

There was a good deal of drift but we were lucky enough to catch sight of our 269-mile mound about three-quarters of a mile away from our lunch camp. After lunch with all three in harness again we got on better. The wind and drift dropped a bit and we had little difficulty in picking up our 261½-mile mound which we passed by about 2 miles making a total of 20½ miles for the day. A thing that helped us unexpectedly was that now with the wind behind us we found it unnecessary to wear burberry trousers. Pyjama trousers took their place in all except the worst weather. It was a great relief as our burberry trousers were very heavy and were always frozen stiff with perspiration, besides making us nearly always too warm while marching, which is very tiring. The blouses were made of lighter material and would dry off much more rapidly, so were very little trouble in this respect.

A wind of 15 miles per hour with only a light drift enabled us to sight our 256-mile mound next day and recover our crampons which had been depoted there. We stopped for lunch at our old 249-mile camp and Webb took a complete set of magnetic observations and another time shot for watch rate. It was late when these were over so we did only 2½ miles more, halting for Christmas Eve well content with a run of 14 miles in addition to a set of observations.

On Christmas Day the wind was a little to the west of south and as we were crossing some very rough country it made sailing difficult. We covered 18½ miles. The wind was practically along the sastrugi and we were crossing both diagonally. As the sledge strikes each sastruga it skids northwards along it to the discomfort of the wheelers and the disgust of the leader. With a heavier wind this is got over by one of the wheelers pulling on a rope fixed to the upwind side of the sledge, but then the others have all the forward dragging to themselves. The wind to-day was not strong enough for this.

For Christmas dinner that night we had to content ourselves with revising the menu for the meal we would have on reaching our 200-mile depot. By now it was all pretty well mapped out. For several days while on the march we had been busy inventing dishes to be concocted from our rations, and now it was complete in theory. Hors d'oeuvre, soup, meat, pudding, sweets and wine were all designed and estimates out. Would we pick up the depot soon enough to justify an " auspicious occasion " ?

Next day we had a dead south wind of 30 miles per hour and again had a very rough time, dragging well up wind of our course to make up for the leeway we were continually making. Dodging big ramps and overturning on sastrugi, we covered an estimated 12 miles without sighting our 215-mile mound which we should have reached in 13 miles. We carefully searched for it with the glasses and although there was a good deal of drift, at last caught a glimpse of it. We had overdone it and were a good 2 miles up wind. We particularly wanted some photos of the ramps at this camp so made across to it and had lunch there, Hurley exposing the last of our films. The wind dropped to about 20 miles per hour and over an easier surface we had a better time. We picked up " Lot's wife " at 209 miles, a tall thin mound which Hurley had put up during a lunch camp on the way out, and camped about 8 miles from our depot, having marched 22½ miles.

On the 27th with a 35-mile wind and a good deal of drift, we did not see the 203-mile mound until we almost ran into it, but by 3 o'clock we sighted the depot and soon after we were there, finding everything in good order. Picking up a depot is quite an event and as we were half a day ahead of our programme we determined to hold the Christmas feast. We had a cup of tea and a bit of biscuit putting aside the rest of the lunch ration. Webb set up his instruments in lee of the big mound and commenced a set of observations, while I sorted out the gear we had left here and rearranged the sledge load.

Hurley was busy in the tent concocting all sorts of dishes. As our tableware was limited to three mugs and the Nansen cooker, we had to come in to deal with each course the moment it was ready. As we were determined to make a really high class meal, Hurley had started by actually cleaning out the cooker. The absence of reindeer hair and other oddments made all the concoctions taste quite strange, though they were made from the same old ration with one or two perks that still remained. After the " raisin gliders," soup and a good stiff hoosh, Webb finished his observations while I recorded for him.

It is wonderful what sledging does for the appetite. For the first week out the unaccustomed ration proved too much for us, but now when Hurley announced " pudding " we were all still ravenous. It was a fine example of ye goode olde English plum pudding, made from biscuit, sawn up with the saw from our pocket set of tools, fat picked out of pemmican, raisins and glaxo-and-sugar all boiled in an old food-bag. This pudding did the trick completely, for though it was quite small, we could hardly struggle through a savoury (" Angels on runners ") and cocoa. We revived when the " wine " was produced, made from stewed raisins and primus alcohol and toasted the King with much gusto. At the first sip to say the least we were disappointed. The rule " no heeltaps " nearly settled us, and quite a long interval and cigars, saved up for the occasion by Webb, were necessary before we could get courage enough to drink to the Other Sledging Parties and Our Supporting Party.

The sun was low in the south when, cigars out and conversation lagging, we finally toggled in for the finest sleep of the whole journey.

It blew up a bit during the night, but at 1.15 on the afternoon of the 28th we moved off in a 40-mile wind on the next section of the homeward march. For the first 10 miles our course was more northerly than hitherto, practically straight down wind. The sail was reefed down well to prevent the sledge over-running

us on smooth patches, and we made good pace. We stopped for lunch at the place where we expected to find the 190-mile mound but could not see it for drift, especially as the sky was now overcast. However, we could not have been far off, as 2 or 3 miles further on we picked up our outward tracks, or rather all that was left of them after a fortnight's wind—three footsteps and a yard of sledge-meter track, all raised ½ an inch, and undercut by the wind. Not very much, but quite a comfort when one is navigating in blind weather. Later on the light improved a little and we saw the 182-mile mound about three-quarters of a mile to the east. After another 3 miles we again halted intending to camp as it was 11·30 p.m. We had covered 21 miles but as it was clearing and the surface had been improving every mile, I proposed making a long run of it. We could make good progress with a wind like this on a good surface. Hurley and Webb both eagerly agreeing, we had a hoosh and a rest, and moved on at 1.15 a.m. after again fitting on the sledge-meter. We pegged away steadily for another 10 miles when we had a two-hour halt with a boil-up.

Once more the sky was clouded over and we had seen nothing of the mounds around the 170-mile. However, this was the point where we were to leave our old track so a course was laid direct for the 113-mile. The next four hours were broken only by the sledge-meter ringing up every now and then like a cash register, each time another broken spoke struck the forks. We would halt a minute and extract the remains. It was getting very groggy now, and when we halted thoroughly tired out at 11·30 a.m. of December 29th it was lying over on its side with a sickly expression. Out of the original 36 wire spokes only 12 wire and 1 wooden one remained. It indicated 22 miles, making (so we thought) a total of 43 miles in the 22¼ hours since we left the depot. Observations for position obtained next day proved that in its dying effort it overstepped the truth, our total run being 41·6 miles. We had taken 7½ days to cover this same stretch of country on the outward journey, or 5 days allowing for the time we were held up at the 174-mile. The difference is due mostly to the wind and gradient, but partly to the fact that the snow which fell then and made the surface very heavy was by now well hardened and not very rough. This run put us well ahead of schedule time, so after inspection of our food supply we found that we now had 4½ days' food more than was probably required to reach the 67½-mile depot.

It was decided to hold 3 days' of this and to use 1½ days' food as a bonus during the coming week, as long as we were ahead of our necessary distance. The sledging ration is quite enough to live on, but for the whole of our journey we had felt that we could have done more distance with a slightly larger ration. Indeed, we had decided that we were all getting in rather bad condition, often feeling faint after the day's march. No doubt this was partly due to our comparatively high altitude.

Before we turned in Webb took a latitude shot. Then we had a glorious sleep. Hurley and I suspected blisters, but in the morning careful examination while we were changing our foot-gear showed there was no harm done.

We cut the sledge-meter away and stuck it in the snow. It looked very forlorn sitting cock-eyed in its forks, with a pair of old worn out finnesko hanging over it. On December 30th after a run of 12 miles with a 30-mile wind, we camped for Webb to get another magnetic station. It was cloudy but he just managed to get the necessary sun observations, Hurley and I taking turns recording. There were several small holes in the tent which needed mending, and I experimented with adhesive plaster from our medical kit. It was a great success. Heated over a fusee and pressed hard down between the bottoms of mugs held outside and inside, the patches adhered well and made a permanent job. After this whenever we caught sight of one of our patches or darns (some of which I must say were really almost creditable), we would get quite annoyed at the remembrance of cold fingers and time wasted.

On the morning of the 31st we found snow falling. The light was very bad all day and we again ran into some rough sastrugi. Hurley had an attack of snow-blindness. He had a bad day but we improved matters by wearing finnesko crampons as boots without finnesko. This was a great help as one does not need to stare continually at the invisible sastrugi but can tread anywhere safely. It also saved finnesko which was important for we were now using the ones we had previously depoted as worn out. The wind

was only about 10 miles per hour, and we could not make full use of it as carrying a lot of sail meant too frequent overturns among the sastrugi. On the whole we were very glad to stop after a run of only 15 miles, estimating our position as 5 miles east of the 123-mile mound.

On New Year's Day the wind was fresher and the surface improved. It was overcast all day and snowed lightly most of the time. Very little could be seen. We noticed, however, some of the little surface cracks such as we had seen around the 109-mile. We estimated we were past the 113-mile but were not very hopeful of picking up a mound. Shortly afterwards the snow ceased, the light improved slightly and Webb sighted one 2 miles ahead. We were very lucky as it only showed up for a few minutes. We were soon there and identified it as the 109-mile. The mound was much weathered in front, and some of the upper blocks had fallen but it was still a good mark as a big sastrugi had formed in its lee.

It had been my turn to-day to be snow-blind. I was pretty bad by now, and it was a case of camping or of riding on the sledge. Our course changed here to straight down wind, so Webb and Hurley undertook the job, hauling the sledge with me as a passenger for 3½ miles to our 105-mile mound where we camped. It must have proved a trying finish to a run of 20 miles. In spite of this spell I was no better in the morning, having had no sleep during the night and again had to ride. The others hauled on for 5 miles with a good wind behind but a very bad light, as it snowed all day. We camped where we judged the 100-mile mound to be. In even such a short distance as 5 miles it is easy to miss a mound in weather like this, with nothing to march by but the wind and without a sledge-meter. We spent longer than usual over lunch, hoping that it would clear off, for a time shot at the mound was desirable to obtain our watch rate. It did not clear, however, so we moved on, or rather I was moved on again. After 2 miles the surface became much heavier. My eyes were better now from the rest and from a snow " poultice " Webb had invented, so I harnessed in. We had to pay now for the good surfaces we had met since the 200-mile, for we now met a surface of light unpacked snow 6 inches deep on top, with pie-crust underneath. We did 12 miles altogether. I was pretty tired after only 5 miles, so it can be imagined that the others had more than enough.

It was still snowing on the morning of January 3rd but the clouds broke at noon sufficiently for a latitude observation, which agreed with our reckoning. We plugged away over the same trying surface till lunch at 5 p.m. when the clouds broke up and the wind and drift almost ceased. In the better light we saw our 90-mile mound about 4 miles behind us right on our course. We must have passed a few hundred yards from it. At 11·30 p.m. we halted for the night after a very tiring 15 miles. Thanks to the last two days' heavy going we were still 11 miles from our depot, so at breakfast on the 4th we came down to half rations, so as to give ourselves plenty of time to locate the depot. On the 4th the sky was clear but the surface drift prevented us from seeing any of our mounds, till in the afternoon, we once or twice caught sight of the ramps near our depot. We decided they were bearing too much to the north so we altered our course a bit more to the west, and camped in rising wind and drift hoping to see the depot in the morning.

On January 5th, however, it was snowing lightly from a densely overcast sky. We moved on 2 miles but we could not see 100 yards, so camped again, walking as far as seemed safe from the tent in various directions. There was nothing for it but to wait until the weather cleared. The clouds broke in the evening and at 6 p.m. and 9 p.m. altitudes of the sun were obtained putting us as 4 miles south of the depot. With only one chronometer watch, one had to rely entirely on dead reckoning for longitude, rate of a single watch being very variable. When rates have been obtained over several sections of the journey the longitude observations finally tell you quite accurately where you *have been*, but at the time they do not tell you where you *are*. The longitude obtained on this occasion from our latest known rate indicated that we were still several miles to the east of the depot so I concluded that our distances since the 90-mile had been over-estimated and that we were probably to the south-east of it. Accordingly we moved off 4 miles to the north-west but by this time it had again clouded over and nothing could be seen. We camped for the night and on the 6th found it still overcast but at noon we checked our latitude by a lucky glimpse and moved on to the exact latitude of the depot. We walked east and west from the tent but it snowed all the afternoon and everything was invisible.

On the 7th the weather was the same and we moved 4 miles due east, camped again and walked about without avail. I now decided that, if the weather did not improve by morning, we should have to try to reach the coast. It was a risk but things were becoming serious here. On broaching the matter to Webb and Hurley, I found they agreed with me. However, at 3 a.m. on the 8th the sky cleared rapidly and we turned out and saw ramps clearly to the east. Webb set up the theodolite while Hurley and I paced out a half-mile base line to get our distance from the ramps. Just as we got to the end of it, however, the clouds were over again and we had the pleasure of seeing the ramps fade away as the light decreased. Before Webb had got the first angle they had completely disappeared and it started snowing again. This almost continuous cloudy weather and snow-fall was quite unexpected, as about this time the previous year while we were landing from the *Aurora* the sky had been almost uniformly clear.

There was only one thing for it now and that was to make a break for the coast. I turned out all the food remaining and found one full day's ration complete, together with enough pemmican for half a hoosh, six lumps of sugar and nine raisins rather the worse for wear, oil for two days and last but not least a pint of alcohol. We had now been four days on half rations, but were feeling perfectly fit, thanks no doubt to our good meals of the previous week, for which we were very thankful. We had 67 miles to go, which we estimated to take three days' travelling, but we could not hope to find the narrow descent to the Hut in thick weather, so we decided to make the food spin out for five days. We stripped off everything from the sledge and then loaded up with what was essential. Dip circle, thermometers, hypsometer, camera, spare clothing and most of the medical and repair kits were left. The only superfluous weights we put on board were the aluminium prismatic compass which Dr. Mawson had with him on the 1908 Magnetic Pole journey and the dip circle needles, altogether only a few ounces.

At 7 a.m. we set off on the final stage of our journey. The sky was densely overcast and snow was falling but we had a strong wind almost behind. We would march for an hour by my wrist watch and then halt for 5 minutes and on again till we all agreed we had covered 10 miles, when we halted for lunch. Each man's share consisted of one-third of a biscuit, a third of an ounce of butter, and a drink made of a spoonful of glaxo-and-sugar, and a spoonful of absolute alcohol mixed in a mug of luke warm water. We could not afford oil enough to do much more than thaw the water but the drop of alcohol had good effect, warming us splendidly and enabling us to get a good rest. After an hour's spell we started again, luckily seeing just enough of the sun to check our course. The wind grew stronger in the afternoon and several times dense fog banks drove down on us. We met one steep rise round which we sidled for what seemed hours but my chief memory of that afternoon is of the clouds on the northern horizon. They were a deep blue-grey colour— a typical water sky—but I have never seen clouds moving so fast. Steering by them was like trying to steer by one particular piece in a kaleidoscope. After every hour spell by my watch (each of which I lengthened out to an hour and a quarter), we would halt and decide what speed we had been travelling and when we were all satisfied we had covered a full 20 miles in the day we camped. Dinner consisted of a very watery hoosh followed up by a mug of alcohol and water. We were all very thankful for the forethought of Dr. Mawson in providing absolute alcohol for lighting the primus instead of methylated spirit. It is of course quite feasible to light a stove with kerosene alone, but any flame will do and it is much better to carry pure alcohol which is certainly a fine emergency food. Its use also avoids getting soot over everything. We were soon in bag and thanks to the alcohol and a nibble of chocolate and biscuit were soon off to sleep.

Our breakfast on the 9th was of about the same consistency as dinner the night before, but we had cocoa instead of alcohol. In fact breakfast was possibly even more watery, as I was in charge of the food bag and surreptitiously decided to make the rations last six days instead of five : for I did not like the look of things.

This was the worst day's march we had on our journey. The wind was blowing a full 60 miles per hour with dense drift and falling snow. What was worse was that by the position of our sledge we saw that the wind had veered to south-east and we had to pull across it. I was the up wind wheeler and had to hitch on

to the side of the sledge to keep the leeway as low as possible. We were continually jamming the sledge into big old invisible sastrugi and falling about in the wind. Therefore we called a halt to put on crampons—no easy task in bad weather, with hard wind, thick drift, and a fairly empty stomach; ideal conditions for getting frost-bitten fingres. After this we got on better, but when at 4 p.m. we got a faint indication of the sun's whereabouts for a few seconds we were disgusted to find that the wind by which we had been marching had now veered to south-by-east. So for possibly several hours we had been doing Heaven only knows how many times the amount of work necessary and for any time up to four hours might have been marching three points off our course. We now made much more rapid progress, being blown straight down wind, and about 6 p.m. halted for lunch. This was over almost as soon as we began, but we got a good rest, sheltering ourselves with the floor-cloth from the wind which blew through the tent. It is when one is hungry that particular care must be taken to conserve the heat of the body.

We were soon off again and plugged away till midnight when we were much surprised to find the usual snow surface merging into blue ice. We were all satisfied we had done 20 miles, so decided to camp. We pitched the tent on solid ice, getting snow from the bridge of a crevasse as we had no pick, even our ice-axe having been left behind. It took some time to chip holes for the legs with the shovel.

When we turned out on the morning of the 10th we were delighted to find the sky clearing and the wind moderating and further to see on the horizon a beautiful line of blue sea dotted with bergs.

We now officially considered ourselves to be 27 miles from the Hut. Privately I thought we might be as close as 20 miles, no closer. Accordingly, we decided that we could not afford time to go over to a small dark speck we saw to the east. Sastrugi often show black in the sun, and Webb who walked towards it for nearly a mile reported that it was probably 4 miles away and quite unrecognizable.

As we should not have met blue ice on our proper course till we were only 13 miles out, we decided that we must have got a long way to the east of our course the day before. When we started therefore in looking for a crossing place at each crevasse we edged to the west. It was easy work on a slight down-grade, and I made Webb ride on the sledge for a bit as he had already been walking. It was not long before we began to notice that the bergs on the horizon were rapidly enlarging and at last we realised that we were in reality only a few miles from them. Suddenly the grade increased, the ice becoming much cut up. We had some trouble getting the sledge along. Hurley was snow-blind and had one eye covered. He looked very comical feeling his way over the crevasses, but he probably did not consider it so humorous.

I was in the lead and suddenly, coming over a ridge above a steep ice fall, I caught sight of the Mackellar Islands and the old " Piano " berg. Just at that instant the spur of ice I was standing on collapsed, and down I went into a crevasse. The others soon had me out, and as soon as I was on top I gave them the news—" There are the Islands ! " Being 20 feet further back on the rope they had not yet seen them.

We were now able to place ourselves as about 3 miles west of the 5-mile cave. Our previous camp must have been about 13 miles from the Hut and we had really done 27 miles each day instead of our conservative 20.

We tried to work along to the east but the ice was too much cut up, so we camped for lunch on a patch of snow. In view of our good luck I produced that evening's hoosh ration in addition to our usual lunch. Even this meagre " spree " went against Hurley's feelings, for being snow-blind he had not been able to see the islands and positively would not believe that we were almost home.

After lunch we had to retrace our steps up wind for some distance to get out of the rough country and then went east. About midnight Webb sighted the 5-mile. Hurley and I had a competition as to who would see it first, for I was also getting a bit blind again. We had a dead heat at 150 yards, though Webb had seen it 2 miles off.

When we finally arrived the first thing we saw was an open tin of dog biscuits. These kept us going till we dug out a food tank from which we took a week's supply of chocolate. After that we proceeded in a happier frame of mind to open up the cave and have a meal.

Our journey was now practically over. We had a splendid time in the cave till 5 p.m. on January 11th when we went down the final 5 miles, arriving just after dinner and finding all well at the Hut.

We three had never thought that Hut quite such a fine place nor have we ever since.

THE WESTERN SLEDGE JOURNEY.

From the Report of F. H. BICKERTON, Leader.

It was for the exploration of the Adelie Land highlands to the west that the air-tractor sledge was allocated. Bickerton, in whose charge it always had been, had spent much time during the winter months repairing the severe damage which it sustained when on shipboard in transit from Australia. Also he had supplied it with a novel form of brake for operations on ice surfaces.

The air-tractor had been included in the Expedition equipment in the expectation that it would be employed traversing either bay-ice or flat shelf-ice like the Ross Barrier. Ever since circumstances forced us to winter at a spot so unsuitable for the operation of the air-tractor as Cape Denison, we had not entertained great hopes of its ultimate utility. However, Bickerton was determined to make use of it if possible and did everything he could to get useful results from it. It was obvious that to achieve any success at all in Adelie Land its use would have to be limited to the height of summer. Consequently, the departure of Bickerton's party was delayed until early December.

A trial run was made late in November. On that occasion, the machine, manned by three men, hauled a sledge load of supplies of over 350 lb. weight up the steep ice slopes towards Aladdin's Cave. The engine was not at its best but nevertheless the air-tractor gave promising performance. Bickerton reported: "But, in spite of this (one cylinder missing fire) and a head wind of 15 miles per hour, we covered the distance between the one-mile and two-mile flags in three minutes. This was on ice and the gradient one in fifteen."

On December 2nd a very successful trip to Aladdin's Cave was made with a total trailed load of about 870 lb. Final departure took place in perfectly calm weather at 4 p.m. on December 3rd. The Party, Bickerton, Whetter and Hodgeman, with a load of 400 lb. of supplies reached Aladdin's Cave in one hour. Additional food stores and petrol were then taken on and the air-tractor continued the journey trailing four sledges, a total load of 1,750 lb. as well as carrying the three men.

With this load progress was very disappointing. Continuing further inland and at increasing elevation the surface changed from ice to névé and the machine was then unable to haul the full load; a quantity of petrol had to be abandoned. One of the cylinders was missing fire and this Bickerton hoped to remedy on reaching Cathedral Grotto. After reducing the load they were still travelling at the rate of 6 miles per hour when at 11 p.m. the wind began to rise and camp was pitched.

Under calmer conditions at 4 p.m. the following day the engine was restarted and with one idle cylinder ejecting oil, progress was being made towards Cathedral Grotto when suddenly the engine pulled up with a jerk, smashing the propeller. It would appear that some metal part had got loose and jammed in the mechanism. It was immediately obvious that the air-tractor had to be abandoned. Without delay, the party equipped the man-hauled sledge and continued to Cathedral Grotto arriving there at 8 p.m. A start to the west over new country was made next morning, December 5th, in bright clear weather. The track of this sledge party is recorded on map-plate VII.

"To avoid crevasses we steered first of all to the south-west. After 6 miles the sastrugi became hard and compact, so the course was changed to due west. Shortly afterwards a piece of rock, which we took to be a meteorite,* was found on the surface of the snow. It measured approximately 5 inches by 3 inches by 3½ inches and was covered with a black scale which in places had blistered; three or four small pieces of this scale were lying within 3 inches of the main piece. Most of the surface was rounded except one

* The Adelie Land Meteorite—for description see these Reports, Series A, Vol. III. It was found at a distance of 6 miles 240 yards in a west-south-west direction from Cathedral Grotto.

face (that on the lee side from the prevailing wind) which looked as if it had been fractured. It was lying on the snow, in a slight depression, about 2½ inches below the mean surface and there was nothing to indicate that there had been any violent impact."

"At 8 p.m. that night we had done 12 miles, losing sight of the sea at a height of about 3,000 feet. All felt pleased and looked forward to getting over a ridge ahead, which, from an altitude of 4,000 feet, ran in pencilled outline to the western point of Commonwealth Bay."

During the three following days the party remained stormbound under conditions of thick drift and a 50-mile wind.*

"At 5 p.m. on December 8th a move was made. The drift was what our hut-standard reckoned to be 'moderate,' but the wind had fallen to 30 miles an hour and had veered to the east; so sail was hoisted. The going was difficult over a soft surface, and after five hours, by which time the drift had perceptibly thickened, we had done 8 miles.

"The next day it blew harder and drifted thicker. Above the loud flapping of the tent and the incessant sizzling of the drift we discussed our situation. We were one week 'out' and had travelled 31 miles. Future progress depended entirely on the weather—unfortunately. We were beginning to learn that though the season was 'meteorologically' called summer, it was hardly recognizable as such."

Further progress was made in wind and drift on the 11th. They set out in the late afternoon and had plodded on until after midnight over a soft and uncomfortable surface when it was discovered that the sledge-meter had broken down, the sprocket having been knocked off and lost. In future they had to estimate the miles covered, checked only occasionally by astronomic observations. The latter were to be had only on occasions when the sky was clear of cloud and the plateau surface free from drifting snow.

On December 13th progress was again made but it was a day of misfortune. They were travelling across the wind with sail hoisted when the sledge hit a large sastrugi with such force that the bow timber smashed. As this is a very vital part of a sledge they could not proceed until the damage had been repaired by utilizing a small male bamboo pole which had been brought for use as a depot pole. The repair job was evidently well done for it stood for the rest of the journey.

On December 16th the wind dropped and drift ceased for the first time since December 5th. During the whole of the eleven days heavy to moderate drift had prevailed.

"The next four days passed in excellent weather. The surface was mainly hard and the clusters of large sastrugi could generally be avoided. Patches of softer 'pie-crust' were met but only lasted for 2 or 3 miles. Making up for lost time, we did a few miles short of one hundred in five days.

"Unfortunately there was always drift at midday, so that it was impossible to get a latitude 'shot' with a sextant and artificial horizon.

"On December 19th camp was pitched at 1 a.m. before a glorious view; an horizon of sea from north-west to north-east and white fields of massive bergs. In the extreme north-west there was something which very closely resembled pack-ice.

"On the 20th the surface was softer and the snow more recent, but the wind was behind us and for part of the day the track led downhill into a peculiar saucer-shaped depression, which, on our first entry, looked like a valley closed at the far end, while when we came to the middle it resolved itself once more into a saucer.

"Camping here, I managed to get a good time-shot, so that, provided we occupied this camp on the return journey, I reckoned that I could get the watch-rate and fix the approximate longitude of the pack-ice, which for two days had been clearly within view."

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* Tabulated meteorological data for this journey appears as pages 247–257, Vol. V, Series B, of these Reports.

" December 21st marked the end of the good weather, for drift and wind came on apace lasting four days, the wind attaining about 80 miles an hour. Sleeping-bags and tent-cloth were soon in a wretched state, sodden with moisture. Christmas Day was not very enjoyable in cramped quarters, the tent having encroached on us owing to drift settling around it. Still, by the evening, it was clear enough to break camp and we made a spurt of 13 miles.

" From the next camp there was a good view to the north-west, the pack extending beyond the limit of vision. The land trended to the west-north-west and we could see it at a distance of 50 miles from our altitude.

" All things considered, I thought it right to turn back at this stage. In twenty-six days we had done 158 miles, and 97 miles of that distance had been covered on the only five consecutive good days. We waited some time until the sun appeared, when I was able to get an observation while Hodgeman made a sketch of the view.

" By December 30th, we reoccupied the camp of the 20th, 16 miles on the return journey. A time-shot was successful, and observations were also taken for magnetic declination.

" As the weather was fine, Hodgeman and Whetter went to investigate two odd-looking pyramids about 5 miles away. These turned out to be high snow-ramps, 200 yards long, on the lee side of open crevasses.

" The last day of 1912 was calm and ' snow-blind '—the first of this particular variety we had experienced without drift.

" On January 1st and the two succeeding days the drift was so thick that we had to lie up.

" The evening of the 4th found us camped 10 miles nearer home, beside a large crevasse and with a closer view of the bay, seen on December 20th. This time we were greatly excited to see rocks outcropping near the water-line, and an investigation of them was resolved upon for the following day.

" The morning broke overcast and ghostly white. Although only 10 yards away from it, we could not see the huge crevasse in our vicinity. Thus our expedition to the rocks had to be abandoned.

" After a week's travelling, during which obscured skies and intermittent drift were the rule, we were once more in the neighbourhood of Madigan's spring depot, 45 miles west of Aladdin's Cave. It had been passed without our seeing any signs of it on the outward journey, and, as we never relied on finding it, we did not mind about missing it again.

" Thick drift and a 50-mile wind on January 12th kept us confined for 36 hours. It was clear enough after noon on the 13th, and 5 miles were covered in four hours through thick surface drift.

" To avoid the drift, which was thickest by day, travelling had for some time been conducted at night. On the evening of the 14th, during a clear spell, a ridge rose up behind, and in front, a wide bay was visible with its far eastern point rising in mirage. This was taken to be Commonwealth Bay, but the fact could not be verified as the drift came on thickly once more. The day's march was 12 miles by concerted reckoning.

" Next day we went 3 miles to the north to see if any recognizable bergs would come in sight, but were stopped by crevasses. The eastward course was therefore resumed.

" After continuing for about a mile Hodgeman told us to stop, flung down his harness and dashed back to the sledge, rummaging in the instrument-box till he found the glasses, ' Yes, it's the aeroplane,' he said.

" This remark took us by surprise as we had not expected it for 8 miles at least."

It was then about midnight when mirage is at a maximum. Consequently it was thought that the air-tractor was about 12 miles away. They steered a little to the south of it to reach Cathedral Grotto but camped after 3 miles. The following day they went on to the east in thick drift and camped. On breaking camp on the 17th they were surprised to meet a flag which had been erected by Ninnis's party in the spring at 13 miles south-east of Aladdin's Cave. It was obvious that they had underestimated the distance to the air-tractor on the 15th and as a consequence had overshot their mark by 13 miles. Leaving Ninnis's flag they made off down the glacier slopes to Aladdin's Cave which was reached at 10 p.m. and later the Hut at 1.30 a.m. on the 18th.

ACTIVITIES OF THE WESTERN BASE PARTY.

THE ESTABLISHMENT OF THE WESTERN BASE STATION.

As the *Aurora* receded in the distance, the men of Wild's party ceased gazing hypnotically after her and turned their faces cheerfully and hopefully towards the shelf-ice where they were to be domiciled for good or ill for at least a twelve-month period before any relief could arrive. On that morning, the twenty-first of February, 1912, with their private luggage and some essential articles, they sledged from the brink of the ice precipice across some 640 yards to the site, selected as reasonably free from small crevasses, whereon the Hut was to be built. The job of erecting the structure was then immediately undertaken. The weather remained good but the temperature fell to 5° F. during the night.

The work went forward next day without hindrance, Jones, Hoadley, Kennedy and Harrisson building whilst Wild, Watson, Moyes and Dovers sledged equipment from the edge of the shelf-ice over to the Hut site. The nine Greenland sledge dogs landed with the party were in such poor condition from exposure on the long voyage that they were not employed in sledging operations until several months later.

On the following day a wind with drifting snow as fine in grain-size as castor sugar seriously hampered operations.

On February 24th the weather rapidly improved. By evening nearly all the framework of the Hut was erected. The sledgers brought in thirteen heavy loads during the day. It was found that the wind had driven out much of the bay-ice, including that to which the flying-fox was attached below. The strain had torn away the lower anchor and broken the sheer-legs at the top of the cliff.

The external walls of the Hut were completed on the 26th, and the first meal was eaten inside it on the 27th. The following day the whole structure was practically complete except for certain special features and some caulking of cracks in the walls. Rolls of tarred paper had been provided in the equipment, intended to be secured between the inner and outer wooden walls with the object of preventing draughts. However, the amateur builders tacked it on the outside of the outer wall, so the whole when completed looked quite funereal. The installation of the stove was celebrated by all hands participating in a special hot supper.

On February 27th, while working on the roof, Harrisson made an addition to geographical knowledge. Well to the north of the mainland, and bearing a little north of east, he could trace the outline of land. Subsequently, this was proved to be an island, 32 miles distant, and 17 miles north of the mainland. It was 20 miles long and 15 miles wide, being entirely ice-covered. This was eventually charted as Masson Island. This and other discoveries of the Western Base Party are shown in the folding map of Queen Mary Land.

The Hut which Wild's party subsequently named the "Grottoes," was of ample proportions for accommodating eight men. The living-room measured 20 feet square with an enclosed verandah 6 feet wide extending around the three windward sides. The height to the peak of the roof in the centre was 16 feet. Entrance to the interior was by way of a double-doored lobby. Daylight was admitted through four plate-glass skylights in the roof. The progress of hut construction is illustrated in Plate LXXXV.

The building was erected only just in time, for more wind and much more snow commenced the next day.

On March 1st, the sea-front of the bay-ice below the ice-shelf wall was found to be not very different in position from what it was when the ship departed. That day there were to be seen about a dozen seals basking on the sea-ice below the shelf-ice cliffs; also there were Adelie Penguins on the bay-ice and Emperors in the water. There was in sight also a solitary Skua but no other flying birds.

The energies of the whole party were now concentrated on sledging to the Hut the balance of the food stores, general equipment and the coal. The journey across from the dump at the cliff edge was not at all a flat run, for the surface of the shelf-ice thereabouts was undulating. There was first of all a long steep

icy slope to drag up, then a down grade which necessitated holding back on the loaded sledge, for it ended in an awkward sharp turn across the "Blue Devil" which was a small but troublesome crevasse; then there followed a more gradual slope which the sledgers had to traverse at a run to keep ahead of the sledge. Finally, a long and gradual pull up to the Hut completed the course.

Acetylene gas lighting was installed on the 2nd. That day Dovers and Kennedy were despatched to secure fresh meat. Towards evening they returned with a sledge load of seal steak and penguins.

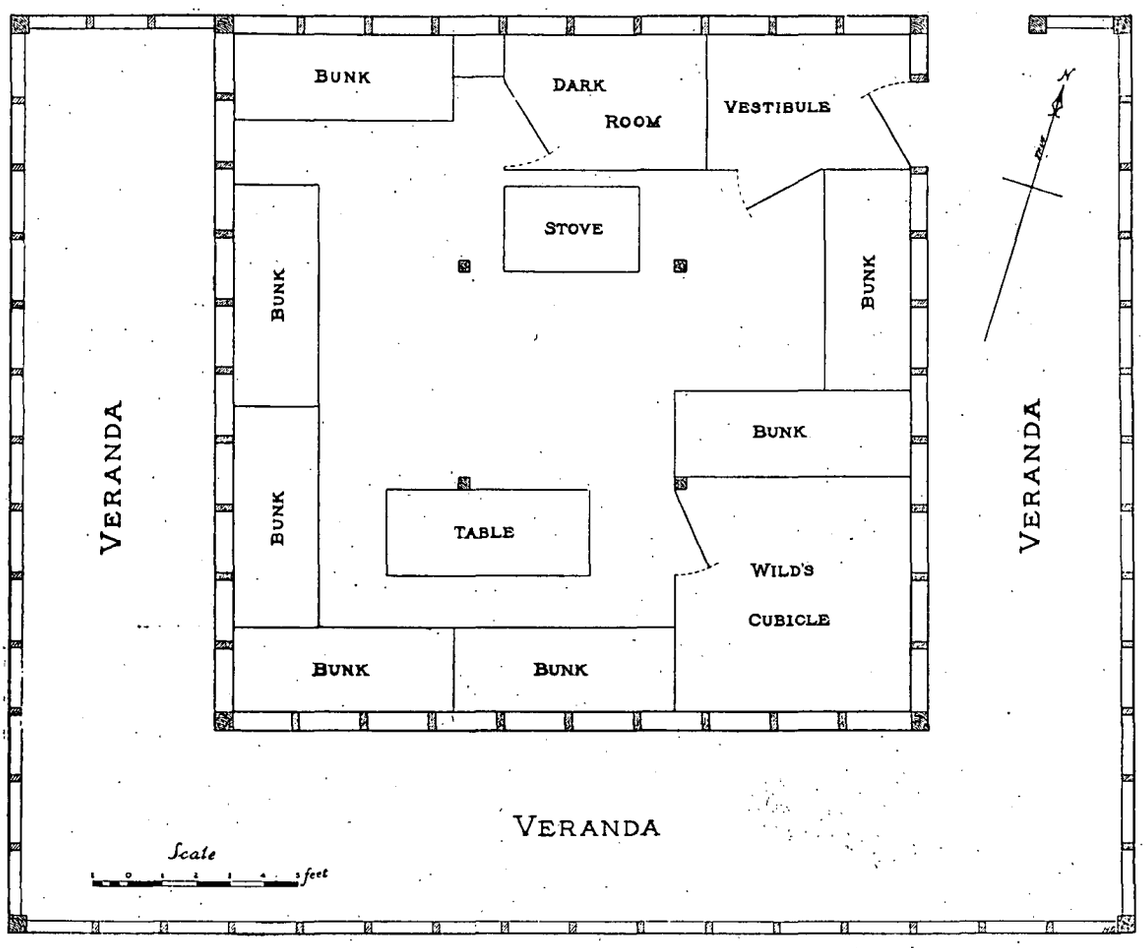

FIG. 15. Plan of the hut—"The Grottoes."

Several days of wind and snow then followed. There was a partial improvement on the 6th. The snow surface was then found to be level with the eaves of the Hut. On visiting the cliff edge, part of the bay-ice was found to have gone out. There was still bay-ice in the vicinity of the ice-shelf, but further away to the west none remained; the sea there extending much further to the south. Three groups of Emperor Penguins were sighted on the bay-ice, each numbering about a score of birds. A black mass away in the far distance to the west-south-west appeared to Harrisson to be an Emperor Penguin rookery.

March 9th was a bright day. Efforts were made to complete all preparations for an autumn depot-laying journey to the south. Two Skua Gulls flew around the Hut until shot by Jones. During the preceding few days frequent loud boomings were heard coming from the west, evidently arising from large falls from the shelf-ice wall.

Many days of wind and driving snow then followed, delaying sledging operations. On the 12th, when a visit was paid to the coal and stores still remaining at the dump where the flying-fox had been rigged, Harrisson recorded that there had evidently been falls from the cliffs, for all the grand cornices that had formerly featured the cliff edge were gone and indeed the precipice was visibly nearer to the dump of stores.

On the 13th when Dovers visited the cliff to get a case of dog biscuits, he witnessed the fall of a great mass from the cliffs between the landing point and Icy Cape (a projecting cape on the shelf-ice wall a couple of miles to the south of the landing spot). The falling mass, tumbling upon the bay-ice, smashed it up and set most of it free. Harrisson went across to look at it soon afterwards and reported that " the floe (bay-ice) over all the bay was broken up. That is, a stretch of ice, some 20 feet thick, and some 1½ miles long by ½ mile broad, had been shattered, not merely broken up. With the exception of two or three pieces, perhaps 10 or 20 acres in extent, the whole was literally shattered. The bay held a miniature ' pack '; it was filled with ice of all sizes, large fragments of the fallen ice floating high amongst the smaller pieces of the floe. I could not have believed it had I not seen it, that a fall from a portion of the icy cliffs above could have so effectively smashed up the floe and into such small pieces. But a great mass of ice had undoubtedly fallen and the floe was badly cracked."

With the bay-ice gone and merely a perpendicular cliff of 60 to 100 feet high along the sea-front, opportunities for obtaining seals and penguins for food were greatly restricted.

THE SOUTHERN RECONNAISSANCE JOURNEY.

March 13th.—On this day the weather was at last propitious for a start on the projected sledge journey, so they got away after lunch. Only Kennedy and Watson remained to carry on the scientific observations. The sledges were loaded with seven weeks' provisions for six men. Details of the sledging gear and food were as follows :—

	lb.	oz.
Small sledge (10-ft.) fitted with instrument box, oil tray, straps and centre bamboo ...	57	4
11-ft. sledge fitted with instrument box, oil tray, straps and bamboo	64	0
10 gallons kerosene in 1-gallon screw-topped tins	47	8
Six one-man sleeping bags	62	12
Provisions for six men for seven weeks, in bags	457	12
Four tins plasmon biscuits	326	8
Two tents with poles and floor cloths	57	8
Two cookers complete with mugs and spoons	24	0
Two primus heaters filled with kerosene	8	8
Two spades, two alpine ropes and two ice-axes	24	8
Extra clothing and etceteras for six men	96	0
Instruments	44	12
Three bamboos for depot flags	10	0
Bo's'un bag	4	8
	1,233	0

The whole load worked out at 205 lb. per man. Just as the party was about to depart ten inquisitive Skua Gulls settled down on the snow near the Hut. Six of them were shot for food.

A course was set to the south-south-east over the great level white waste towards the grey rim of the southern horizon where the highlands rose above the shelf-ice. Harrisson recorded, " It was a beautiful surface, level and fairly smooth, the snow crunching crisply under our feet. Sometimes slipping on a snow surface glazed with ice, sometimes sinking in snow, but really good going." They covered 7½ miles in four hours, then camped for the night. Departure from the Hut is shown in Plate LXXXVI, Fig. 1.

The 14th opened with a beautiful morning, so they got on the march soon after 7 a.m. The surface was not as good as on the previous day. It was softer and broke under their feet somewhat, as sand does, or collapsed in extensive pie-crust sheets. They encountered great undulations and the pulling was hard over such soft surfaces, especially when there was even a slight up grade. However, they had no reason to be dissatisfied, for by 5 p.m. the sledgemeter showed that over 13 miles had been traversed.

Harrisson recorded, "A glorious evening; the land getting visibly closer, but still far off. The land to the east* is falling behind. It appears to be a large island."

The evening camp was pitched south of the Antarctic Circle. During the night the temperature fell to — 16° F. but the weather remained clear and good.

"Away just after 7 a.m. tramping still for that low sweeping line to the south and heading east of south. White markings on that land had turned out to be scars, that through glasses were seen to be ice-falls over uneven ground. We could not guess how distant. The going was through the same crusty surface as yesterday, and the dragging heavy. The surface was like that of an ocean suddenly frozen while a heavy long swell was running—long undulations, and the sastrugi like smaller waves upon it.

"Presently down went Hoadley and Dovers into a crevasse, one to the shoulders, the other to his head. It was clear cut and too deep to see the bottom, an abyss of glorious blue, hung with long icicles, narrow enough to step over, so gave no trouble. We had already passed over narrow temperature (contraction) cracks, but were now getting amongst real crevasses, in the region where the glacier (shelf-ice) came away from the land. After lunch the going improved very much, the snow hard and firm—no more undulations. Then we seemed to come suddenly upon the land, or rather the ice-cap over land, for not a rock or stone was visible; though here and there a great ploughed-up line of shattered ice on the glacier surface indicated rock far down below the frozen surface. Wild's experienced eye detected crevasses (where the ice sheet left the land) and our team was separated wider by the two leaders pulling on a double alpine rope instead of the sledge traces.

"Presently we came to a great crevasse 50 or 60 feet wide. Moyes was tied to the alpine rope, and as the snow crust held him we crossed one by one, hanging on to the rope, and then pulled the sledge over. One little place broke through. The snow bridge appeared to be 20 feet thick except on the windward edge. We crossed several crevasses safely, and a stiff pull up a hard frozen surface to the flat at the top where we encamped distant 30 miles from the Hut. This was above the old sea beach of ages gone. In front rose the steep slope of the ice-cap; behind the endless glacier (shelf-ice). On the east a great ice-fall, at the foot of it a blue lake. To the west the undulations of the ice-cap, in slopes and knolls sweeping down to the glacier (shelf-ice)."

March 16th.—The morning broke sunny and bright. They all roped up and set out to reconnoitre the ice-falls to the east. "Our way was over névé—snow that had been melted on the surface and then frozen. In places it was smooth ice (these steep slopes face the summer sun) or hard grey snow, almost as hard and slippery, on a slope, as the névé. Both are good footing on a level.

"The slopes increase in steepness and are crevassed in successive furrows, their snowy bridges showing in long grey lines, across the névé, in very regular succession. We had no difficulty when crossing them in choosing, where possible, places where the snow bridge looked thick and high. Here and there a peep down a hole revealed a vista of glorious cobalt blue and long icicles 20 feet long, or buttresses and shoulders and encrustations of pure white snow against the deep-blue depths—blue and white blending most beautifully."

When the party reached the ice-fall they found the slopes high, rounded and slippery. Steps had to be cut in places. They climbed up amongst the huge ice masses with chasms of blue and white. The view was striking. The fallen masses of ice and blue depths and the névé slopes ploughed with long lines

*That first sighted by Harrisson from the roof of the Hut

of crevasses. Two blue frozen lakes and an endless ice plain to the north. It was hard enough to climb up, but more difficult to come down with a gale of wind behind. The tents were just visible as mere specks in the waste.

The sledge journey was continued next day. Harrisson wrote: "We were now on the first slope of the land—and after the first mile, the dragging became so heavy, we had to untoggle the rear sledge, and relay—drag one sledge up, then come back for the other. Some of the slopes were steep—about 1 in 12—so it was pretty solid dragging with only the one loaded sledge. Ahead was always a ridge, but on gaining the crest, it would prove to be only a slight flattening out and another ridge beyond, and from first to last on this trip there was always another beyond! Once only, this afternoon, were we able to toggle on the second sledge for a short distance. We passed over many crevasses on the steeper slopes, mostly narrow enough to step over. I fell into one (hidden by snow) up to the hips, saved myself from going further by the hands. Most were bridged with névé, and firm. Evidently the movement of the ice-cap is very slow. About 5 p.m., we stopped for the night on a patch of snow; the meter showing 2 miles 700 yards."

It blew up strongly during the night, so members of the party lay talking until the rattle of the tent lessened. Then out they got. A snow mound about 6 feet high was erected as a guide for the return journey. A start was made about 11·50 a.m. The sledges were dragged one at a time up the steep slopes. After much heavy work camp was pitched for the night at about $2\frac{1}{2}$ miles further south and 600 feet higher up the ice slopes. This camp was situated at a height of about 1,400 feet above sea-level.

Wild recorded, "The outlook to the south was a series of irregular terraces, varying from $\frac{1}{2}$ mile to 2 miles in breadth and 20 to 200 feet in height. These were furrowed by small valleys and traversed by ridges, but there was not a sign of rock anywhere."

A very early start was made on the 19th. The first 3 miles lay across a rough, sastrugi-furrowed surface. The sastrugi were, in the main, about a foot high and of a general south-east to north-west trend. At intervals there were sastrugi 3 or 4 feet in height. After some 3 miles the surface was nearly level so that both sledges could be hauled along together. After another 3 miles the party had to turn to the south-west in order to head off a valley depression. This took them more up hill and across wide crevasses. The later afternoon was over hard ridged and slippery sastrugi. The valley opened wide and rough, broken with crevasses and small ice falls. Camp was pitched at 1,500 feet above sea-level and 46 miles from the Hut.

The 20th was another beautiful day but cold; the temperature remained below zero all day. All day long they pulled up the east side of the long valley over similar sastrugi as negotiated the previous day. Sometimes there were high, hard, glazed ridges. When they camped at $8\frac{1}{4}$ miles for the day they appeared to be getting to the head of the long valley.

On the 21st they worked south and west but were still ascending slowly. They crossed to the west side of the valley and continued pulling over ridges but the surface often broadened out into sloping, rounded knolls and gully-heads. The total distance for the day was $7\frac{3}{4}$ miles.

The night temperature inside the tent was as low as — 7°F. On the 22nd thick falling snow was the order of the day. Nothing could be distinguished even a few yards away, just a dense whiteness enveloping everything. Throughout the afternoon there was scarcely enough breeze to flap the tent even gently, and the thick rain of flakes continued to descend. They remained in camp all day.

During the night a great wind got up and thereafter there was the dull roar of the wind and the driving snow surging past the tents. The tents thrashed and rattled so that the men could scarcely hear each other speak and, though the two tents were only 8 yards away from each other the occupants of either were entirely cut off from their mates in the other, even though they shouted. Moyes, who went outside to get kerosene from the sledge, reported that the air was so laden with flying snow that he saw nothing of the other tent. Sledging was out of the question.

This sort of thing continued throughout the 24th. The party suffered considerably for much snow managed to get into the tents, nearly filling one of them so that the occupants were virtually buried in snow.

The 25th opened well for the wind fell off to a light breeze and came in from the north-east. They were just preparing to break camp when back came the wind from the south-east, and drift as bad as ever. This state of things continued all day and throughout the 26th. The barometer during this period showed some remarkable fluctuations. The minimum temperature during the night was —2°F.; at noon it was 4°F.

By the 27th life in this camp became most irksome for they were still confined to the tents which were deeply buried in the snow, only 3 feet of the tip then projecting along the level surface of the surrounding plain. Also the temperature had risen to 25°F. and the sleeping bags had become wet with the thaw. A light breeze from the north-east was evidently bringing moist air from the sea.

These uncomfortably mild conditions continued until the early morning hours of the 28th when the north-east airs died away and perfect stillness reigned for a time. No snow fell; no eddying of drift; no sound to break the silence, just frozen stillness; then later a heavy slow flapping of the tent as a gentle wind from the south-east crept in. The weather rapidly improved. After lunch the sky was clear except for some light clouds; Wild decided to commence preparations for breaking camp.

The white glare of the snow fog had gone. All the landscape was soft shadeless white. It was not merely a case of drift around the tents, but everywhere the old surface was buried to an average depth of quite 3 feet. All that hard rough sastrugi-scored surface had gone and in its place a soft white waste, already just rippled with lines, the beginning of another set of sastrugi. The upper half of the two tents showed, each in its little bowl caused by wind scour. The walls of these moats were a good 3 to nearly 4 feet high. The sledges were completely buried, feet deep (Plate LXXXVI, Fig. 2).

Walking about one sank down above the knees. The sledges were dug out, and as members of the party stood in the holes lifting out the bags of provisions the surrounding snow surface was breast high. The prospect of attempting to drag sledges through this sea of soft snow was not attractive, so after the labours of digging out the camp the men retired for the night. The temperature in the early evening was 3° F., the wind then rising.

The early morning hours of the 29th were cold, a southerly wind dropping the temperature to —15° F. All the damp equipment froze stiff. Outside the sun shone but the wind was sufficient to develop a low drift which swirled up into the face.

Wild now decided that it would be hopeless to attempt further progress to the south. Indeed, with such a depth of soft fallen snow, he was anxious regarding the difficulty of return to the Hut. Retreat to the coast was ordered. A six-weeks' food supply was cached on a rise about half a mile distant from the camp.

In a fresh breeze and flying drift next day (30th), the tents were struck and the march begun. Of this Harrisson recorded: "We dragged, struggled, ploughed through drifts—fell and tried hands and knees—and at the cry of 'halt' would sink down gasping. It took us 3 hours to get the two sledges 900 yards." After lunch the journey was resumed and as they then entered upon a definite down grade, progress was better. The coast came into sight down the long valley encountered on the up journey. A course was directed to the coast down the west side of the valley depression. The day's run amounted to only 1 mile 450 yards.

When they turned out of the sleeping bags on the 31st, the wind had risen and the air was full of drift, so Wild decided to remain in camp. April 1st was worse, the fierce patter of drift snow stinging the tents.

The weather improved on April 2nd and the march was resumed in a fresh wind with low drift. It proved a wretched day for all hands as they alternately ploughed through soft drifts or broke through crusted surfaces. The day's work took them little more than 5 miles nearer the Hut.

April 3rd was a good, fine day, the distant slopes of the ice-cap shining in the sunlight. The going was much improved for frequent patches were encountered which would bear their weight. After noon they fell in with some of the old surface which had been stripped of newly fallen snow; as a consequence progress was rapid.

The sky became overcast and the light very bad. Harrisson wrote, " At 10 feet in front all appeared a smooth white surface—I might almost say a white vacancy." Distant objects, such as the sky line, were distinct, but all between was blurred into one indistinct whiteness. They could not even see that the land was sloping until the sledges started overtaking them. Altogether 12½ miles were covered, the latter part being over crevassed country.

An early start was made on the 4th in a cold fresh breeze and low drift. Back on the ice-cap drift was flying in clouds obscuring everything. After dragging over several ridges a view of the shelf-ice surface opened out before them. There was no definite division between the ice-capped land and the shelf-ice. Long, low, ramp-like tongues ran out from the ice slopes over the level surface of the shelf-ice.

From " Satan's Hollow," as the location of their long blizzard-bound camp was known, to the junction with the shelf-ice was a distance of about 21 miles. Their course had been straight down the ice slopes towards the shelf-ice, but exactly when they had left the ice-cap and stood on shelf-ice was not evident.

They found the shelf-ice surface excellent for sledging, better than when travelling across it three weeks earlier; it was now hard and glazed.

During the afternoon there were observed signs of an approaching blizzard. By 4.30 p.m. they had covered 17½ miles and, as all hands were fresh and willing, Wild decided to push on again after a meal, for there remained now only 6 miles more to the Hut.

Breaking camp once more just after 6 p.m., they pushed on in clear twilight with overcast sky. Harrisson here recorded: "Then as the moon ascended in the south-south-east the ice-slopes of the distant land beneath her showed white and misty, and a white irregular ' wake ' of light extended across the Glacier surface to us—here and there in it, patches of glazed snow shining like water. Passed some pressure ridges, but did not tumble into any crevasses; however, we took precaution to swing round and across them at right angles. Looking for the Hut was like looking for the proverbial needle in a bale of hay. The Glacier seemed to melt into the sky in the direction we were heading, we could not see any distance—nobody knew the exact position, direction, or distance of the Hut."

At 8.30 p.m., when they had covered a distance of 22½ miles for the day, Wild gave up searching for the Hut and camp was pitched.

They awoke next morning to find a furious blizzard raging. One of the tents was blown down and the occupants spent thirty-six very uncomfortable hours buried under the snow and without anything to eat.

They packed up camp on April 6th and continued their march in light drift and falling snow. They had not gone very far before Hoadley sighted the masts at their Winter Quarters. It then transpired that their camp on the night of April 4th had been pitched only 2 miles from the Hut.

On arrival they were welcomed by Watson and Kennedy who prepared for them a great dinner which was very acceptable after their rough experience of the past month.

On reviewing this reconnaissance journey, Wild reported: " I was very pleased with the way all the party had shaped. They had worked splendidly and were always cheerful, although conditions had been exceptionally trying during this journey. No one was any the worse for the hardships, except for a few blistered fingers from frost-bites. The party lost weight at the average of 2½ pounds; Harrisson was the greatest loser, being reduced 6 pounds. Out of the twenty-five days we were away, it was only possible to sledge on twelve days. The total distance covered, including relay work, was nearly 122 miles, and the greatest elevation reached on the southern mainland was 2,600 feet above sea-level."

AUTUMN OPERATIONS.

Wild's report states, "Kennedy and Watson had been very busy during the absence of the sledging party. In two days they had trained five of the dogs to pull in harness, and got to work on the stores, getting everything from the landing place and storing it round the Hut. The total number of sledge loads brought up from the landing on the Glacier edge to the Hut was 264—124 by Kennedy, Watson and dogs—so that the distance covered in that operation was 192 miles. The weather at the base had been as bad as that experienced by the sledging party, Kennedy and Watson being unable to leave the Hut the greater part of the time (Plate LXXXVII, Fig. 1).

The wireless masts both broke down in the first blizzard, which at the Hut the wind was blowing 90 miles an hour. The masts were of very poor timber, full of knots. They managed to repair and erect one of the masts again, but henceforth it was only 37 feet in height.

Watson had fitted up a splendid dark-room, and shelves, racks, etc., for kitchen utensils. (A corner of the interior of the Hut is illustrated in Plate XCII, Fig. 2.)

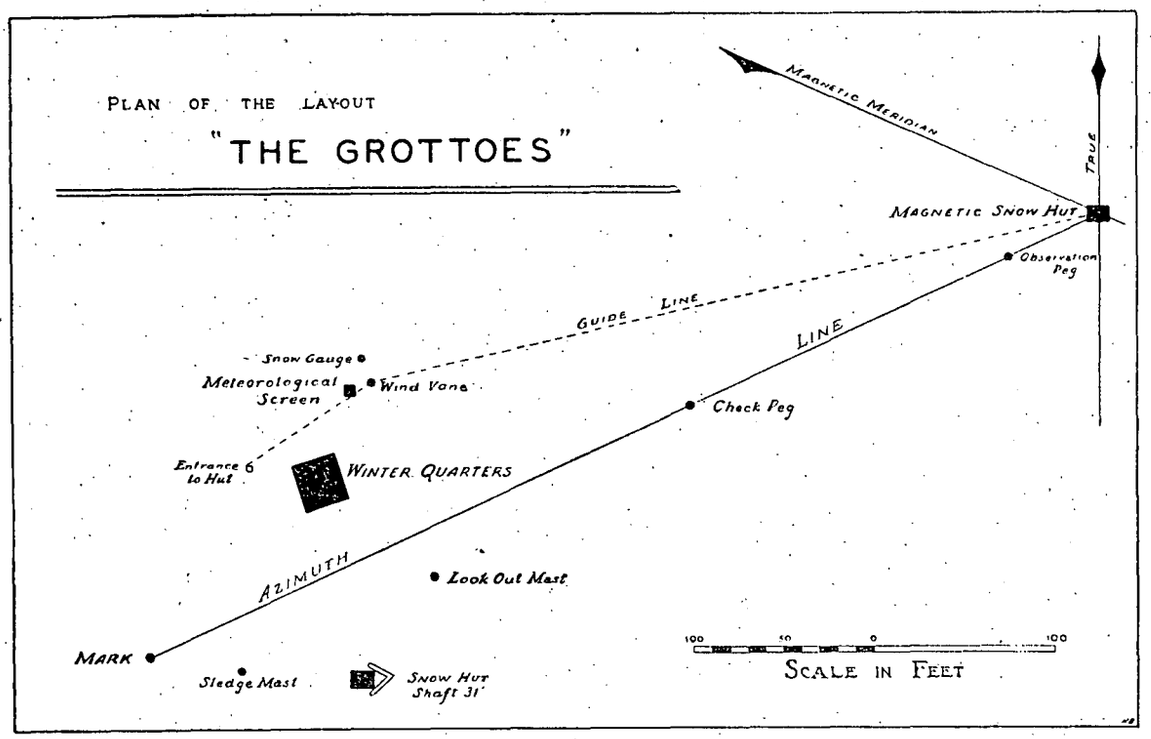

FIG. 16. A plan, to scale, illustrating the distribution of instruments and structures.

Kennedy was able to get a series of magnetic observations on one of his term days, but before the next one, the tent he was using was blown to ribbons."

A blizzard with very dense drift continued from April 6th to 9th. It took all hands an hour to dig their way out from the Hut. As a consequence Wild resolved to drive a 40-ft. long tunnel from the Hut, which would emerge at a point where wind scour would tend to keep the opening as free as possible. Thenceforth, the entrance to the Hut was a trap-door, built over the tunnel and raised well above the outside surface to prevent it drifting over. This trap-door was reached by a ladder from below. The end of the tunnel was left open so that in fine weather sledges could be dragged in and out. This latter arrangement was much handier for bringing in loads of ice, etc., but was offset by the fact that each blizzard which came along filled up the entrance and gave a day's work for two men to clear it again (Plate LXXXIX).

Having excavated this main tunnel, all hands then set to work to dig out a system of underground caverns as store rooms, all connected with the entrance tunnel. Thereafter, everything was accessible without the necessity of going outside. Winter Quarters now became a series of grottoes and henceforth was appropriately designated "The Grottoes," illustrated at this stage by Plate LXXXVII, Fig 2 and Plate XCII, Fig. 1.

Kennedy, with the help of others, built a large igloo to serve as a Magnetic Observatory. This was followed soon afterwards by the erection of a second igloo built over the mouth of a vertical shaft which Watson and Hoadley were to sink in the shelf-ice with the object of studying its nature (Plate LXXXVIII, Fig. 2).

On May 1st, Harrisson, Hoadley and Watson sledged south towards where the shelf-ice junctioned with the land. They were to search for seals for food, delineate the margin of the shelf-ice and examine icebergs embedded in the bay-ice. With them went four dogs dragging a load of 342 lb. weight. They followed south along the margin of the shelf-ice, finding it undulating and crevassed in places. At about 12 miles from the Grottoes, a region of very old thick bay-ice was encountered, evidently securely held in place for some seasons past by three large grounded bergs. This old floe area appeared to be free from tidal influence.

The nearest berg was well over a mile away from the shelf-ice. There they found the old bay-ice jammed against the berg by pressure which had heaped it up 40 or 50 feet high. For three days strong winds and drift hampered their movements, but encamped on the bay-ice in the lee of the shelf-ice, they escaped some of its force. Several days were spent examining the derelict grounded bergs and the shelf-ice at its junction with the ice-cap covering the land. They returned to the Grottoes on the evening of May 5th. Wild in his report states that "they had missed the strong winds blowing at the Base though less than 20 miles away." It may be that the sledge party had experienced less wind than those at the Grottoes, but they definitely reported considerable wind during three of the days.

On May 1st, Wild with other members of the party skied a few miles to the north along the edge of the shelf-ice, hoping to find a low part of the glacier where it would be possible to descend on to the sea-ice, to secure seals and penguins. Though several places were found not more than 40 or 50 feet high, there were none low enough to provide access to the frozen surface of the sea. As, however, there were no seals or penguins about, it did not matter much. The sea was found to be completely frozen over for a distance of 30 miles to the north.

During the blizzard on May 7th the barometer behaved very strangely, rising eight-tenths of an inch in a little over an hour, and then slowly falling again.

Recurrent blizzards with copious drifting snow cooped up Wild's party in the Grottoes during much of the winter months. However, unlike the Main Base station at Cape Denison, they were favoured by a moderate percentage of beautifully bright fine days. May 15th was one of these. Wild made the most of the occasion to examine the neighbourhood of Icy Cape (a point of the shelf-ice about 2 miles south of the Grottoes), searching for a means of access down to the sea-ice. He was accompanied by Harrisson, Hoadley, Dovers and Watson. They were successful in the quest. He reported: "At Icy Cape we got down quite easily by climbing into a crevasse, which opened out at sea-level into a magnificent cave, from which we walked straight out on to the sea-ice. We went some distance along the glacier (shelf-ice) edge, but saw no sign of life, finding not even so much as a seal hole."

During the autumn and winter months, Kennedy made bold efforts to carry out the magnetic programme entrusted to him. Unfortunately, his task was conducted at very low temperatures in the igloo which served as a shelter for the magnetic instruments. Furthermore, as his term hours usually extended from 10 p.m. to 2·30 a.m. he found it difficult to get volunteers to help him in the work. (See Plate XCIII, Fig. 2.)

Moyes was in charge of the meteorological records, a job which gave him constant work, much of it conducted in the face of adverse weather. Hoadley and Watson made observations on the ice formations, while Harrisson sought in vain during the winter months for matters of zoological and botanical interest.

Seals and birds were scarce or entirely absent during that period, and Harrisson was not provided with dredging equipment adequate to work in water 200 fathoms deep as was the sea in the neighbourhood of the Grottoes. Dr. Jones, besides ministering to the medical needs of the party, proved himself to be a very efficient tinsmith and artisan in many useful spheres of activity. Watson, Hoadley and Moyes were the photographers of the party. Several of the dogs perished, so that the party was soon left with only a paltry two or three, the care of which was not an onerous matter.

Thus it was that in fine weather during autumn and winter, they were able to devote much time to outdoor sports, of which skiing claimed most attention. For the rest, during the dark hours and in bad weather they engaged in a campaign of indoor games of which bridge took the premier place. This was in great contrast to life at the Main Base where there was so much more to claim our attention that only one game of cards was played during the first twelve months.

WINTER ACTIVITIES.

Wild recorded that "another heavy blizzard kept us prisoners from May 22nd to 24th, the wind at times reaching a force of 100 miles per hour. It was impossible to get out for meteorological observations or to feed the dogs until noon on the 24th, when Moyes and I went out during a slight lull, and with the aid of a rope from the trap-door, managed to find the dogs and gave them some biscuits. The drift was then so thick that we could not see more than 6 feet, and without a rope we should never have got back to the trap-door." Wild adds further, "It is very fortunate that the temperature always rises during a blizzard; they would otherwise be much more deadly than they are. At this time when we are getting — 25° to — 27° on fine days, the temperature rose with blizzards to + 25° or + 30°."

The last days of May were in fine weather. Kennedy and Harrisson took the opportunity to rebuild the Magnetic Igloo which had been demolished by the wind. Jones and Kennedy found a seal blow-hole near the steps that had been cut down the shelf-ice face leading to the bay-ice.

The duties of cook and night-watch, which were taken in rotation by the men, kept them fully occupied during their respective terms of office.

Manifestations of aurora polaris were fairly frequent and occasionally very brilliant, but on the whole not so regular a feature as was the case at the Main Base station. However, as no special effort was directed towards maintaining a close watch on auroral phenomena, the record secured is not sufficient to make very useful quantitative comparison with the prevalence and intensity manifested at Cape Denison.

Every effort was made to obtain seals for food but they proved to be very scarce indeed. However, on June 9th Dovers and Watson secured a Weddell Seal on the sea-ice some 2 miles to the west of the Grottoes.

By this date the drifting snow had built up on the sea-ice huge drifts under the lee of the face of the shelf-ice. Some of these were more than 50 feet in height and reached almost to the top of the cliff; the majority were very steep and irregular, so it was seldom that members of the party descended on ski without a fall.

On June 20th Hoadley and Watson set up a line of bamboos 3 miles long, each bamboo a quarter of a mile apart. From then on regular observations of snow accretion were made.

Mid-winter day, June 22nd, was a record to that date for low temperature, the thermometer reaching — 38° F. A special dinner accompanied by speeches marked the culmination of the day's festivities. Toasts were drunk with some of the 40 years old Madeira wine presented to the Expedition by J. Y. Buchanan of *Challenger* fame—wine that he had purchased in Madeira at the commencement of that memorable voyage and carried on board to the end of the cruise. Harrisson recorded in his diary: " Oddly enough, it had been drunk comparatively close to where the *Challenger* made down to her furthest south. Afterwards, Dr. Jones had all our signatures scratched on the bottle with his diamond, and I did a penguin on one side and a ship on the other—the bottle to be returned to Mr. Buchanan" (Plate XCI, Fig 2).

By the first week in July snow ramps reached almost continuously from the sea-ice to the top of the shelf-ice, so that there was no longer any difficulty in getting down to the sea-ice.

On July 3rd, Harrisson recorded, " In the last eleven weeks I have seen only two Snow Petrels and a seal—the only living things apart from our own establishment."

Early in July, Harrisson and Dovers made a hole through the bay-ice with the object of fishing through it. However, fish did not bite. On one occasion when they were close by, a seal pushed its head up through the opening but disappeared on catching sight of the men.

On July 5th and 6th, the wind strove to beat all records. Wild in his diary states that " it reached 100 miles per hour, and had we not known that nothing short of an earthquake could move the Hut, we should have been very uneasy."

On the 16th Wild reported seeing a Snow Petrel flit out of the mist. On July 21st it was noticed that one of the dogs had blood on its mouth and neck. Later in the day Wild found an Emperor Penguin on the sea-ice with all the flesh eaten off its back and partly off its breast. The dog had evidently worried it from behind and probably partly eaten it whilst still alive.

On July 25th, Hoadley and Watson had carried their shaft down into the shelf-ice to a depth of 27 feet. The sides were mostly blue ice alternating with white névé.

About this time Wild arranged for all hands to spend regular periods each week in active preparations for sledging. Foods had to be prepared and weighed out and calico bags sewn up to hold the rations. This all took time; particularly so since the sewing machine landed with Wild's party had a vital part missing and thus was useless. All sewing had to be done by hand.

Since early in autumn, Harrisson had been very anxious to explore first in the direction of Masson Island from the summit of which a good view of the country beyond could be obtained; also to sledge across the sea-ice to the south-west in which direction so many Emperor Penguins had been seen from the ship that there was a hope of locating a rookery. For various reasons, however, Wild had not been able to arrange for such undertakings.

Harrisson wished to visit the large berg frozen into the sea-ice some miles north of the Grottoes. Wild gave his permission; Watson, Hoadley and Dovers joined. The party of four and the dogs to drag the sledge set out on August 14th. At $8\frac{3}{4}$ miles north of the Grottoes a Weddell Seal was sighted asleep on the ice. This was killed and the meat cached (Plate XC, Fig. 2).

Just beyond this point a wedge-shaped ravine extended in a south-south-east direction into the shelf-ice. It was floored with old sea-ice thickened by thick accretions of drift-snow dumped upon it.

A further 3 miles brought them to the berg. This was first visited on June 28th by Harrisson and Dovers. On that occasion Harrisson reported, " This berg was tilted to the north-east, where its further end was apparently in contact with the ice cliffs, the south-west end lifted, and was considerably higher than the Glacier cliffs. Its sides, for about half of the height, were wave-worn and smooth; the rest similar in appearance to the cliffs behind it. Around the berg, then, 3 or 4 acres of the floe was buckled, ploughed up, and in places heaped 20 feet high, while two or three large fragments of the broken floe were poised aloft on the old ' water-line ' of the berg." On the occasion of this second visit great changes had taken place, recorded by Harrisson as follows: "The berg has turned completely over, towards the cliffs, and is now floating upon its side, surrounded by broken fragments—all fast locked in the floe. In what had been the bottom of the berg, Hoadley and Watson made an interesting find of stones and pebbles—the first found in this dead land . . . No sign of open water seen, either off the long point of the Glacier, stretching away north, or between that and the Western Barrier.* Nor could I see any signs of penguins or rookeries; but a couple of seals were observed asleep under the cliffs." A single Snow Petrel had been sighted during the day.

* What the Western Base Party constantly referred to as "The Western Barrier" was the ice wall of the great grounded ceberg some miles west of their Winter Quarters.

The 15th and 16th were days of high wind and drift, but the party by closely following the edge of the shelf-ice managed to reach the Grottoes safely on the 16th, bringing back with them a much needed supply of fresh seal meat.

At lunch time on the 14th after the departure of Harrisson's party, Jones had sighted a group of seven Emperor Penguins some 2 miles out on the sea-ice to the west. Wild wrote, " We immediately set out for them taking a sledge and a camera. When still a mile away they saw us and came to meet us, greeting us with bows and pretty speeches. It seemed an awful shame to kill them, but we were sorely in need of fresh meat, so four of them had to die. They averaged 70 lb. each in weight."

THE EASTERN DEPOT LAYING JOURNEY.

Wild arranged for a spring depot-laying journey over the shelf-ice with the object of assisting an extended summer journey which Wild had decided to undertake towards the east. The party was to consist of six men and the three remaining dogs. Hoadley and Kennedy were to remain at the base, the former to complete the glaciological shaft and the latter for magnetic work. There remained also a good deal for them to do preparing stores for later sledge journeys.

The sledge load amounted in all to 1,440 pounds. This was distributed over three sledges of which one was drawn by the dogs. The Jaeger fleece combination suits of the Expedition outfit, though stated by Wild to be excellent garments for base station work, were regarded as too heavy for sledging. For sledging Wild adopted Jaeger woollen underclothing with only Burberry windproof suits as an over-garment. We, on the other hand, travelling in the cold blizzard winds of Adelie Land, were glad to wear the fleece combination suits referred to above.

Clear weather arrived on the 22nd. They had packed up and departed from the Hut by 7 a.m. The day's run amounted to 11½ miles. On the 23rd more than 9½ miles were covered. The land-ice slopes were in sight far to the right of their course; well to the left was Henderson Island. Soon after starting on the day's march a mile-wide belt of crevasses was traversed, crossing about at right angles to the fissures. The widest was about 30 feet across. The temperatures remained low ranging from — 20° to — 34° F.

On August 24th they covered nearly 10¾ miles. During the afternoon two small rocky islets in the shelf-ice were sighted. These lay about 8 miles to the south among much pressure-ice.

Continuing on the 25th a course was made almost due east at a distance of about 10 miles from the mainland. They passed between Henderson Island and the mainland, and came in sight of another island still further to the east and much like Henderson Island. Harrisson reported that the shelf-ice in this region between the islands and the land was found to be heaved up in " league-long billows," so high that in the trough of one, Henderson Island was entirely shut out from view. Wild states that " several mounds were passed to-day from 30 or 40 feet in height and from half a mile to a mile in diameter; they appear to be caused by the glacier riding over smooth-topped rises. We also crossed about thirty cracks which show recent movement."

On account of a strong east-south-east wind and drift they did not break camp on the 25th.

An early start was made on the 27th in beautiful bright weather. The surface was of a highly polished nature with some patches of new snow drifts from the snow fall of the previous evening. A distance of 5½ miles was covered by lunch where, however, camp was pitched for the day as thick drift was observed approaching from the south-east.

High winds with varying density of drift confined the party to their tents during the 28th and 29th. Then the wind became gusty, clearing up considerably during the early morning hours of the 30th. They got under way and covered another 6½ miles before camp was again pitched in the face of further drift bearing down upon them.

They were under way again the next morning at 8 a.m., sledging past the perpendicular cliff face of Henderson Island which was found to be about the same height as the face of the Shackleton Shelf. No rock was exposed. There was then a long pull up a great sweeping " billow," gradually passing the island. The shelf-ice surface was heaped up against the island, but with no apparent break. At 11 a.m. they topped the glacier " billow " and there obtained a good view all round. A great sweeping embayment of the coast of the mainland to the south was named the " Bay of Winds " since swirling drift clouds were a feature of it. From the shelf-ice in this bay an even ice slope led up to the high plateau further south. Harrisson, describing the view, recorded : " Eastward from this bay, the coastline is high—mostly cliffs over which the ice-cap has come in mighty ice-falls, slopes, etc., crevassed and ridged. Land behind sloping into almost a table-land, lowering eastward. It's a fine bit of coastline. But what excited most interest was rocks ! Undoubted rocks at last ! A large razor-backed rock or ' nunatak ' in the east end of the ' Bay of the Winds,' several rocks shown on the coast behind it—a cliff face in one place, with a great ice cliff above, where the ice-cap's edge has fallen away—still further along, a cliff of rock and other rock tops showing. Many miles ahead what appears to be another large nunatak, standing out in the glacier. Beyond this the land tapers to a low point, another point beyond, on the east horizon, faintly seen, and perhaps 30 miles away ; apparently ending in a broken point—looks like rock."

The razor-backed nunatak* ahead was styled the Hippo and another small one in the centre of the Bay of Winds was named the Alligator. During the afternoon they crossed about a mile wide belt of crevasses, all well bridged.

The camp that night was a cold one with a temperature about 60° F. below freezing point and a very uncomfortable wind blowing. On the morning of September 1st they were under way at 7·40 a.m. making for the Hippo. It was further off than originally estimated. Though 15½ miles were covered during the day, the night camp had to be pitched several miles short of the nunatak. Wild recorded that " the surface all day was cut up by very heavy sastrugi, many of the ridges being 2 or 3 feet high and almost as hard as ice. When we came to camp, the surface was so badly cut up that we had some trouble to find a camping ground, and finally had to pitch the tents a quarter of a mile apart."

The night was again cold, the thermometer registering about 70° of frost.

An early start was made on September 2nd and a further 2 miles covered which brought them as near to the Hippo as practicable for camping ; this was half a mile distant to the north-west of the mass. Nearer to the nunatak the ice was so shattered that no suitable camping ground offered.

Referring to their approach to the rock mass, Harrisson wrote, " All around the surface is hard névé—almost ice—with a great pressure ' billow ' heaved up to the south-west ; shattered ice all along the west side, tailing away like a high broken ' wave ' for a mile or two to the north-east. All along heaped up, piled, broken, splintered ; with crevasses running out at right angles. We looked down one or two crevasses we crossed, and saw only a bottomless depth of blue."

As soon as the tents were pitched members of the party hurried off to examine the nunatak. A belt of greatly heaved and broken ice had to be negotiated before reaching the rock. Around the base a vast fosse was encountered—a wall of rock on the one hand and the shattered ice piled on the other. There was evidence of much thaw in summer time.

They scrambled to the top which was found to be 420 feet above the level of the shelf-ice. The other dimensions recorded are a length of half a mile and breadth of 200 yards. The rocks were reported to be granite, schist and gneiss. The shelf-ice sweeping around this rock showed up strikingly from the summit, recorded by Harrisson as follows : " Heaped up solid and smooth to the east and south ; heaved in a billow to the south-west, sweeping shattered and loose to the west and tailing off broken to the north-east and the black threads of crevasses rayed out."

* In the records of the Western Base Party, certain rocky peaks such as these, projecting through the Shackleton Ice-Shelf, are referred to as " nunataks," though they are actually islands since they rise from the floor of the sea some distance off the coast of the Antarctic mainland.

Watson photographed and collected rocks whilst Harrisson secured half a dozen varieties of lichen and one moss, the first plants located in that newly-discovered land. A fully-fledged, mummified Snow Petrel was also found, showing that the birds must nest amongst the rocks in summer time.

The night was a very cold one, recording as low as — 47° F. When they commenced marching next day (the 2nd) it was — 29° F., but not many minutes later it had risen to — 6° F. This sudden rise was apparently directly connected with the advent of a stiff southerly breeze which sprang up just as they made a start. The wind was so strong that great difficulty was experienced in trying to advance across the smooth, hard névé surface. They and the sledges were carried bodily to leeward. It was a strong wind without drift-snow. After going only about 500 yards, Wild decided to return to the camping spot just abandoned, where there was some shelter in the lee of the nunatak. Tents were pitched and they remained in camp all day. Later in the day Wild remarked in his diary, " Curiously the barometer is the highest we have had this year, 29·96 inches; the temperature is now + 12° F.

On the morning of September 4th there was less wind. Wild decided to depot food and surplus gear and return to the Grottoes. He recorded, " We are 84 miles out; I had hoped to do 100, but we can make it up by starting the summer journey a few days earlier. We left one sledge here, six weeks' allowance of food for three men except tea, of which there was sufficient for fifty days, seventy days' oil and seventy-eight days' biscuit. The sledge was placed on end in a hole 3 feet deep and a mound built around it 6 feet high, a bamboo and flag lashed to the top. Supporting stays from the sledge were made fast to the food-bags, one of which weighed 133 lb. and the other 68 lb., and these also were buried. The total weight of material cached was 453 lb."

A course was set to the south-west with the object of coming up with the mainland coast on the return journey. As the coast was approached a broad belt of hard polished and furrowed névé was crossed— " most uncomfortable ' going '—hard and nobbly—and so smooth that it was difficult keeping our feet in that stiff gusty wind."

On close approach, the coastline, defined by great crevassed downfalls and rock outcrops, was most impressive. Shortly after 3 p.m. a halt was called in front of a great cliff and a quarter of a mile distant from it. There a great wall of solid rock rose sheer for over 400 feet and was crowned by an ice-cap quite 200 feet in thickness (Plate XCIII, Fig. 1).

They had erected one tent and were setting the other, when the wind, which had been blowing fresh from the west, suddenly veered right around to the east and flattened out both tents. Later, having successfully erected the tents, and when about to retire to the sleeping bags, a tremendous avalanche came down just abreast of the camp. Harrisson continued, " A shattering roar from the ice cliff startled us. I was next the door; with a quick jerk had it untied and plunged out, followed by the others. The roar was fearfully loud—and the sight terrible to us! The face of the cliff was veiled in a dense smoke of rising drift that advanced towards us, spurting out white puffs at its foot where the blocks of the avalanche were bounding down the slope towards us. The cloud rose, spread, advanced—shutting out all the ice cliffs from view. I called out to the other fellows to turn out; but the knot in their door fastening had fouled, and they could not get it undone. Then a second rending crash from behind that cloud of drift. Someone called desperately for a knife. I cried quickly, ' Don't cut,' for no blocks were coming near us. Luckily Dovers hadn't a knife, or he would have ripped both tents in his excitement. Those imprisoned inside were desperate, knowing not what was happening. With one accord they heaved up the loaded skirt and three men crawled out from underneath—scattering the snow in all directions: how I laughed at the sight! The smoke blew over like a wet mist . . . No blocks came down as far as our tents."

Several more avalanches came down through the night, disturbing their sleep, but they were not quite so alarming as the first one.

A strong breeze was blowing next morning (5th) but not strong enough to prevent sledging. However, just as a start was being made to prepare breakfast, a terrific squall descended splitting Wild's tent from top to bottom. The wind increased in force and the second tent had to be dropped to save it from a like fate.

Whilst Wild and his tent mates were trying to collect and save their gear, Harrisson was instructed to search for shelter in sunken crevasses. Here Harrisson recorded, " Crossing the high rounded snow slope I got the full force of the storm, a gust hurling me down and sent me back headlong down the slope. It seemed to me that I was half an hour crossing that great smooth ridge. I would run, then as the next squall burst on me, dig my ice-axe in and hang on, but such was the force of the wind that the axe would be torn out, and I flung headlong back, swept along the smooth slope until digging fingers, toes, ice-axe into snow, I managed to pull up. Again and again I lost all I had gained between the squalls ! Finally, crawling on hands and knees, driving ice-axe deep at every step—and a final run carried me over. Could keep footing better off that ridge—and reached crevasses 5 to 10 feet wide and as much as 20 feet deep floored with snow. One gave a little shelter, but very little. Then saw Dovers coming over slope, and after him Wild—and I had a good laugh watching them going thro' same experience, whipped off their feet and sliding helplessly back ! Arms and legs flying as they went over ! Decided would never get sledges over—so back again—headlong down that slope, throwing ourselves down, and checking our way with ice-axes. Wild, Jones and I held anxious consultation under lee of block of ice."

The final decision was to try excavating a shelter hole in the névé at the camp site. As a furious wind was blowing, even this was accomplished only with difficulty. Eventually a pit 12 feet long, 6 feet wide and 3 feet deep was produced. The sides were overhung so that it was wider at the bottom. This was roofed with sledges and tent poles, then the tents spread above and all buried under blocks of ice heaped above. In this retreat they managed to cook some food. When they turned into the sleeping bags the thermometer had risen to + 23° F.

The bad weather continued for some days. They maintained existence in the trench where they were moderately comfortable. Avalanches continued to descend at intervals during all this time. On one occasion when outside Harrisson actually saw one start—" the green ice crumbling away, ran down like a foaming cascade over the brown rock, beneath a cloud of ' smoke ' upon the slopes; with those rapid puffs spurting from beneath as the blocks rolled down the slope. That shattering, rending roar does not jar on our nerves as badly now."

Late in the afternoon of the 8th, on crawling out of the trench, Wild found the weather greatly improved; it had ceased snowing and was fairly clear but still windy. " Little whirlwinds flying about—occasional large ones—whittling snow in a thin column, 100 feet into the air. Could hear the wind blowing hard over the cliffs."

The temperature finally rose to such an extent that considerable drip from thawed snow descended upon them, making life very uncomfortable. Camp was broken on the morning of the 10th. They " ran before the wind " to the north over about 4 miles of polished névé surface in " rolling billows " of great size and some height. This brought them to the sastrugi-furrowed snow surface which extended from there on to the north. Harrisson wrote, " Looking back when at the sastrugi area, it reminded me of a great ocean roll covered with smaller waves and ripples, and flecked with foam."

A course was then set to the west. " We made great progress, though sastrugi at first rough, so rough that the dog sledge capsized once. Then into splendid ' going,' smooth glazed surface. . . . Day cleared off beautifully fine, and quite warm—included sun, only a little cirrus in the sky—in the west the coastline from which we have drawn away fast, clear and beautiful. The great cliffs under which we had camped still visible to-night, 20 miles away."

September 11th saw a return of the wind which kept them in camp all day. A strong gale with stinging drift came off the land. The minimum temperature was —30°F. The dogs spent the day crouched in a hole in the ice, giving vent to their feelings in a series of whines, ascending periodically to a prolonged howl.

It was still blowing fresh on the 12th but a considerable improvement on the gale of the previous day. Wild decided to travel. They were away at 8 a.m. over a very rough surface, with sastrugi frequently two to three feet high and very hard. The drift was fairly thick at times. With the wind dead astern, the

sledges were blown along with little assistance, so that by lunch time they had covered 11 miles. As the wind has increased to a moderate gale, causing considerable difficulty in erecting the tents, Wild decided not to break camp again in the afternoon.

The wind had dropped considerably by the morning of the 13th. They made a good start at 7.40 a.m. in spite of having a lot of digging out to do. The land was still obscured by drift. With the wind behind and a hard glazed surface under foot, the pace was fast, much of the distance being covered at a jog-trot. Falls were numerous and sometimes heavy. Watson hurt his foot rather badly in one of his falls. The distance covered was 21 miles, leaving only about 26 miles more to the Hut.

The 14th opened fine and the party got under way before 7 a.m. and made a rapid pace. Thirteen miles were covered by 11.30 a.m. when a halt was called for lunch. They were away again in less than an hour.

Harrisson's account of the march is interesting: "Day fine and bright; sun quite warm (the temperature actually ranged between — 18°F and — 28°F)—such as we generally have before bad weather. Nor were signs of a coming blizzard wanting; sky streaked with cirrus and a yellow haze below the sun; fine halo, but no parhelion; mirage-like bands of shining glass across the glacier. We were now in that monotonous stretch of glacier where nothing is to be seen, but the low, very distant land and island (Henderson Island).

". . . . at 4 p.m. stopped for fifteen minutes, and a bit to eat. Course altered more to the north-west. Then down through a considerable depression, where the lines of 'pressure' rose like waves 'topping' upon a bar—line upon line broken and irregular, green ice instead of water. The sail on the leading sledge made it strikingly like a boat crossing the bar in the sunset. Passed through between these, and over divers crevasses, sounding hollow beneath our tramp. Did not know quite our position. The twilight deepened. Then through the gloom, a line of cliffs came up—we at least had reached the glacier (shelf-ice) edge. We rushed on over more hollow-sounding crevasses until we could see a bit of the cliff. We thought it was Icy Cape . . . . turned north. There was just light enough from a light crescent moon to throw a feeble shadow, as we blundered on, dimly seeing crevasse and pressure ridge as we came upon them. Then we felt the sledges beginning to slip down a smooth incline, and stopped to find that we were within 20 yards of the cliff edge, for which we were heading! Turned more to the east. Knew by the absence of high pressure that it was not Icy Cape—halted in doubt."

It was hopeless to search further for the Hut, so Wild decided to camp. It was after 10 p.m. before they got into the ice-saturated sleeping bags with a very cold prospect ahead, for the temperature was —30°F. The day's run had amounted to more than 32½ miles.

They were on the march again before 7 a.m. on the 15th. The night camp was found to have been pitched in a hollow amongst pressure, and for a few minutes after starting they could see nothing to show where they were. On gaining the top of a ridge, however, the Hut appeared as a black speck away to the south. Two hours' march brought them to it, the distance by meter being 7 miles. They had overshot their objective the previous evening owing to the adoption of a wrong angular bearing on Henderson Island.

On arriving at the Hut all members of the sledge party weighed and found their average loss in weight since leaving the Hut to be 8 lbs. Hoadley and Kennedy cooked them a couple of fine meals during the day and in the evening Wild and Moyes on re-weighing found they had gained 5¾ lbs. and 7 lbs. respectively. The three-man reindeer sleeping bag used in Wild's tent during the twenty-five days' sledge journey, which, when dry, originally weighed 28 lbs., was found in its ice-laden state on return to weigh 59 lbs.

Hoadley and Kennedy reported a very quiet and busy time during the absence of the sledge party. Nothing much of special note appeared to have occurred except that the cowl of the chimney got choked with snow one night, nearly smothering Hoadley, asleep in his bunk, so that he was quite ill all the following day. They had all prepared and packed up the provisions for summer sledging. No sign of life had been seen, neither seal nor penguin.

The following day, September 16th, was one of beautiful weather. The returned sledgers revelled in the luxury of the Hut. During the afternoon an Antarctic Petrel flew along the edge of the shelf-ice; it was cheered as it passed by—the first living thing seen for a month past.

WESTERN DEPOT LAYING JOURNEY.

All hands were already busy discussing plans and preparing for further sledging. Wild arranged for Jones to take charge of a Western journey in the summer. In view of this, Jones decided to lay a depot as soon as possible. This was to be located on the land as far west as could be attained in a depot-laying journey of four weeks' duration over the old fast sea-ice skirting the coastline west of the Shackleton Shelf. Wild proposed sledging south with a party to pick up the depot left in the autumn.

However, the weather became bad and remained adverse for some days. They were troubled at this time by a great deal of thaw inside the Hut—mostly of ice between the inner and outer walls. Some of the men re-weighed themselves on the 21st, less than a week after return from sledging : Wild had put on 12 lbs., Moyes 13 lbs., Watson 14 lbs., Dovers 9 lbs., and Harrisson 12 lbs.

Wind and dense drift continued until the morning of the 26th when at last the blizzard ceased. Jones lost no time in getting away. Jones, Hoadley and Dovers were the main party, with Moyes and Harrisson as supports. Four men dragged the first sledge; one man and the three dogs brought up the second sledge. The total load of both sledges was 1,336 lbs.

On descending to the fast sea-ice they found the dragging heavy on account of extensive, rather soft, snow drifts strewn across the surface. The temperature rose to + 13°F. and the sea-ice became somewhat sticky. Camp was pitched at 7½ miles out.

Alas, it was snowing steadily next morning so that all hands after breakfasting turned in to the sleeping bags again to await a break in the weather. Harrison wrote : " After breakfast, Moyes and I lay in our bags chatting. Dogs restless and making some noise. Presently heard one pass—looked from the door and saw Switzerland with blood on his rope. Moyes turned out, and called " Penguins !" Hastily donning burberries, we found five Emperor Penguins had come fearlessly up to their doom. The dogs had dragged the ice-axes to which they had been tethered from the snow, and worried the birds—two dreadfully mangled, the other three badly torn and bitten. Even then, the great birds seem to have struggled silently—their foot prints and the blood stains were all round our tents. And these wolves do not ' bay ' like other dogs. So we, in our tent, had no suspicion of what was going on only a few yards away. One poor bird struggled up to the other tent door and lay there. Inside they heard it making low sounds as if complaining of such treatment to visitors. But the other chaps did not turn out. Moyes and I put it and another out of their misery. It does seem such a pity; such beautiful birds—such a yellow ' shade ' on their breasts, that seemed to change and deepen with every movement, and all blood-smeared and torn—not even the head worth skinning. The brutes of dogs did not even want fresh meat—it would have been acceptable in a week or so—now they are fat as butter. It is strange where the birds come from. They must be more than 20 miles from open water, even though they come west from beyond the Western Barrier—possibly more than 30 miles. And no ' leads ' or open cracks or holes that they could feed in within view. One of the dead birds was a great size. Found that I could not lift it without the blood-stained body rubbing against my clothes."

It was not until the afternoon of the 28th that the weather was judged sufficiently clear to continue with the march. The hauling through soft drift was very heavy, so that only a distance of 3 miles was added before camp pitched.

Next day in fine weather the journey was continued to the south-west. The wind increased and thick low drift followed. The hauling was very heavy. Finally the vicinity of the large grounded bergs near Junction Corner was reached. One of these appeared to have capsized and shattered. Amongst the debris from this berg was found ice discoloured with sediments, also gravel and mud, mixed with pebbles. Specimens of mica schist, granite, etc., were collected. When passing over a tide-crack late in the day a seal showed its head above the water. Camp was pitched just short of ten miles for the day.

There was wind with drift during the night and in the morning, but the weather had cleared up by noon when a start was made. Away to the south the shattered ice slopes showed up clearly. A line of broken ice was in view to the west; amongst it blocks and masses of " chocolate " coloured, earth-stained ice.

The sea-ice on which they were, was only a foot or eighteen inches above sea-level. Shortly afterwards they reached the old floe (more than one year old) which was 5 or 6 feet above the level of that already travelled over.

A long snow ramp led up to the bergs on the windward side. From the top of a hummocky patch about 40 feet high they tried to pick out a road through long lines of what appeared to be pressure belts in the sea-ice. Camp was pitched amongst large ice masses only 4¼ miles beyond the previous day's camp.

The weather on October 1st was bad, confining the party to camp most of the day. Some of them made reconnaissance to the south amidst a close-inshore belt of greatly crumbled and broken ice.

On the 2nd, as there was still a good deal of drift, the morning was again spent in reconnoitring the adjacent puzzling belt of tumultuous ice wherein great blocks of land-ice, often carrying erratics, were firmly cemented in sea-ice. Some marine shells and sand were also found amongst the earthy debris in the ice.

The ice coast to the west could be seen to turn north and in the far distance ended abruptly in a more elevated section. This latter appeared to be the tip of a long glacier tongue extending north from the land-ice slopes. It would appear that this tip had been driven up by pressure from behind on to a shoal area of the sea.

Camp was struck in the afternoon and a further distance of 6 miles covered before the evening halt.

They rose early on October 3rd and got under way by 6·35 a.m. continuing their course to the north and west to head off the ice cape. The breeze was fresh and drift could be seen on the ice-cap. The sky was overcast and there developed a great halo around the sun, occupying most of the north sky, and four mock suns.

Harrisson here recorded : " The first thing I saw upon coming from tent after lunch, was an Emperor Penguin coming for us at a great rate—tobogganing from the north-west. We watched the bird curiously—the dogs also caught sight of it and strained in their traces, with eager eyes. The bird came up fearlessly, until about 20 yards away—then a burst of howls from the dogs and it stopped and stood up. Hoadley and I walked down to it. It bowed stiffly, with a very ' distant ' air, and moved away. I had not the heart to kill that beautiful bird for dog's meat ! So bright the yellow round the neck and glossy the black hood; spotlessly clean the yellow-tinted breast. So we went on, Moyes whipping the dogs off it. The penguin had turned its back and stood there dejectedly—it never even looked round as our departing team passed a few yards behind it ! Appeared deeply disappointed in us."

During the day they had come up with the ice point and followed west across bays filled with sea-ice. By this time the great ice lobe had been recognised as a glacier tongue (later referred to as the Helen Glacier—Ed.) thrusting its way north amongst the sea-ice. The ice cliffs were white and marbled, veined with streaks of blue and some of it very dark blue. Crevasses were of a cobalt blue colour. The day's run amounted to just over 11 miles.

October 4th was a fine day. Continuing the march they soon reached a point of the glacier wall towards which they had been making. There the sledges were left and an ascent of the glacier made. From its summit could be seen the tip of the glacier to the north-west where it ended in detached bergs. The great iceberg-like mass which Wild's party had designated " the Western Barrier " could be seen low and far to the north-north-east. Harrisson remarked : " The floe (sea-ice—Ed.) around us appears young, showing large pressure blocks and ridges of ice heaved up. So all that old floe we landed on last February went out that autumn ! "

They found the top of the glacier much crevassed, some being 30 feet wide but snow covered, but the surface looked practicable to sledges over towards the south-west, the direction they wished to make to reach the land. So after return to the sledges and lunch they set to work to drag the sledges up to the top of the glacier. The rise to the top at this point was 110 feet. Further on some big undulations were traversed bringing them to greater heights. On reaching the top of a second great undulation, Harrisson recorded : " We topped the rise and stopped aghast ! Through the next valley ran a deep chasm . . . and broken ice."

Further progress could not be made in that direction, so back they went the way they had come, and camp for the night was pitched at the spot where they had lunched. After some discussion, Jones decided to return to Junction Corner and ascend the ice-cap there.

The 5th was a beautifully bright day and rapid progress was made across the sea-ice towards Junction Corner. A course was laid north of the outgoing track, where a less obstructed surface was to be expected. However, much broken bay-ice, heaved up in pressure ridges, was encountered. A Weddell Seal basking on the bay-ice beside a tide-crack was despatched for food. Camp was pitched at 11 miles for the day.

The morning of the 6th was fine with a low temperature, — 13° F. They were well in towards Junction Corner by the evening, having done 11 more miles. The sun went down obscured by a murky haze and the sky covered with cirrus, so that bad weather was anticipated.

Snow was drifting on the 7th, so they remained in camp. The following day the wind was troublesome but the sky clear. They divided up and reconnoitred through the rough ice, with a view to finding an easy ascent to the land-ice over which they hoped to complete the journey to Junction Corner.

Several large tide-cracks were met with and some Weddell Seals asleep thereby. Amongst the latter was a mother and calf just born. Moyes reported a passable ramp from sea-ice to ice-cap at the next point ahead.

The start was made at 7 a.m. on the 9th. A haul of a little over 1 mile brought the sledges to the ramp where the ascent to the land-ice was to be made. There the cliffs were low and in front was rough pressure-ice heaved to a height of 10 feet. Across this the sledges were taken and then hauled up in relays to the top of the land-ice. From there a good view was obtained of some well-defined lines of heavy pressure in the off-lying sea-ice.

The rest of the morning's march was across a good, hard, smooth sastrugi surface of the land-ice. Occasionally great patches of névé, many acres in extent, were encountered. The morning was rather dull and the névé slopes of the foreground appeared greenish-grey. The party rose considerably on the ice-slopes as they progressed, soon reaching 1,000 feet above the sea. A fine view was spread out to the north and west. The detail of the great seraced glacier to the west could be clearly discerned and what appeared to be a nunatak showed up near the land almost 30 miles to the west. The day's run amounted to $8\frac{3}{4}$ miles.

During the night a strong wind with drift-snow sprang up. They remained in camp on the 10th. The wind opened seams in Jones's tent, so they let it down and used it thenceforth as a roof over a trench cut in the ice which served as a shelter for them.

Alas ! the wind and drift continued without a break for more than a fortnight and there they remained immured. They soon became heartily sick of inaction, and spent an altogether uncomfortable time. The dogs also suffered much.

The weather improved somewhat on the 16th. A mound of ice was built and a quantity of food cached under it.

Eventually on October 26th, better weather prevailed and, though a fresh breeze with low drift continued, orders were given to break camp and make a dash for " The Grottoes." By 1 p.m. they had reached sea-level. After crossing the clean-swept sea-ice, passing three seals on the way, they camped for an early dinner at the seal meat depot left nearly three weeks earlier. The weather was glorious there, warm and bright, with no drift.

They determined to push on to the Hut that night. On the way a band of sixteen Adelie Penguins, some of which were killed for the dogs, was encountered. At 8 miles out from " The Grottoes " they fell in with Wild and Kennedy who had set out to search for the overdue party. The Hut was reached at midnight after a march of 28 miles.

SPRING AT THE "GROTTOES."

When Jones's party left the Hut on September 26th, Wild had intended setting out on a southern reconnaissance that day. However, the departure was postponed, the rest of the day being spent hoisting up to the surface the cases of stores which had been packed away in the underground grottoes. Wild thought it advisable to get them out then rather than have to dig them out later in the summer when he anticipated the roof of the caverns would collapse.

The next day was blizzarding and a start was not made until the 29th. Camp was then pitched 9 miles south of Winter Quarters.

By lunch time on the 30th they were 14 miles south of the Hut. They then encountered pressure and several crevasses. The uphill climb was commenced and with the sledges sinking 6 to 10 inches in soft snow, the hauling was heavy, so that only 3½ miles' progress was made in the afternoon.

Kennedy determined the magnetic elements at lunch time on October 1st. After that the wind sprang up with thick drift, so camp was pitched.

Further progress was made after noon on the 2nd, but it was uphill work, so less than 3 miles was accomplished.

They came upon a great hole where the lid of a crevasse had fallen in just before they reached it. The crevasse was about 30 feet wide. A length of 150 feet of the lid had collapsed. Until the collapse, there was no trace on the surface to show that a crevasse existed under the snow at that spot. They observed that when it fell in, the outrush of air was so great that it swept free of snow the surface thereabouts, and strewed around pieces of ejected ice.

Little progress was made on the following day before they were forced to camp owing to wind and drift. The march was not resumed until the 5th when a further 6½ miles was scored. They camped that night at 2,000 feet above sea-level.

In the face of a strong wind the journey south was resumed on the 6th but they had not gone far before Kennedy strained his leg. Wild then decided to return to Winter Quarters, which goal was reached at 4.30 p.m. on the 8th.

At the Grottoes a blizzard continued from October 10th to the 14th inclusive; but the 15th was a day of moderate south-east breeze with sun shining at intervals. An Antarctic Petrel was seen.

October 16th was a beautiful, calm, sunny day with a temperature ranging from 11° to — 2°F.

The blizzard returned on the 17th and continued unabated until 10.30 a.m. on the 22nd when it cleared up considerably but returned the following morning, and continued until 4 p.m. on October 25th. Wild then arranged for Kennedy and himself to set out in search of Jones's party whose return was overdue. Wild reported: "At 4 p.m. the wind eased to a strong breeze and I went to the masthead to have a look around. From Icy Cape to the south and west a gale was still blowing, and a heavy cloud of drift 50 to 60 feet high, obscured everything. At 5 p.m. we had a walk to the glacier edge, when Watson saw three Adelie Penguins approaching across the floe, and we went down to meet them, bringing them in for the larder. Four Antarctic Petrels flew over us while we were down there, a sign of returning summer, which was very cheering. At 9 p.m. the wind fell to light airs, the sky cleared, and the temperature dropped from 15° to 1°, giving promise of a fine day to-morrow. There is a good moon, nearly full, and as I expect, the Depot Laying Party will take advantage of it and march during the night. I have been on the lookout, but there is yet no sign of them.

"*Saturday, October 26th*—a fine bright morning, light breeze, temperature zero. We squared up the Hut, packed a sledge with provisions for eight men for fourteen days and started away on a search expedition at 10 a.m. The surface was fairly good, but as we stopped every half-hour to sweep the country with the glasses, we did not get on very rapidly. We had many false alarms, time after time thinking we sighted the

party, but it always turned out to be either a bit of pressure-ice or a particularly high piece of sastrugi. During the day we saw several Adelie Penguins wandering about singly and one party of eleven. A Cape Pigeon, Fulmar Petrel and a Skua Gull also paid us a visit.

" We camped at 5.30, having done a little over nine miles. Before turning in I had a last look round and was delighted to see Jones and party about a mile south of us. Leaving Watson to prepare some food, Kennedy and I went over to cut them off. It was now getting dark and we were within 200 yards of them before we were seen, and as they were to windward they could not hear our shouts. We were pleased to find them all looking well."

THE EASTERN SLEDGE JOURNEY.

October 28th all preparations were made for the Eastern Journey, the object of which was to chart as much of the coastline as possible, and at the same time to make geological and magnetic observations. Wild was to lead this party, which included also Kennedy and Watson. Another party, comprising Jones, Dovers and Hoadley, was to operate to the west of the Grottoes and link up with Gaussberg which Drygalski's Expedition had put on the map in 1902.

This arrangement provided for Harrisson and Moyes to remain at the Grottoes to carry on the scientific records. However, Harrisson was anxious to visit the Hippo with the object of observing the nesting operations of the Snow Petrels, which, as had been ascertained on the depot journey, apparently resorted to the Hippo in summer time. He eventually prevailed on Wild to allow him to accompany the Eastern Party as a support as far as the Hippo. He planned to return then with the dogs to the Hut.

Wild's and Jones's parties were each to take provisions for fourteen weeks.

The detailed list of the food and equipment adopted for Wild's Eastern Sledge Journey is as set out below. The stock of food was designed to supply the needs of three men for fourteen weeks.

	lb.	oz.
One 12-foot sledge fitted with instrument and primus box, oil tray, bamboo packing pieces, cross piece for sledgemeter, mast step, straps and towing bridle	71	8
Venesta (three-ply wood) box containing 273 glaxo biscuits and 75 lime juice nodules	62	0
Set of tent poles	12	4
Mast fitted with halliards and stays	3	4
Alpine rope, 60 feet	3	4½
Food bag, No. 1	47	12
Food bag, No. 2	68	8
Food bag, No. 3	34	4
Food bag, No. 4	131	0
One tin of spirit	6	11
Three tins of kerosene, each one gallon	29	10
Primus, full	4	8
Nansen cooker	11	3½
Three pannikins and spoons	1	10½
One tent and floor cloth	15	0
Three ice-axes	6	12
One boatswain's bag, containing a pocket set of tools, a coil of copper wire, hank of twine, spun yarn for stays for depot bamboos, three depot flags, a case of needles, one palm, reel of thread, piece of linen for tent repairs, also spare caps, nipples, washers and nipple remover for primus lamp, and one Union Jack	5	1½
Medical outfit	4	2½
Bamboo for depot	3	0

	lb.	oz.
Plasmon biscuits and box fitted with snow-proof cover	36	8
One sail and two yards	5	12½
Nine pairs finnesko	9	14
Saennegras	3	0
Three bags personal gear, each containing one sleeping suit, 6 pairs day socks, 3 pairs sleeping socks, one cap, one pair mittens, one pair foot bags, one diary, one grass bag, tobacco and matches. Weight including bags ...	39	0
Three sets of man harness, tow rope and toggles	7	3⅓
Spout and lever for kerosene tins	0	9
Lloyd-Creak dip circle with alt.-azimuth attachment	26	8
Books, papers, etc., comprising "Hints to Travellers," Calipers, field book, nautical almanac, meteorological log, protractor, scale, pencils, charts in tin case, pith and tissue paper for dip needles	3	14½
Prismatic compass	0	13
Aneroid barometer	0	10½
Thermometers (two)	0	5
Binoculars	2	3
Instrument stand	7	0
Camera in case, films, plates (3 dozen films, 2 dozen plates, the latter to be left at depot) and changing bag	9	11½
Three sleeping bags, lashings and waterproof sheets	33	1
Three pairs of spiked boots	9	7½
Geological hammer	1	10
Specimen bags	0	9½
One shovel	6	14
Ready-bottle for priming spirit for primus heater	1	3
One bag for spare gear	3	13
Sanitary paper	1	9
Total weight to be taken from the "Grottoes"...	732	11

Also as part of the provision for Wild's projected fourteen weeks sledging campaign were the supplies cached on September 4th at the Hippo Nunatak depot, located 84 miles to the east of the Grottoes. These were as follows :—

	lb.	oz.
One 11-foot sledge and fittings	57	0
One food bag containing provisions for three or four weeks	130	8
One ditto for two weeks	67	0
Two tins of Plasmon biscuits	125	0
Seven tins of kerosene	69	2
One bamboo, flag and stays	4	0
Total at the depot	452	10

Thus the entire outfit assembled for the eastern summer sledging party journey amounted to 1,185 lbs. 5 ozs.

At the last moment, when Harrisson and the dogs joined Wild's party with the object of accompanying and supporting them as far as the Hippo, the quantity and distribution of weights were somewhat altered. Instead of 735 lbs. to be taken from the Hut, the total was 970 lbs. of which Harrisson and the dogs pulled 400 lbs.

Kennedy acted as navigator for the party and, as the journey progressed, made a running survey of the geographical features in view. Watson was geologist and photographer. (See Plate XCVI.)

This Eastern Party set out at 10·30 a.m. on October 30th. The surface was found to be fairly good though some soft patches were encountered. At the lunch halt the meter showed 4 miles. Shortly after resuming the march they crossed three pressure ridges and the same mile-wide belt of crevasses noted on the spring depot trip. The day remained beautiful, calm and cloudless; the temperature 17°F. The distance covered in the day was 11 miles.

October 31st was another beautiful day with not a cloud in the sky, but drift was seen to be flying on the land slopes 10 miles to the south. During the afternoon the Gillies Nunataks were miraged up into view on several occasions. At 5.45 p.m. Henderson Island came into view for a time, then disappeared. The day's run amounted to 15 miles. At this stage Wild contemplated making a journey of 500 miles to the east, but as will be seen, subsequent events determined otherwise.

November 1st.—When they turned out of the sleeping bags the temperature was —15°F. but it had fallen to — 20°F. during the night. It was still calm when they started to march, but very soon afterwards a fresh easterly breeze got up.

"The pulling was heavy as there was a good deal of soft snow and the few hard patches were too smooth. As anyone who has pulled a sledge knows, an uneven surface is much easier than a smooth one as there is less friction on the runners."

After 5 p.m. the surface improved considerably. The wind dropped just before camp. All day long, cirro-stratus clouds had been in evidence and a fine halo appeared around the sun. After 13 miles camp was pitched about due south of Masson Island and at 10 miles from the mainland. They were then in proximity to a great "billow" of the shelf-ice which feature was 41 miles out from the Hut.

November 2nd.—Harrisson remarked: "The last three nights have been so still and peaceful—not a sound! In such contrast to the two previous weeks spent on that damned Ice-Cap." It was cloudy, and the night comparatively warm; the morning dull and misty. Later the sky thickened and a little snow fell; only very tiny crystals, so small that it required a lens to see them clearly. "The Ice-Cap shows to advantage on days like these, for the great névé slopes show a dull grey-green against the snow."

At 3 miles on the way the shelf-ice rose as a low hillock a mile or so to the northward of the track. A distance of 16 miles was covered by evening. At 5 p.m. a fresh east-north-east wind sprang up bringing snow with it. Kennedy wrote: "The ice appears to be flowing out fairly rapidly, as we pass over many fresh narrow cracks, very long and parallel to one another, trending about 148° magnetic."

November 3rd started with an east-south-east wind and drift, but moderated at 8.30 a.m. A start was then made at a temperature of 26°F. The surface was rather soft and pulling heavy. Gusty south-east to east-south-east wind hindered progress on occasions during the day. The surface of the shelf-ice was noted to undulate slightly, demonstrated by the alternate appearance and disappearance of distant rock outcrops as the march progressed.

When camp was pitched for lunch about 7½ miles had been covered. The wind then rapidly increased and no further progress was made that day. They were then about 63 miles from the Grottoes. The Hippo, where the depot had been made, lay about 24 miles ahead; it had been sighted for a brief interval during the morning. Wild had purposely set a course to bring them in nearer to the land as the surface there was harder and more icy than further out on the shelf-ice.

The blizzard continued with much drift all day on the 4th and the party remained in camp.

November 5th.—They turned out in a fresh breeze and low drift, but later in the day the weather became calm. Lunch camp was pitched at 6 miles on the way. A Skua Gull was sighted flying east. At 8 miles they were about 3 miles north of the Alligator which, Kennedy wrote, "appears to be ¼ mile long, about 100 yards broad and 300 feet high."

Harrisson wrote of the Alligator: "Not so fine as the Hippo, hasn't so great a bergschrund. One side as high again as the other. Great ditch cut out along one side, must be of great depth. Rock must be 250 to 400 feet high; presenting almost a wall side to the east; a great razor-backed buttress when off the end."

Pressure ridges and crevasses were encountered in the afternoon, especially where the flow of the shelf-ice was impeded by the Alligator. Camp was pitched for the evening, after a 12-mile run, at a point 3 miles from the land near the eastern side of the Bay of Winds. "The Avalanche Rocks some 5 or 6 miles ahead; the Hippo looming large on the horizon beyond. Shore-line inside of us picturesque: three brown rock outcrops; very broken slopes, almost all that soft blue-greenish-grey; ice in broken slopes, falls and in rounded knolls, with the white snow slopes between."

November 6th.—There was a fresh east wind with low drift nearly all the day. A course was laid for the Avalanche Rocks, until 3 miles distant, then altered to the east running parallel with the land. Harrisson wrote: "The point of the land near the Alligator looked well, sloping somewhat steeply down; white snow and great masses of blue ice, seamed, cracked and broken, looking at this distance as if ten thousand rills of water had been cutting it into tiny channels. As we neared the Avalanche Cliffs, saw a fall smoking over the cliffs."

The Avalanche Rocks were passed at noon and soon after the party came to a large erratic of gneiss measuring 5 feet cube, (Plate XCVII, Fig. 3). This was one of four more conspicuous rocks distributed in a line from the cliffs and evidently carried on the ice from there. After a midday meal at this place, the march was resumed. "Leaving behind the beautiful treacherous cliffs—as beautiful as ever with its rough soft blue-grey, mantled with purest white snow slopes. Passed over many rounded icy ridges, but on the whole hard dragging. Shore along here very fine; generally blue ice, very broken, high and steep. I imagine (as in one place) a slope, almost a cliff, going back 700 or 1,000 feet. This subsiding bodily (not falling) gradually coming down in mighty blocks and squares—rifted, cracked, tilted—piled there so shattered with deep cracks, as if it might any minute fall headlong!"

At 4 p.m. they were 1 mile from the land and opposite the Hippo. There Wild decided to leave all gear not required for the night and headed towards the depot at the Hippo. Some badly crevassed surface had to be crossed, and Watson, who was driving the dogs, had a close call in one of the bottomless pits; he fell through the lid when not roped up, but managed to hold on to the edge until help came.

Scores of Snow Petrels were seen flying over the rocks at the Hippo; evidently nesting operations had begun. A search was made for the depot. When it was located a nasty shock awaited the party, for the 7-foot snow mound had been levelled, the sledge and flag-pole gone and the food bags blown about. A search failed to locate the sledge which Wild had counted upon for the execution of his plans; consequently its loss was a serious blow.

Kennedy in his diary briefly describes the Hippo in the following terms: "The Hippo is a huge nunatak about ½ mile long and quite 400 feet high of dark gneissic rock with bands of red granite. Lichens of various kinds grow on it and Snow Petrels apparently nest there, though their food supply comes from the sea quite 80 miles away, (Plate XCI, Fig. 2).

"To the south-west corner, the glacier sweeps round in a high mound with a huge 'bergschrund' and the lee is hard ice, fearfully crevassed and broken. Altogether the view from some distance up the rock is indescribably beautiful."

November 7th.—In the morning a further search for the sledge was made over the hummocky ice to the leeward of the Hippo, but without result. Harrisson took the opportunity of climbing over the rocks in search of petrel eggs, of which he wrote in his diary: "After breakfast we went over to the rock, I taking an empty tea-tin for eggs. Climbed ledge about half way; looking with binoculars for the lost sledge out on the glacier, but could not see it. Snow Petrels mating, but had not laid yet. Beautiful little things, a little larger than pigeons, purest white, black eyes, feet and beaks, nestling by dozens in the crevices and under the stones; the rock was alive with them and resounded with their cries, while dozens flew around. Would let us catch them, but ejected a stream of liquid, like gravy from a tin of preserved salmon."

Under the altered circumstances, Wild decided to attach Harrisson with his dogs and sledge to his own party. It was realised that such a course would inevitably shorten the sledge party's time in the field and that Moyes would be left alone at the Grottoes under the belief that Harrisson had perished. Wild was firmly convinced that to proceed with only one sledge, relying upon it to last out the journey, was too risky.

Kennedy executed a set of magnetic determinations and Watson collected rocks.

The search was finally given up and camp struck at 4 p.m. As they topped the great pressure ridge in front of the Hippo, heading back towards the mainland, they came in sight of the sledge and equipment dropped the previous day. This was reached at 5 p.m. Camp was pitched about a mile further along on the foot of a long ramp leading down from the ice-cap near a point of brown rock outcrop.

November 8th.—A gale sprang up during the night. This was not unexpected, since Noah's ark cirrus clouds and a halo on the 7th foretold bad weather. The thick drift kept them confined in the tents all day.

November 9th.—The wind and drift continued but the sky cleared and a bright sun shone most of the day. Though they did not break camp, Harrisson went east exploring the landscape for about a mile, climbing the great snow slope leading to the top of the brown rock bluff. " Very slippery with the strong wind. Did not get to the bluff but to a rock outcrop this side. Apparently same rock as the Hippo, and about the same height. Hippo plainly in sight about 4 miles away, a great ice billow before it; and a great ice slope up its south-east side, as if a huge ocean roller had been frozen motionless, as it burst on the great rock's side ! "

November 10th.—The wind with some drift continued, but the morning was bright and sunny. The drift melted on the tents, the water trickling down and freezing at ground level.

They all turned out of the tents and went for a walk to the brown rock bluff (Delay Point) about 1½ miles to the east of the camp. A half-mile-long snow ramp leading from the shelf-ice to the cliff edge, and extending for miles along the land edge to a height of 400 feet, was mounted; then on they went to the icy slopes above and finally to the rock outcrop. The rocks were described as mainly mica schists and granite but also gneisses and felsites. Wild recorded: the rock area as of about 70 or 80 acres in extent. A line of moraine was observed to extend in a north-east direction from this rock mass. The highest point of the rock was found to be about 600 feet high; from that vantage point, Harrisson wrote, " We are a couple of hundred feet higher than the Hippo, which shows well, with its couple of miles of pressure tailing away to the northward. At our feet, a thin line of moraine runs out from the bluff, while the glacier ice, in places, bore the exact appearance of whirlpools and rapids in a strong current, as well as swelling into billows."

Apparently no Skuas were found nesting on this rock area, though Wild's party had expected to find some there.

November 11th.—The wind remained strong and gusty but improved in the afternoon. The camp was dug out and sledges repacked. Kennedy made some magnetic observations. By the time all were ready for marching it was about 4 p.m., as there was nothing but bare rough ice ahead. Wild decided to repitch camp and await the morrow. The wind increased again in the early evening and by 8 p.m. was once more blowing a gale.

November 12th.—The wind abated considerably during the morning. After an early lunch the party got under way. They passed Delay Point over ice heaped in irregular billows. Fine waves of pressure-ice were met running off the point, jagged and piled. Then they came to the moraine running to the north-east —a heap of boulders, stones and pebbles, some 15 yards across, with two or three more such heaps beyond.

The coast beyond Delay Point was very fine. Harrisson wrote of it: " Great slopes and hills of ice and snow, with occasional ridges and points of rock showing. In one place the crest of a rounded hill, all ice slopes and snow slopes, was shattered and ploughed up—a shattered line running down the ridge, and

continuing down the slope below to the glacier. Sheets of ice and snow—and just a point of rock showing. Further, a great rock cliff, partly hidden by a snow slope with the ice flowing over one end of it, in a sheer wall, split and rifted, showing beautiful stratification—bands of blue ice, and white between. From there, the bold shore ran as a snow bank, almost steep enough to be called a cliff, down to the point, rock ended, not unlike the Hippo. Higher, and behind this, a terminal point, crested with rock; a mighty ridge of ice and snow that ran out far into the channel, and prevents us seeing what is there—seeing, even, if the land ahead is really an island."

Camp was pitched after a run of 9 miles, having crossed innumerable cracks, over hard ice, all mounds, hills and valleys. Two Snow Petrels had flown around the party in the morning, and two more paid them a visit in the evening.

About 15 miles ahead could be seen an island (David Island) some 20 miles long on which were several bare peaks and rocky patches. The evening was dead calm and the air quite warm.

November 13*th*.—The wind got up again during the night and half a gale was blowing at 6.30 a.m. when they breakfasted. By 3.30 p.m. the wind was but a moderate breeze, but Wild decided that it was too late to be worth breaking camp that day.

It became quite calm after the evening meal when Kennedy and Harrisson took the opportunity to explore the heaved and crevassed ice for a couple of miles ahead. By the time they got back to camp later in the evening the wind was blowing fresh again.

November 14*th*.—There was a fresh breeze at 6.30 a.m. when they turned out. Wild decided to depot about 90 lbs. of the load. A large mound of snow was built over the depot and a short bamboo flying a black flag was mounted thereon. A tin containing an account of the journey thus far was attached to the bamboo in case Moyes should seek Harrisson so far.

As they proceeded the sky ahead looked threatening and very dark, with rising temperature. After proceeding 2 miles heavy fluffy flakes of snow began to fall and soon the landscape was blotted out, so Wild gave orders to pitch camp. The temperature in the tents during the afternoon was 37°F., it being about 30°F. outside.

November 15*th*.—The morning opened overcast with a little falling snow. They got away at 10 a.m. in a shockingly bad light so that they knew by feel only whether they were on level snow or otherwise. Soon they stumbled on gaping crevasses, without warning. A halt was called awaiting a better light. There was absolutely not a breath of wind and all felt it " close and muggy."

Later in the day, extended along a length of rope, they pulled through the badly crevassed area and reached more solid ground from which a fine view ahead could be obtained. Camp was pitched after only a 5-mile run for the day.

November 16*th*.—The march was continued in a fresh breeze and low drift, but by 10 a.m. the wind dropped to calm for the rest of the day. They headed east-south-east towards what appeared to be a channel between David Island and the ice-cap of the mainland. Heavy lines of pressure were encountered and nasty crevassed belts were crossed at considerable peril. Sledges had to be relayed, consequently progress was slow. A very hard day's work brought them only 9½ miles further on their way. During the morning seven Snow Petrels passed overhead flying south towards rock outcrops on the land.

November 17*th*.—There was a stiff breeze and low drift during the night, but this died away to a calm by 11 a.m. Their course was east at first, over the lower land slopes, but they soon rounded a point and were heading south. On reconnoitring on the higher slopes, the discovery was made that they were on a peninsula.

Lunch camp was pitched at the eastern point of this peninsula. Then they climbed higher up to spy out the land. A great flow of ice in a fearfully shattered state was observed to come down along the south side of this ice-capped peninsula; " down from, in one place, the very sky line, in foaming cascades that

must be 500 feet high, and, collectively, miles in length. Huge white cascades of shattered ice blocks, so broken that it was one great scar of white—not one dark thread of unbroken ice through them! Cascade beyond cascade, fall beyond fall, extending away for a great distance; pouring down to form that great stream tailing north."

This formed a great barrier in their efforts to push further to the east. Wild wrote: "To get around this would mean travelling inland at least 30 miles and probably much more, so we must go north."

So they headed northwards towards Watson Bluff on David Island. Kennedy wrote: "At the junction of the ice flows respectively from the Denman Glacier and from the channel nearby, the pressure is terrific and enormous crevasses and pressure mounds lie in every direction."

Taking the sledges across to the north of the shattered belt on the coastal margin was a tough job. They encountered many exciting adventures in crevasses. The day's run registered only 5½ miles. A couple of Skuas flew around the lunch camp. (See Plate CII.)

Wild recorded: "On several occasions during the night, while in this disturbed area, sounds of movement were distinctly heard, cracks like rifle shots and others similar to distant heavy guns, and occasionally a moaning noise as of the glacier moving over rocks."

November 18th.—This was a fine bright day with a temperature ranging between 8° and 20°F. They headed in a general northerly direction towards a point where the pressure of the Denman Glacier appeared to be less marked and more likely to afford a crossing.

In the first 1,100 yards they crossed twelve large crevasses, not to mention smaller ones. One of the largest measured 100 feet wide. A still wider one, like a great sunken roadway, was crossed soon afterwards. They were not so numerous after the first mile, but there was still great pressure heaving the surface into billows, a half a mile from crest to crest. By lunch time a distance of 5½ miles had been crossed. After lunch Wild made a reconnaissance towards the main pressure in search of a road for the sledges; but instead found, in his own words "The most magnificent piece of ice scenery that I have ever seen. The Denman Glacier, moving much more rapidly than the Shackleton Shelf, is tearing through the latter and in doing so has shattered both its own sides, and also a considerable area of the larger glacier. At the actual point of contact is what might be called a bergschrund, as it is formed in the same way, an enormous chasm over 1,000 feet wide, and from 300 to 400 feet deep, and at the bottom, crevasses which appeared to go down for ever. The sides of this chasm are splintered and crumpled and in the sunlight glittered in millions of points of light. On either side of the bergschrund are several huge masses pressed up to a height of 200 feet. The whole place is the wildest, maddest, and yet most beautiful sight imaginable. So far as we can see to the north from the top of some pressure, this turmoil continues."

Kennedy ascertained the depth of the bergschrund by timing the fall of pieces of ice. Whilst they were admiring the scenery a Snow Petrel flew over. They found with difficulty a place to camp; crevasses lay on all sides of the camp. It was planned that on the morrow an ascent of Watson Bluff, which lay about 3 miles to the west, would be made in the hope that from that vantage point some way out of the chaotic region might be sighted.

November 19th.—Sky overcast and snow falling; consequently the light was very bad. Kennedy remarked: "About 5 yards in front of the tents yawns a partly fallen-in crevasse, whilst all around low sunken lines show weak-lidded hell-holes. To move out in this light is asking for sudden death, and to sledge would be dangerous. It is very trying to sit in all day when there is so much to do."

At about 5.15 p.m. it cleared up somewhat and the sun shone through breaks in the clouds. Wild, Watson and Kennedy then roped up and set out for David Island, from the higher portions of which Wild hoped to see some way through the icy chaos to the east. They made for a very fine rocky bluff, Watson Bluff, distant about 3½ miles. This rocky outcrop is about a mile in length and 900 feet above sea-level, and 600 feet above the shelf-ice. Wild recorded, "It was almost all gneiss and showed much wearing from

ice action. The face of the rocks was very steep, and being much weathered, great care was necessary in climbing. There is a lot of moss and lichen on the rocks, and scores of Snow Petrels were flying about, but no eggs yet."

Kennedy observed that the rocks are the usual gneisses and that the Snow Petrel nests were on the lee side of the rocks. " We climbed over the small bergschrund, up a snow slope, through a rocky cleft and then up a broad, smooth easy sloping gravel walk, which would be a credit to any garden. At the northern end of Watson Bluff the rock is much weathered and some boulders are quite hollow. The rocky area has the appearance of having been over-ridden by ice at some time."

Unfortunately the sky was overcast when they got to the summit. Wild's journal records, " Very little could be seen to the north. The land to the south was clear and we saw the Denman Glacier as far as the horizon, which would be about 40 miles and well over 3,000 feet above sea-level. Away to the east is a sea of pressure for at least 20 miles, and beyond that, probably 60 miles from here, are several large patches of bare rock which look like islands. I intend to bring the sledges in towards this island to-morrow, as it is on our way whether we go north or south, and have another look round."

The view from the top of Watson Bluff is further illustrated by Kennedy's record: " To the north the ice is broken as far as can be seen with binoculars, not merely crevassed, but crushed up in heaps like a heavy sea with waves a hundred feet or so high—a crevasse in every crest and in every hollow.

" To the south, from the south-west to south-east it can be likened to a pile of broken glass outside a bottle works, magnified enormously, each piece 20-30 feet high. We must go ahead, for the binoculars showed far to the east a flat black mass of land which must be of some large extent, and to the northward of it two islands with black peaks are visible. We hope for a good light to-morrow to enable us to form some idea of what to do. Go we must, but whether to the north or south in order to get east is to be decided. Wild likens it all to ' hell with the lid off '."

Whilst some of the party were thus visiting Watson Bluff, Harrisson retraced the sledge tracks to the edge of the great bergschrund of the Denman Glacier and spent several hours attempting to paint illustrative records of the extraordinary phenomena there presented. " Reached the bergschrund—as vast, as grandly beautiful as it looked yesterday, with its indescribable tumbled mass of torn ice—the higher masses, that rise above the glacier level, looking as if heaved, splintered, straight up from its proper level by some great force beneath ! How beautiful it was in detail, too ! . . . I sketched the peep down between two buttresses of the cliff, but could not get that beautiful detail; while the very softness of it all—the absence of strong contrasts, the softened lights and shades, made it very difficult to do, and the sketch rather disappointing."

Whilst Harrisson sketched, a small avalanche fell nearby.

November 20th.—The weather was worse than ever. A strong north-east wind blew all day accompanied by thick falling and driving snow. " Nothing could be seen but a white blanket above, below and all round."

November 21st.—A moderate to strong gale with heavy falling snow and drift continued all day. No communication between the two tent parties was effected.

November 22nd.—The wind reached hurricane strength during the night but moderated a little at about 7 a.m., though continued at full gale strength all day.

November 23rd.—The gale fell off during the morning and by 1 p.m. had diminished to a strong breeze. The sun then began to make its appearance through the clouds. No time was lost in digging out the sledges and packing up. Camp was moved to a new site about 1 mile from David Island opposite Watson Bluff.

At 7 p.m. the party made their way across to the foot of the Bluff. A great snow slope led up to the rock but ended abruptly in a great fosse 50 or 60 feet deep, swept out by the wind around the foot of the rock. The ice wall of this ditch was perpendicular to overhanging. From the top of the Bluff the great

stream of shattered ice of the Denman Glacier could be seen descending from the sky line about 3,000 feet above sea-level in the south and continuing unbroken to the northern horizon. On the very sky line in the north-east great pressure blocks with cliff faces were standing up in jagged array. Beyond, to the eastward of the main shatter zone, the shelf-ice was seen to be heaved in great billows.

When descending to the camp a Skua Gull flew around them, an indication that it had a nest nearby. Wild decided to follow the glacier 10 or 12 miles to the north and there attempt the crossing.

November 24th.—This was a beautiful warm, bright day. They headed north to pass in front of Watson Bluff. When opposite the north end, a halt was called and another ascent of the rock made to give Kennedy the further opportunity of charting the points of interest in view from that high level. The ice traversed during the morning was evidently moving rapidly, for the crevasses were quite new and the ice was cracking and banging under their feet. They found that where the sledges were then left was 100 feet below their camp of the previous night.

Lunch was eaten in the open in a shade temperature of 31° F. Then the journey was continued on a course north-by-west (true). On passing to the north of David Island the crevassed and broken ice was left behind, for they got on to a fairly level snow plain but were heading towards a pressure belt, evidently the bergschrund which, in that direction, turned more to the west of north.

Camp was pitched for the night, after somewhat more than 6 miles had been covered, just before this line of pressure where some of the ice was forced up over 100 feet. After a meal some of them roped up and went ahead to reconnoitre for a passage through the broken ice which would serve for their advance on the morrow.

They had climbed down a slope in the shattered ice, when to their unbounded astonishment, salt water was found occupying cracks in the ice. Wild remarked, " We must have descended a lot in the last two days, as the great bergschrund farther south was well over 300 feet in depth and no water showed there."

Wild returned to the camp believing that at a point 2 miles further north there was a possible passage through the lateral shatter zone of the Denman Glacier.

November 25th.—Another beautiful day so far as the weather was concerned. The sledges were dragged over 6¼ miles of a dreadfully shattered surface. Harrisson remarked, " Slow and difficult work. Not as bad as expected, but even in this more open part, hills of ice 200 feet high, ridges too steep to ascend; lines of cliffs (along ' leads ') 60 or 80 feet high; immense masses of ice, shattered or solid, sometimes over 100 feet high. This we take to be the wreckage of the great bergschrund solidified somewhat, as it is borne along on the ice-current. And amongst it are long rents, like tide-cracks in bay-ice, with water showing at the bottom—sometimes bounded by cliffs."

Every member of the party suffered from the effects of the sun glare, faces becoming badly blistered. Pools of fresh thaw water were encountered.

November 26th.—Another clear, bright and sunny day. The first half mile took three hours to cover. Wild's journal records, " I never saw or dreamt of anything so gloriously beautiful as some of the stuff we have come through this morning; a fairyland on a very large scale. After lunch the country changed entirely. In place of the confused jumble and crush we have had, we got on to névé slopes, huge billows, half a mile to a mile from crest to crest, and 150 feet high from trough to crest, crevassed in all directions, so that our course was a devious one. A large number of the crevasses, from 30 to 150 feet wide, were open, and frequently we had to go considerable distances along them before they pinched out or we found a bridge.

" In several places we lowered the sledges by alpine rope on to sunken bridges and hauled them up the other side, one man always going first on a rope and testing the bridge by jumping on it. We all had falls during the day, Harrisson having the longest drop, 15 feet. I received rather a nasty squeeze through falling into a hole whilst going downhill, the sledge running on to me before I could get clear, and pinning me down. The total easting made for the day was only about 2 miles."

November 27th.—Another fine morning, bright, clear and calm. Wild's narrative runs as follows:

"After starting this morning we had nearly a mile along a valley running south-east, almost good travelling; then our troubles commenced again. (See Plates C and CI.)

"Several times we had to resort to hand-hauling with the alpine rope, and we turned and twisted in all directions to avoid crevasses. These were almost all open, from 30 to 150 feet wide and from 30 to 200 feet or more in depth. The bridges of those which were covered were generally very rotten except the wide ones. Just before lunch we had a very stiff uphill pull and then a drop into a large basin about three quarters of a mile in diameter. Here we lunched. The afternoon was spent searching in vain for a road, the way we have come seeming to be the only possible one. On every side are huge waves split up in all directions, by crevasses up to 200 feet in width. The general trend of the main crevasses is north and south. Many of the crevasses are partly snow-filled, but even these are from 50 to 100 feet deep and many others have no visible bottom. From some of the highest points we had a view of the glacier for about 8 miles to the east, 4 or 5 to the north, and 20 to the south, and it appears to be just as badly broken all over.

"I have therefore decided to go back and if possible follow the road we came by, then proceed south on to the inland ice-cap, and find out the source of this chaos. If we are able to get round it and proceed east so much the better, but at any rate we shall be doing something and getting somewhere. We could get through farther east from here, but it would be by lowering the gear piece-meal into chasms 50 to 100-feet deep, and hauling it up the other side, each crevasse taking at least two hours to negotiate. For such slow progress I don't feel justified in risking the lives of the party." (See Plate CII, Fig. 2.)

November 28th.—The morning was dull and a little falling snow. The light was vile, precluding any prospect of travelling through such a crevassed region. The sky was uniformly overcast, but a dark patch in the sky to the east was diagnosed by Wild as a "water sky." The shade temperature stood high, only just below melting point.

December 2nd.—Heavy snow in large soft flakes had continued to descend all day on November 29th and thereafter until about noon to-day. A patch of blue sky appeared in the evening.

December 3rd.—A bright morning. All hands set about digging out the sledges in preparation for the start. Over everything was an accumulation of 18 inches of soft snow. Whilst roped up reconnoitring, Watson made a clean fall to the full length of his section of the rope through the lid of a crevasse. He was hung up at 15 feet below the lid of a 12-foot wide crevasse. As he was the heaviest of the party, and the disposition awkward, it took 20 minutes to drag him out.

Watson said afterwards that he could not but admire the beauty of that crevasse, where there were great icicles 11 feet long and as thick as his leg.

Only about 2 miles of distance was covered during the day, though Wild remarked that it was "one of the hardest days I have had in the Antarctic."

December 4th.—On this day Wild got the party on the march at 4 a.m. with a view to travelling during the cooler hours when the surface would be firmer.

It proved another extremely hard day with only $2\frac{1}{2}$ miles to show for it. The way was through badly crevassed and shattered ice in which the crevasse lids were often very rotten. The outgoing tracks were obliterated by snow that had fallen since. All had nasty drops into crevasses. One bridge 10 feet wide fell as the meter on the stern of the 12-foot sledge was going over it. Camp was pitched at 2 p.m. when snow commenced falling again.

December 5th.—It was snowing, blowing and a bad light, so they remained in camp. Several Snow Petrels and a Wilson Petrel flew around the camp in the evening.

December 6th.—Falling snow of the early morning took off and the light improved sufficiently about 10 a.m. for the party to resume the march back across the shattered ice. There was again much trouble with crevasses and progress difficult and slow. At 1.30 p.m. an open lead which they had crossed on the

outward journey was reached at the same spot where the former crossing was made. There had been much movement since then. The bridge made on the occasion of the first crossing had been crushed up : a new one had to be made by cutting away masses of ice in some places and filling up the water channels with blocks of snow and ice. Then Harrisson crossed with the aid of two bamboo poles and then hauled Wild over on a sledge. With two men on each side the sledges were hauled backwards and forwards with the rope, gradually transferring light loads to the far side until all was across.

The day's run was under 2 miles. At the evening camp the dog Switzerland had to be killed to supply food for the other dogs, for they had been living for some time on the man rations and now no more could be sacrificed. Amundsen ate Switzerland's flesh ravenously, but Zip looked and sniffed at it, and hungry as he was, turned from it and lay down. Several Snow Petrels were seen during the day.

December 7th.—There was not a cloud in the sky when they got under way at 8·30 a.m. As the morning progressed the snow surface softened with the warmth to such an extent that Wild decided to camp at 11·30 a.m. after covering only $2\frac{1}{2}$ miles.

He intended to travel during the night hours whilst the weather remained so warm.

Before leaving the camp in the morning, Skuas had arrived, probably aware of the slaughter of Switzerland.

One crevasse from which Harrisson had collected ice crystals on the outward-bound journey on November 25th was found to have increased its width from 3 to 6 feet.

In the middle of the day every cliff and mass of ice dripped water. At the foot of many of the steep slopes were pools of deep-blue thaw water.

December 8th.—The march was again commenced at 2·30 a.m. After negotiating 3 miles of pressure-ice, they were able to swing their course directly towards Watson Bluff. At 11 a.m. camp was pitched only 200 yards from the Bluff, a distance of $9\frac{3}{4}$ miles having been traversed. From the camp the Snow Petrels could be seen sailing around the crags and slopes in dozens, their harsh cries echoing from the rocks.

Wild caught a Skua with a noose on a fishing line. The others climbed the rocks in search of Snow Petrels and their eggs, most of which were to be fed to the dogs in an effort to keep them alive.

Describing their search for Snow Petrels, Harrisson wrote : " Found the great rock swarming with the beautiful birds always stowed away in crevices, under boulders, or in holes where the Skuas could not get them easily. Sometimes the pure white birds sit amongst snow that is not more spotless, but with a bit of a nest or pebbles or gravel under them. They are not particular. One had nested on remains of a dead bird. But they do not appear to make any regular ' nest.' We ' worked ' up a great talus slope, searching under the boulders. The birds often betray their nests by calling out. When molested they eject a stream of oily liquid to a distance of nearly a yard. At first pink, not unlike the ' gravy ' of tinned salmon; then a darker, greener, disagreeable liquid—appear to have a great supply. We ' drew fire ' often by touching them first with the ice-axe—but my bare arm was pink and green to the shoulder !

Lumps of hard, greasy, whitish matter, hanging from rocks round nest, appeared to be of this ejection consolidated."

The party soon collected five dozen birds and fifty eggs. Exploring the area further, Harrisson recorded : " Got some fine lichens, and, what pleased me most, a little moss in seed." The latter " grows in dense lumps to the size of my arm, and is quite green now."

When reaching the camp they were quite hungry, so had Snow Petrel eggs boiled. Harrisson states that they were good " although a flavour about them that reminded me of mussels." Wild states, " Snow Petrels' eggs are almost as large as hen's eggs, and are excellent eating when fresh. Many of ours had been under the birds rather too long, but although they don't look so nice, there is really very little difference in the taste. I was very glad to get this fresh food, as we had lived very largely on tinned meats all the year, and I have been rather anxious about scurvy."

December 9th.—As a fresh breeze was blowing, with snow drifting and a very bad light, Wild decided to remain in camp. They snared two Skuas and had them boiled for dinner. The other two meals of the day were constituted chiefly of Snow Petrel eggs.

A Wilson Petrel was seen hovering over the rocks during the morning but a search for its nest was unsuccessful. Snow fell heavily during all the afternoon but did not deter Harrisson from further exploring the rocks nearby and making careful observations of the habits of the Snow Petrels. He wrote: "It was delightful climbing over those great steep boulder slopes—almost cliffs; peeping in at the beautiful birds nesting there, and be able to assure the little tremblers that I was not going to harm them. Some get into splendid shelter, secure from the pirate Skua. Some in under crevices, more open holes, where broken eggs show that the nest has been plundered; sometimes, apparently, the petrel killed too. Sometimes apparently escaping themselves by creeping back into the narrower parts of the crevice, and when I saw them, sitting disconsolately with the broken shell near . . . Mating pairs very noisy. Saw many couples but no eggs under them. Altogether I think the Skuas get a good toll of birds and eggs. Probably hardened matter formed on rock outside most nests have been ejected at the Skuas in previous seasons. Some made semblance of nest—saucer-like depression in pebbles, a few feathers, and even down. Sometimes in, or with snow all round. Others no attempt at nest—scarcely even a depression, even if pebbly floor—so you find eggs that have rolled away into cracks."

Harrisson recorded that the Snow Petrels appeared to fly away towards the north-east from Watson Bluff: "There must the open sea lie."

About midnight Wild heard a heavy fall of rock and a great screaming of birds. "Not surprising, for the shattered rock and boulders are piled on the almost precipitous sides; or piled in the ravines between the crags, at the top of the cliffs, where they jut out like buttresses. This time of the year, too, with the thawing and the freezing going on, there must be considerable stress."

December 10th.—Snow continued to fall until 8 a.m.; then camp was struck. They sledged south over crevassed ice, covering only 2½ miles before lunch camp. Then the wind increased and drift began to fly, so the second tent was erected and an improvement in the weather awaited.

December 11th.—A strong gusty wind and snow continued all day until 6 p.m. when there was an improvement in the weather. Wild decided not to attempt to march until the evening when the sledges would run easier.

However, Harrisson retraced the sledge tracks back to Watson Bluff in order to examine the area further. He collected and brought back to camp about 3 dozen more fresh eggs. A new find was that of a quantity of a green alga.

Camp was struck in the evening and they were on the march by 8 p.m. At midnight three Wilson Petrels were seen flying south.

December 12th.—For 4½ miles, their way lay across crevassed ice to where their camp of November 16th had been pitched. They then travelled on a good surface over the slope of the peninsula. Camp was pitched at 5.45 a.m. after covering 11½ miles.

They were under way again at 8 p.m. and made good progress on a fair surface along the shore between the east slopes and the pressure-shattered ice of the glacier. As they dragged on facing the high land on the southern horizon, a good view of the midnight sun was presented. Harrisson described it well: "The sun sank down to the long level rim of the ice-cap ahead, and dragged along it for nearly an hour; showing in all sorts of odd shapes—club-shaped; pear-shaped; straight line; two or three dots; almost disappeared; then suddenly lifted by refraction as if rising again. Bets were freely made on his succeeding in scraping along the hill without setting. Suddenly he collapsed—dropped entirely out of sight. Three minutes later, he bobbed up again serenely, and hung on for another ten minutes—then disappeared for half an hour. All this time the east was flooded with beautiful rose, and clouds there rose-purple to cold blue. That faded for a half hour, leaving the pink above; very dark cold purple below; then all the warm colour returned with the rising sun!"

December 13*th.*—Camp was not pitched until 6 a.m. when 12¾ miles had been covered. At 8 p.m. the march was resumed over rough crevassed ice heading for the smaller, more western of two rock outcrops on the ice slopes ahead. They were then crossing a bay 12 miles wide. As the southern side of the bay was approached there was met a great trough-like depression : the ice current flowing along this place from a valley depression at the end of the bay was evidently responsible for heaping up the ice here.

Having crossed the bay, a rise was negotiated to reach the rock outcrop. This was half a mile in from the shore-line and about 200 feet above it. This and another small outcrop a little to the east, were named Possession Rocks. There food and spare gear were cached, in all amounting to about 100 lb. in weight.

Holes in the rock surface were filled with clear thaw water. The rock was recorded as gneiss, rich in mica, felspar and garnets.

December 14*th.*—After a meal the march to the south was resumed, plugging steadily uphill. The grade was 1 in 18 for the first mile. The whole sky had now clouded over and the light was bad; land could scarcely be distinguished from clouds. The way was over ice and névé, mostly covered with snow, but some patches of bare blue ice. Harrisson remarked: " What a glorious blue it is when you see a small piece set in a sheet of white snow—a deep, clear unsullied blue ! " A Cape Pigeon flew past the party as they toiled up the ice slopes during the morning.

Camp was pitched at 4 a.m. on the ice slopes 4 miles from and 800 feet above the cache at Possession Rocks.

Kennedy who was the surveyor and magnetician of the party was up again at 6 p.m. charting the features in sight and determining magnetic declination. The party was on the march by 10 p.m. Thick cumulus clouds quickly spread over the sky and soon a mist settled down over them, so that one sledge was invisible from the other at 150 yards.

December 15*th.*—The mist cleared away by 3 a.m. when a halt was called for refreshment. The sky remained overcast during the rest of the march, so that their eyes were painfully affected when a final halt was called at 8 a.m. The distance covered amounted to 9½ miles and they had risen about 1,270 feet. The ice slopes traversed were in the nature of a series of terraces each about 2 miles wide. The lowest temperature of the day was 13° F.

December 16*th.*—As the nights were now very cold, Wild decided again to adopt travelling by day. Accordingly they remained in the sleeping bags until 6 a.m. The light was then fairly good, Watson Bluff being clearly in sight.

Kennedy found by a back-bearing that their course was making directly towards a high rocky nunatak (Mt. Barr Smith) which they had sighted high up on the land-ice slopes, seen from Watson Bluff.

They plugged steadily uphill. At 10 a.m. the sky became overcast and snow soon began to fall in beautiful starry little crystals flying thickly. The landscape became blotted out, so they camped, after a march of only 1¾ miles which entailed a rise of 320 feet.

About 6 p.m. the snow ceased and the sun came out bright in the west. Wild decided to wait until the morning, before breaking camp.

December 17*th.*—It was snowing thickly in the morning but cleared somewhat at 2·30 p.m., when they packed up the tents and got under way again. A Skua Gull which had visited the camp just before their departure had been caught and added to the larder.

The hauling was heavy on account of the up grade and the newly fallen snow. At 5 p.m. after advancing 2 miles, Mount Barr Smith showed up over the curvature of the ice slopes. It was seen to be quite large, sloping steeply to the east with some rocks showing there. It then runs almost flat for a distance and finally slopes gently down to the west.

At the same time another nunatak (Mt. Amundsen), far away on the south-eastern horizon, came into view. With the aid of prismatic glasses several more nunataks were observed.

At a distance that appeared to be about 60 miles away in the north-east, an island (Hordern Island) with about six large rock outcrops, was clearly seen. Below them to the east was the fearfully broken ice of the Denman Glacier. This appeared to be about 6 miles wide.

Camp was pitched for the night at about 2,870 feet above the shelf-ice distant 2 miles 1,000 yards from the previous day's camp.

December 18th.—The party was under way again at 8 p.m. in lightly falling snow and a bad light from overcast sky. The hauling was extremely heavy on account of the deep soft snow. A distance of only 4¾ miles was covered in the day; in this a rise of 390 feet was made. Notwithstanding the elevation, 3,260 feet, the afternoon temperature reached about 30° F.

December 19th.—Snow fell through the night and until 6·45 a.m. They were packed and away by 9 a.m. The clouds broke during the morning.

This was another day of hard work dragging through soft snow. When camp was finally pitched they had covered only 3½ miles. In this they had risen 120 feet and then descended some 80 feet into a small depression. The camp was located about a mile from the nearest rock outcrop of Mount Barr Smith.

From the Mount the ice-cap was seen to slope steeply down in rounded spurs into the deep valley to the east. Beyond the valley of the Denman Glacier the land further east was seen to extend high and steep, very broken along most of its length, showing rock outcrops and ice cliffs at intervals.

December 20th was a day of bad weather; medium wind, drift and a bad light. They remained in camp all day as there appeared to be no use climbing to the summit of the Mount until a view of the surrounding country could be obtained.

December 21st.—The weather cleared at noon. After lunch they climbed to the summit of Mount Barr Smith over very soft snow, from 18 inches to 2 feet deep. Kennedy took with him the dip-circle to obtain magnetic data (Plate CIII, Fig. 2).

At the summit they discovered they were 750 feet above their camp, making the total height of the mountain 4,030 feet. The rocks seen appear to have been chiefly granites and gneisses, but Kennedy stated that some rocks were very much like basalts, and that there were boulders of what appeared to be volcanic breccias in the morainic heaps.

Harrisson wrote: "The rocks have puzzled Watson. Amongst the most altered of the gneiss is what appears to be basalt. One peak, though, has an occurrence of quartzite rock, smooth with the friction of ice passing over it. Down in the rubble and stones I found a few lichens and one or two tints of vivid green which I concluded to be an alga of low form. A bright yellow one found on rocks below seems to be quite luxuriant; also a white encrustation that appears more like something given out by rock. Much of the lichen grows under or between stones down in the sand and grit, apparently for the sake of shelter."

On the south side of the rock outcrop, the ice-cap rises still higher. The highest point is about a quarter of a mile south of the rock exposure. From there a fine view of the south was unfolded. The high undulating ice plateau was there broken in several places by rocky peaks. About 10 or 15 miles away in that direction there was a fine bluff with rounded peaks, slopes and cliffs of rock, largely overlain with snow. Nearer was a fine large nunatak, high and wedge-like, with a lower ridge running out from the north end.

When on Mt. Barr Smith Wild decided to push on, next day, still further south to another rocky peak (Mt. Strathcona). However, when returned to the camp in the evening, he made up his mind to go no further but to return to the Grottoes, on the way back calling at all points of geological interest not yet visited.

December 22nd.—After breakfast another visit was paid to the top of the Mount. Harrisson sketched, and collected specimens. Kennedy determined the latitude 67° 10½′ and charted the features of the land. There was a strong breeze blowing at the time and a temperature of — 10·5° F. After lunch as the sky appeared to portend a blizzard, Wild decided to defer starting on the return journey and remain in camp.

December 23rd.—Snow falling and drifting in the morning and a very bad light. At noon the wind dropped, so the buried sledges were dug out and got moving on the return journey. It was still snowing, the light bad and the surface execrable. They headed down hill towards Watson Bluff. At 6·15 p.m. camp was pitched after covering 4 miles only. Snow was then falling thickly in an unusual form, a" thistle seed " type; a round white centre surrounded by loose soft white down like thistle down, though obviously crystallised. Harrisson remarked : " It would appear as if the main fall (snow) here is in the summer."

December 24th.—The morning opened fine, but very light snow fell most of the time. The sun beat down fiercely, making wet snow which greatly slowed up their progress. Harrisson wrote : " Yet, hot as the sun was, snow was falling ! Looking up at the sun on the edge of the fleecy clouds, could get a glimpse of those lovely opalescent colours ; and see tiny specks of fine snow falling ; see it thicker and finer as I gazed into the blue vault above, until it seemed to be falling from infinite distance ! So small and delicate the crystals, that I could not catch any ; they melted, even as they touched my sleeve. "

Later in the day they arrived at more steeply descending slopes. Harrisson, describing this, wrote : " Going over the brow, where the steeper descent begins, brought the stream of the shattered glacier into sight. Most beautiful—purple shaded, under the shadow of low cumulus that was rising like mist. Alongside of us in the morning, the edges were only broken, as a pavement would be if the ground beneath buckled up into a ridge. But from a height of at least 2,000 or 2,500 feet, where the descent is steep the pressure downwards must be gigantic. So great that the stream is much higher in the middle than at the ' banks ' that it runs between. The ' up-heaved pavement ' gives no idea of it there. A stream of ice blocks broken into great squares, crushed in places into jagged points; tight packed, crowded, not a smooth space between. Spreading like a vast fan, as if it forces its way thro' the main glacier below ! There we could trace it still—two lines of shattered ice at the Watson Bluff, over 20 miles apart, and sweeping wider as they go north and all between them broken almost as badly. Just now, as I was examining it with the binoculars in the light of the low sun, it made a blazing white scar on the plain below ; all the mass of broken straight sides showing whiter than the smooth level parts. It was a great sight ! And far off, 60 or 70 miles off, at least, was a mass of ice, all spires, pinnacles and broken sides, that was far larger than anything between, or which we had previously seen from Mt. Barr Smith."

The distance covered before camping for the night was 7¼ miles.

December 25th.—It was a glorious day. Camp was broken early and rapid progress was made downhill. As they progressed to lower elevations the recently fallen snow diminished and the surface improved. Late in the day the old sledge tracks were found unburied by subsequent snow. They concluded that it had not been snowing at lower levels.

The depot at Possession Rocks was reached at 5.30 p.m. after a run of 15 miles. The shade temperature at this time was 29° F. and a thermometer laid in the sun on the dark rocks went up to 87° F.

Dinner was embellished by the inclusion as an extra of a small plum pudding which had been slipped into one of the food bags by Moyes when packing them at the Grottoes (Plate CIII, Fig. 1).

After dinner Wild raised the Union Jack and in my name took possession of the land for King George and the British Empire. A slip of paper advising the ceremony was sealed up in a bottle and buried in a crack amongst the rocks. Pools of thaw water were found in the pockets of the rock.

December 26th.—Another good weather day but over-warm. The party was under way by 8 a.m. Just below Possession Rocks is a long trough, then a steep rise of 150 feet in height. This trough is like a choppy sea, badly crevassed. They traversed their outward track and noted fresh crevasses formed since passing that way a few days earlier. One such new crevasse was a foot wide and a hundred or two hundred feet in length, clean cut and deep.

By noon 5¾ miles had been covered. As the hauling had proved so heavy owing to the heat, Wild decided to camp for the rest of the day.

December 27th.—High wind delayed the start, but by 4 a.m. in a fresh following wind they got away and made rapid progress north. Their earlier sledge tracks showed up faintly at intervals. By 1·30 p.m. 13¼ miles had been covered and they were within 6 miles of Watson Bluff. There camp was pitched. A Skua flew over the camp.

December 28th.—A cold wind but a fine morning. The march was commenced at 3·15 a.m. With the aid of sail progress was rapid. Many crevasses over 20 yards wide were crossed. A succession of long wide crevasses with sunken lids were crossed—many of these a mile in length. These were solid-lidded. The sledges leapt the bank shooting the 1 or 2 feet drop to the lid, gliding across with the "way on," and up the opposite bank without much exertion from the sledge crew.

After rounding the Bluff, camp was pitched at 6 a.m. Harrisson observed that during the past few weeks they had noted that snow banks "melted out in flakes inclined to the north at 50° or 60°—not vertical—and the surface crystallised."

Whilst they were digging blocks of snow for weighting down the tent flounce they found sodden ice below and holes filled with thaw water which had evidently drained down from the rocky area above.

After lunch they climbed the rocks in search of four dozen Snow Petrels as food for the dogs. The dogs also got all the eggs, for hatching was well advanced. It took only a short while to get the required number of birds. No other species of bird was seen except a dead Wilson Petrel and a live Skua which was promptly caught on a noose and cooked for supper.

December 29th.—Sledges were packed and away before 3 a.m. Their track lay along the north-east side of David Island. Harrisson's log states, "We followed along the foot of the Island ice-cap, fairly level at first. It commenced to curl into a great ridge of pressure. Further along, high fragments up to half a mile long were torn off by the pull of the passing shelf-ice, and tilted back to show cliff faces, 30 to 50 feet high. This extended all along the north-east shore, to a greater or less degree. A large rent, or shallow chasm, of considerable width, separated the ice-cap from the shelf-ice."

On the way several rock outcrops were passed. Watson who had the dog team made detours and examined these as they passed by. Finally the party cut across the north end of the Island near the Triplets. Harrisson recorded that the Triplets are composed of "granite, with large crystals of felspar shining like florins in the sun." Kennedy described the granite as containing quartz, mica and a good deal of hornblende. Some lichens and a piece of dried-up moss were collected.

After a halt of only 15 minutes the journey was resumed, now heading south-south-west, and finally camp was pitched, after about 10 miles for the day. No birds had been seen nesting on the smaller rock outcrops visited during the day, but both a Skua Gull and a Wilson Petrel were seen flying over.

December 30th.—They were early on the march, and crossed the heaved and fractured ice of the channel to the depot near Depot Point. On the way a couple of Wilson Petrels flew around the sledges. The food was collected at the depot and the journey continued towards Delay Point. Harrisson recorded: "All the névé has been covered with a thin layer of snow, which in turn is being converted into névé, and now very rough, all sharp points. Large pools of thaw water frozen over, stretched along for 50 or 100 yards" (Plate XCVII, Fig. 1).

Near Delay Point they came upon some streams of thaw water. One of these was 6 inches to a foot in depth and 2 feet wide, and running fast.

Camp was pitched at 2 p.m. at 1½ miles north of Avalanche Rocks. The run for the day had been about 18 miles. Whilst food was being prepared several avalanches were heard to fall.

After the meal some of the party walked across to inspect Avalanche Rocks. Kennedy noted: "None fell whilst we were there, but the ice was cracking and grumbling most of the time. The rock is 400 yards long and 600 feet high, vertical, with the ice in a very broken state slowly being pushed over the top." Wild observed: "We found that one or more avalanches had thrown blocks of ice, weighing 20 tons, 200 yards past the hole in which we spent five days on the depot journey; they had therefore travelled 600 yards from the cliff."

As they reached the tents on return the boom of an avalanche broke the stillness.

December 31*st.*—Breakfast was at 3 a.m. but as a strong, cold, gusty wind was blowing from the plateau, Wild decided to remain in camp. Snow was observed to be drifting on the highlands, but practically none on the shelf-ice. Harrisson decided to go across to Avalanche Rocks to secure a sketch of it.

Harrisson carefully examined the neighbourhood of their old camp of the preceding spring. He wrote: "Must be a considerable movement of the Ice Cap here, judging from the way it appears to have cracked since we were here last. All the time that I was there the ice was rending; reports loud as small cannonades, but not so full and deep."

Wild's intention was to break camp about midnight, for the weather had cleared up at 6 p.m. and he counted on a better sledging surface in the early morning hours.

January 1*st.*—The wind returned late in the evening and continued with drifting and falling snow until 6 p.m.

January 2*nd.*—Camp was struck and the march begun at 3 a.m. There was a light wind from the Ice Cap with low drift, but the sky was cloudless. They set out for the Alligator but were obliged to make a devious course on account of pressure, badly crevassed belts and an extensive development of an atrocious surface which they likened to an expanse of broken bottle glass firmly cemented below. This surface hurt their feet and cut the sledge runners. These jagged expanses were the result of attack by sun and wind, resulting in the surface being eaten out into thousands of icy points.

The sledgemeter finally collapsed whilst travelling over this, and had to be discarded.

Many frozen ponds of thaw water were crossed during the march; one was about half a mile long and 200 yards wide. Referring to the appearance of the coastline, Harrisson wrote: "This coast is the finest piece we have seen, bold and varied; with the rock outcrops; steep shore; great 'ice falls' pouring over bluff and slope in huge blocks, crevassed, torn and shattered for perhaps a 1,000 feet up—and back, in many places."

Watson tried to get to the rock outcrops on the coast situated south-east of the Alligator, but found the surface too broken to get through to them, so abandoned the quest.

The ice surface between the mainland and the Alligator was found to be uneven and broken, but the crevasse lids were, in the main, fairly solid.

The end of the Alligator was reached at 11 a.m. Camp was pitched ¼ mile away from the north-east end. The surface was unfortunately almost ice, consequently hard to camp upon (Plate XCVIII, Fig. 2).

After partaking of a meal, all hands spent the afternoon exploring the rocks. The dimensions are given as half a mile long, and about 500 feet in width. This ridge of rock slopes gradually to the south but ends in a rounded bluff of rocky crags at the northern extremity. The trend is almost north and south. The east side is almost wall-like and there the shelf-ice and snow bank extends high up on to it at the junction, breaking into a deep fosse. On this eastern side the apparent height of the Alligator was only 200 or 300 feet, on account of the piling of the ice against it. On the west side, however, the ice level is much lower, so that the apparent height is there nearly double that of the east side. Below the western rock face there was found a large lake of thaw water.

Kennedy's report mentions that " the rock itself is a much-contorted gneiss, with basic segregations, veins of quartz and granite, felspar and mica; in fact, apparently a highly altered Pre-Cambrian formation."

Harrisson found Snow Petrels located amongst the rocks in some numbers but no young ones hatched. They were mostly concentrated in the bold craggy area at the north end where good shelter is afforded. Two Wilson Petrels and a Skua were seen.

Patches of moss, several types of lichen (principally the bright yellow one), and a very little alga, were noted. Harrisson, who was the last to return to the camp, then turned in at 8 p.m.

January 3rd.—They were up at 2 a.m. and were all packed up and away by 4 a.m. marching down into the hollow that sweeps away north of the Alligator. There many crevasses were met, but most were solidly packed with snow. The sail was then set to take advantage of a light breeze to help the sledges up the mile-long slope leading from the depression to the general level of the shelf-ice to the west. The breeze soon died away, but a fresh breeze still continued on the Ice-Cap for they could see a low haze of drift over it, lit by the sunlight.

Having done 16 or 17 miles by 2 p.m. camp was pitched. A Skua bound to the east flew around the tents and then resumed its flight.

January 4th.—In the early morning it was blowing strongly with low drift. The party was under way at 4·20 a.m., good use being made of the sail. A course was made towards the Gillies Nunataks.

The rocks were first sighted when 7 miles away, but soon lost to sight owing to the undulations of the shelf-ice surface. They were not seen again until long afterwards when the party reached the summit of a long, high, crevassed, ice-topped ridge. The rocks then lay just below them on the western side of the ridge. Camp was pitched at 3 p.m. at a few hundred yards from the rocks after a day's run of 22 miles. Kennedy in his diary remarks: " After hoosh we visited the southern rock, which is about 200 yards long running north and south and 50 to 80 yards broad. It is constituted of dark granite and not higher than 50 feet. Covered with thousands of erratics and perched blocks of all sizes up to a large packing case and down to a pea. Gneisses, quartz, granites of all kinds and a splendid example of retreating glaciation."

Harrisson's account states that the two nunataks are located in a hollow on the west side of a long swell of the shelf-ice. The usual depression of the ice surface is met with on the west side of this obstruction. In this case the depression is rather much broken and crevassed. " The larger rock a few acres in extent (perhaps three), just outcropping from the ice ridge, and of no height above it. The outer rock standing lower, and with a deep wind-swept bergschrund around it, somewhat resembled an inverted cup in its saucer—for it stood up boldly. The larger was strewn with a great number of erratics, many of white granite, gneisses, schist, etc. The rock itself brown coarse granite; often in rounded masses, many flat hollows and gravelly spaces. One or two great boulders worn perfectly smooth by the grinding ice. I found much the same lichens as on the rocks further east. Great quantities of moss, large patches yards square on the low flat places, thick green, spongy. Only on the sunny side of stones, where dry, could I find a few pieces in seed. It must be very hardy, for large patches would appear dead—all brown-purple and sodden, rotten. But generally, upon examination, green shoots would show life still in it. Also where the snow was melting underneath, leaving a few inches between it and the rock below, the moss was beginning to ' green '—although you had to stoop and peer under the great snow sheets to see it. Not a sign of seed on the luxuriant growth—the little I found was on the sunny side of the rock, in drier places where they were not quite dried up. Generally both moss and lichen were more luxuriant than on the other rocks we visited, doubtlessly the more level situation favoured it. Altogether, interesting rocks. "

January 5th.—They were on the march again at 6 a.m. bearing down towards the smaller Gillies Nunatak. It was soon found that this was larger than appeared when viewed in the distance, for it stood in a deep fosse (investing it on all but the north-west side), larger than that at the Alligator, quite 50 feet deep extending around three sides of it. The height of the rock was, according to Kennedy, about 150 feet and the circumference about 400 yards. The first Gillies Nunatak was merely an outcropping backbone to a humped ice ridge, but this one stood up boldly (Plate XCVIII, Fig. 1).

Westward of the rock was broken ice, great crevasses, tilted ridges and raised masses; but also a long snow ramp on the north-west side leading to the summit. Between Gillies Nunatak and the land-ice slopes was a great ice ridge, apparently the glacier there rides over a long smoothed rise of the rock floor.

They mounted the great snow ramp to the summit of the rocks and found a dark "granite" very similar to that at the other outcrop, also a few erratics. Harrisson observed: "A small colony of Snow Petrels nesting amongst stones on the top and south-east side of the rock. Should say some dozen pairs. No other birds seen, but later in the day a Skua and a Wilson Petrel passed. Lichens as on the other outcrop —except that I got some of the bright orange-coloured one this morning."

Less than an hour was spent at the rock. The journey to the Hut was then resumed, first over a pressure belt about a mile wide, then north-west by west over the monotonous stretch leading to the western margin of the shelf-ice.

The wind increased, and as it was dead astern great help was afforded by the sail. Progress was rapid. At 4 p.m. 20 miles had been covered, leaving only 15 more miles to the Hut. As there was an appearance of bad weather developing and as the wind was favourable, they decided to go on and try to reach the Hut without another camp. However, at 10 p.m. after covering about 35 miles for the day, camp was pitched with some difficulty in a gale of wind. The light was then very bad (sky overcast) and they were not sure of their position, so that it was deemed advisable to go no further.

January 6th.—The march was recommenced at 9 a.m. After advancing a mile on to a rise in the surface, the horizon was searched with the aid of binoculars for sign of the Hut. Kennedy then caught sight of the Hut mast bearing nearly due north.

When approaching the Hut, they could see no sign of Moyes, for whose safety they were, of course, anxious. When only 150 yards away they struck up a rousing "Marching Chorus." Of this moment Harrisson wrote: "Oh, how relieved I felt when I saw Morton rush round the corner of the Hut, bareheaded; waved his hand to us—then, seeing there were four of us in the team, stood on his head for joy! He was amongst us in another minute or two, shaking hands all round. 'Oh, you renegade!' shaking his head at me and wringing my hand, 'You, renegade!' and his feelings almost overcame him."

The distance sledged was 305 miles, which does not include relay work or reconnoitring for a passage through the shattered ice belts. Good work had been accomplished, but Wild was disappointed to have been so successfully blocked in efforts to get east of the Denman Glacier to what is evidently a very interesting region of rock outcrops beyond that obstruction.

SUMMER AT THE "GROTTOES."

Moyes looked no worse for his nine weeks of loneliness, but he said it had been the worst time he had ever experienced in his life. Jones's Western Party had set out on November 7th, and they were still absent.

When, according to the original plans, Harrisson was overdue at the Hut, Moyes had set out in search of him. He got as far as Henderson Island; then as he had had difficulty in erecting the tent in wind by himself and as his eyes had got bad with the glare, he turned back. On the way he got into trouble in a crevasse but got out on the sledge harness. On arriving back at the Hut he was again disappointed to find that Harrisson had not turned up during his absence.

At the Hut Moyes had had a lot of trouble arising from thawing of the snow and drip. His only companions were several Emperor Penguins which camped on the floe nearby whilst moulting. Moyes used to go down and talk to them.

Five Skua Gulls had followed him on his lonely sledging trip, causing him to feel quite eerie. As a reprisal on return to the Hut he set about shooting all Skuas that appeared.

Visiting the sea-ice on the afternoon of their return, Wild's party found scarcely any more of the sea-ice broken out than when they had left at the end of October. However, open water was visible to the north about 8 miles away. Many of the great ramps along the edge of the shelf-ice had collapsed further, the sea-ice tilting under them. Two seals were basking alongside a crack. Two Emperor Penguins were observed standing by a pressure ridge; one was half moulted, partly covered with long ragged old feathers. The other had not yet started to shed feathers and was looking very large and fat alongside the first.

January 7th.—Kennedy seized all available opportunities to plot his survey notes of the sledge journey, and Watson spent much time developing the photos of the trip. Harrisson found more Emperor Penguins moulting on the floe towards Icy Cape; two in one place and three in another. There also he had a shot at a Wilson Petrel. Some of these little creatures visited the Hut in the evening.

Along the shelf-ice cliffs Harrisson found a great development of icicles; immense overhanging curtains of them. Water was running, and sodden melting snow falling from the cliffs. The cliffs were in veritable ruins. The temperature during the day ranged from 15° F. at 3 a.m. to 34° F. at the hottest hours.

January 8th.—A beautiful bright day. Harrisson made a fish-trap out of wire net and lowered it through a crack in the sea-ice about 1 mile out from the cliff face. Wilson Petrels and Skuas were frequent visitors.

January 9th.—Fine weather. Harrisson hauled up the trap, to find in it lots of ice crystals amongst which were four pale pink amphipods with black eyes. The thickness of the sea-ice where the trap was lowered was more than the length of a bamboo pole (10 feet). Weddell Seals basked on the ice along the tide-cracks.

January 10th.—Another fine warm day. The snow surface became quite wet during part of the day. Wilson Petrels, Skuas and some Snow Petrels were seen; also more crustaceans in the fish-trap. Though the sea-ice was broken out to within 8 miles, dense pack-ice was to be seen along the horizon.

January 12th.—The good weather continued. Harrisson spent the day walking north over the sea-ice, keeping in close touch with the shelf-ice, in search of seals and birds. In his walk to 7 miles north of the Hut he found a considerable number of Weddell Seals distributed at intervals along cracks in the ice. Wilson Petrels and Skua Gulls were met with repeatedly. At Seal Point fifteen Giant Petrels were gorging themselves on the carcase of a seal which had been killed in the previous August.

January 13th.—Harrisson collected internal parasites from a Weddell Seal killed for food and fuel. Also he got a good haul of crustaceans in his trap. Skua Gulls and Wilson Petrels plentiful.

The next day more seal meat was got and buried in the snow near the Hut in case the *Aurora* should not arrive and the party have to carry on for another year.

January 15th.—Giant Petrels had arrived at the carcases of the seals killed near Winter Quarters. A large catch of crustaceans was taken in the trap. Harrisson found that the Emperor Penguins which had not started to shed feathers when seen on the 6th, now looked like a pillow case with feathers coming out all over it; only parts of the flippers showed new feathers.

January 16th.—Hundreds of amphipods were caught in a bag baited with a Giant Petrel body and lowered 18 feet below the surface. Numbers of Wilson Petrels about. Harrisson had by now shot quite a number for skins.

January 17th.—Watson visited his ablation poles in the shelf-ice and found the glacier level in recent weeks to be gradually going down. But the average rise to that date since the poles were set up appeared to be about 9 inches.

January 18th.—A beautiful day. The shade temperature in the meteorological screen was 38° F., at 11.50 p.m. it was 14° F.

January 19*th.*—Wild's specialisation was in sledging and the general routine of polar expeditionary existence. Under his direction all hands shared alike the routine work at Winter Quarters. When that was done for the day the men were free to do as they liked; scientific work being a matter of personal option, quite a secondary matter. An organised scientific programme as a primary consideration in which all hands took part would have achieved more in that direction.

Sunday was a day when all hands were allowed to do what they liked. So this being a Sunday, Harrisson again set out to explore the sea-ice, leaving soon after 10 a.m. This time he took the dogs and a sledge. He travelled along below the cliffs for 5 miles, passing numbers of seals and birds; then struck out to the north-west 7 more miles before reaching the edge of the sea-ice. There he was pleased to see once more the free waves splashing and heaving after nine months within the ice. Numbers of bergs and much drift-ice were in sight. A whale was seen spouting in the north-east. Seals were in the sea and on the floe. A few Emperors were on the floe and Skuas and Wilson Petrels in sight. As the pithing needle had accidentally been lost from the sledge, Harrisson had to return without specimens of Emperors which he had hoped to secure for skins. He reached the Hut at 10.45 p.m.

January 20th.—Magnificent weather. A Weddell Seal brought in to-day was infested with many large tapeworms. Harrisson had by now almost completed an ambitious fish-trap and dredging reel by means of which he hoped to trap fish on the bottom below the sea-ice.

With the surface névé in such a soft condition owing to partial thaw, Kennedy had been experiencing great difficulty in maintaining his instrument firm and immovable for magnetic and time observations. To obtain a firm foundation he now sank three large wooden posts to a depth of 4 feet below the shelf-ice surface. The legs of the instruments were then mounted on these with completely satisfactory results.

January 21*st.*—The Western Sledge Party arrived back at the Grottoes after a successful journey to Gaussberg. They were all very sunburnt and hairy, but looked well. Hoadley brought back a collection of rock specimens and Jones handed over to Harrisson a valuable collection of eggs: two of the Silver-grey Petrel, five of the Antarctic Petrel, four Cape Pigeon eggs and two Skua eggs. Their trophies included also moss, some algae and three or four lichens.

THE WESTERN SLEDGE JOURNEY.

The party consisted of Dovers (surveyor), Hoadley (geologist), and myself (surgeon).* We were hauling one sledge with rations for nine weeks. Setting out from the Grottoes on November 7th, our course, which was almost due south, lay over the Shackleton Ice-shelf practically parallel to the sea-cliffs. The surface was good, and we covered 11 miles by nightfall, reaching a point some 2 or 3 miles from the rising and slopes. As the high land was approached closer, the surface of the Shackleton Shelf, which farther north was practically level, became undulating and broken by pressure-ridges and crevasses. These, however, offered no obstacle to sledging.

Proceeding in the morning and finding that an ascent of the slopes ahead was rendered impracticable by wide patches of ice, we turned more to the west and steered for Junction Corner. Upon our arrival there it was discovered that several bergs lay frozen within the fast ice close to where the seaward wall of the Shackleton Shelf joined that of the land Ice-Cap. Some of these bergs were old and rotten, but one seemed to have broken away quite recently.

From the same place we could see several black points ahead; our course was altered towards them, almost due westward, about half a mile from the sea-cliffs. They proved to be rocks, six in number, forming a moraine. As it was then half-past five, we camped in order that Hoadley might examine them. There had been a halo visible all day, with mock-suns in the evening.

In the morning a high wind was blowing. Everything went well for a little over a mile, then we found ourselves running across a steep slope. The wind having increased and being abeam, the sledge was driven to leeward when on a smooth surface, and when amongst soft sastrugi, which occurred in patches, was capsized. Accordingly camp was pitched.

* Dr. Jones was leader of the Party and this is his report, somewhat modified.

The next day being less boisterous, a start was made at 9 a.m. There was still a strong beam wind, however, which carried the sledge downhill, with the result that for one forward step two had to be taken to the right. We were more fortunate in the afternoon and, at 5.30 p.m., reached the depot laid on October 16th. From this position we had a fine view of the Helen Glacier running out of a bay which opened up ahead.

Having picked up the depot next morning, we were disappointed to find that we should have to commence relay work. There were then two sledges with rations for thirteen weeks; the total weight amounting to 1,200 pounds. By making an even division between the two sledges the work was rendered easy but slow. When we camped at 6 p.m. 5½ miles had been covered. The surface was good, but a strong beam wind hindered us while approaching the head of Farr Bay. The Ice-Cap to the west appeared to be very broken, and it seemed inevitable that we should have to ascend to a considerable altitude towards the south-west to find a good travelling surface.

In the morning we were delayed by heavy wind, but left camp at ten o'clock after spending an hour digging out the sledges and tent. At lunch time the sun became quite obscured and each of us had many falls stumbling over the invisible sastrugi. At five o'clock the weather became so thick that camp was pitched.

On November 13th, we started early, and, finding a good firm track over a gently rising plateau, made fair progress. At three o'clock a gale sprang up suddenly; and fortunately the sledges were only a quarter of a mile apart as we were relaying them in stages up the rising plateau. The tent was pitched hurriedly, though with difficulty, on account of the high wind and drift. The distance for the day was 4 miles 1,500 yards, the last mile and a half being downhill into a valley at the head of the bay. The morainic boulders visible from the camp at the depot were now obscured behind a point to the west of Farr Bay.

The next sixty hours were spent in sleeping-bags, a heavy snow-storm making it impossible to move. Owing to the comparatively high temperature, 20° to 26° F., the snow melted readily on the lee side of the tent, and, the water running through, things became uncomfortably wet inside. At midday of the 16th, however, we were able to go out, and, after spending two and a half hours digging out the tent and sledges, we made a start, travelling 2¾ miles on a south-westerly course.

During the morning of the 17th a slight descent was negotiated, but in the afternoon came the ascent of the slopes on the western side of Farr Bay. The Ice-Cap here was very badly crevassed, and spiked boots had to be worn in hauling the sledges up the steep névé slopes. In the latter part of the afternoon a course was made more to the west, and about the same time the south-east wind freshened and we travelled for a couple of hours through thick drift. The night's camp was situated approximately at the eastern edge of the Helen Glacier. The portion of the Ice-Cap which contributes to the glacier below is marked off from the general icy surface on either side by a series of falls and cascades. These appeared quite impassable near sea-level, but we hoped to find a smooth passage at an altitude of about 1,000 feet.

A start was made at 7 a.m. The surface consisted of ice and névé and was badly broken by pressure-mounds, 10 to 20 feet high, and by numerous crevasses, old and recent; many with sunken or fallen bridges. While crossing a narrow crevasse, about 40 feet of the bridge collapsed lengthwise under the leading man, letting him fall to the full extent of his harness rope. Hoadley and myself had passed over the same spot, unsuspecting and unroped, a few minutes previously, while looking for a safe track. We were now nearing the approximate western edge of the Helen Glacier, and the broken condition of the ice evidently indicated considerable movement. Later in the morning a more southerly course was kept over an improving surface.

At midday Dovers took observations of the sun and found the latitude to be 66° 47′ S. Owing to the heat of the sun the fat in the pemmican had been melting in the food-bags, so after lunch the provisions were repacked and the pemmican was put in the centre of the large tanks. In the afternoon we hoisted the sail, and by evening had done 4 miles. From our camp the eye could range across the Helen Glacier eastward to the Shackleton Ice-shelf. Far away in the north-west was a wide expanse of open water, while a multitude of bergs lay scattered along the coast to the west of the Helen Glacier.

The next day, November 19th, was gloriously bright, with a breeze just strong enough to make hauling pleasant. Erecting a sail, we made an attempt to haul both sledges, but found that they were too heavy. It was soon discovered that a considerable detour would have to be made to cross the broken ice on the western edge of the Helen Glacier. By keeping to the saddles and valleys as much as possible, and working to the south, we were able to avoid the rougher country, but at 4 p.m. we arrived at what at first appeared an impasse.

At this point three great crevassed ridges united to form the ice-falls on the western side of the glacier. The point of confluence was the only place that appeared to offer any hope of a passage, and, as we did not want to retrace our steps, we decided to attempt it. The whole surface was a net-work of huge crevasses some open, the majority from 50 to 100 hundred feet or more in width. After many devious turns, a patch of snow between two large abysses was reached. As the ice in front seemed even more broken than that behind, camp was pitched. After tea a search was made for a way out, and it was found that by travelling along a narrow, knife-edge ridge of ice and névé, with an open crevasse on each side, a good surface could be reached within a mile of the camp. This ridge had a gradient of one in ten, and, unfortunately, also sloped down towards one of the open crevasses.

During the next four days a heavy blizzard raged. There was a tremendous snowfall accompanied by a gale of wind, and, after the second day, the snow was piled 4 feet high round the tent, completely burying the sledges and by its pressure greatly reducing the space inside the tent. On the 23rd, the fourth day, we dug out the floor, lowering the level of the tent about 2 feet, and this made things more comfortable. While digging, a crack in the ice was disclosed running across the floor, and from this came a considerable draught. By midday the weather had improved sufficiently to allow us to move.

The sledge and tent were excavated from beneath a great mass of soft snow; the new level of the snow's surface being 4 to 5 feet above that on which the camp had been made four days earlier. The wind having fallen, we went ahead with the sledges. While crossing the ridge of ice which leads into the valley below, one man hauled the sledges while the other two prevented them from sliding sideways downhill into the open crevasse. That afternoon we noticed very fine iridescent colouring in cirro-cumulus clouds as they crossed the sun.

The next day (the 24th) gave us a pleasant surprise, there being a strong breeze dead aft, while the travelling surface ahead looked distinctly favourable. Sail was hoisted and the two sledges were coupled together. The course for a short distance was downhill, and we had to run to keep up with the sledges. The slopes on the far side of the valley we had entered on the previous afternoon were not so formidable as they had looked, for by lunch time 6½ miles had been covered. The surface was good, with occasional long undulations. After lunch a turn to the north was made for a short distance in order to come in touch with the coastline. Then the march west was resumed by travelling parallel to the shore at a distance of 5 to 10 miles. At halting-time the extreme western edge of Helen Glacier was passed, and below lay young floe-ice, studded with numerous bergs.

In the morning (the 25th) Dovers called attention to what appeared to be an ice-covered island (Drygalski Island) lying to the north-north-west, 30 to 40 miles away.

As soon as camp was struck the march was resumed direct for what every one thought was a rocky outcrop, though nearer approach proved it to be merely the shaded face of an open crevasse. The same course was maintained and the ridge of ice that runs down to the western point of Depot Bay was soon close at hand. From its crest we could see a group of about a dozen rocky islands, (subsequently known as Rookery Islands), the most distant being 5 miles off the coast. All were surrounded by fast-ice. Descending steeply from the ridge into a valley which ran out to the sea-cliffs, we pitched camp for lunch (Plate CIV, Fig. 2).

The meal completed, Hoadley and I descended to the edge of the ice-cap in order to see if there were a passable route down on to the sea-ice. Crossing wide areas of badly crevassed ice and névé during a descent of 900 feet, we reached the sea-front about 1½ miles from the camp. Below us there was a chaos of bergs and smaller debris, resulting from the disintegration of the land-ice, which were frozen into the

fast-ice and connected to one another by huge ramparts of snow. Following a path downward with great difficulty, we approached a small berg which was discovered to be rapidly thawing under the action of the heat absorbed by a pile of stones and mud. The trickling of the falling water made a pleasant relief in the otherwise intense silence. As it seemed impossible to haul sledges through this jumble of ice and snow, Hoadley suggested that he should walk across the fast-ice and make a brief geological examination of at least the largest islet. I therefore returned to the camp and helped Dovers take observations for longitude and magnetic variation.

Hoadley returned at 9 p.m. and reported that he had seen an immense rookery of Emperor Penguins near the largest islet, besides Adelie Penguins, Silver-grey, Wilson and Antarctic Petrels and Skua Gulls. He also said that he thought it possible to take a sledge, lightly laden, through the drifts below the brink of the glacier.

Accordingly in the morning (November 26th) the 11-foot sledge was packed with necessaries for a week's stay, although we intended to remain only for a day in order to take photographs and search for specimens. Erecting a depot flag to mark the big sledge, we broke camp at midday and soon reached the sea-front. Our track then wound among the snow-drifts until it emerged from the broken ice which was observed to border the land ice-sheet for miles. The travelling became unexpectedly good for a time over highly polished, green sea-ice, and thence on to snow, amid a field of numerous small bergs. Many of these showed a marked degree of ablation, and, in places, blocks of ice perched on eminences had weathered into most grotesque forms. There were numerous streams of thaw-water running from mud-covered bergs. Perspiring in the heat, we more than once stopped to slake our thirst.

Approaching the largest rock—Haswell Island, as it was called later—we saw more distinctly the immense numbers of Emperor Penguins covering several acres of floe. The birds extended in rows even on to the lower slopes of several bergs. The sound of their cries coming across the ice reminded one of the noise from a distant sports ground during a well-contested game. We camped at 5 p.m. on a snow-drift at the southern end of the island. A large rookery of Adelie Penguins on a long, low rock, about a mile distant, soon made itself evident.

Although the stay was intended to occupy only about twenty-four hours, we were compelled to remain five days on the island on account of a snow-storm which continued for practically the whole of the time. This did not prevent us from leaving the tent and wandering about; Hoadley keen on the geology and Dovers surveying whenever the light was good enough. The temperature of the rock was well above freezing-point where it was exposed, and snow melted almost as soon as it fell. Our sleeping-bags and gear soon became very wet, but we rejoiced in one compensation, and that was a change of diet. It was agreed that five Adelie Penguin or ten Cape Pigeon eggs made a good tasty entree to the monotonous ration.

The camp was situated on the largest of a group of about twelve small islets, lying within 5 or 6 miles of the coast, on the lower slopes of which several outcrops of rock could be observed. Haswell Island was found to be roughly diamond-shaped; three-quarters of a mile in length, the same in width, and about 300 feet on the highest point. It was surrounded by fast-ice one season old, raised in pressure-ridges on the eastern side. On the northern, southern, and especially the eastern face, the rock was steep; on the western aspect, there was a more gentle slope down to the sea-ice, the rock being almost concealed by big snow-drifts. There were signs of previous glaciation in the form of erratics and many examples of polishing and grooving. The rock was very rotten and in many places, especially about the penguin rookeries, there were collections of soil-like matter. Two deep gorges cut through the island from south-east to north-west, in both of which there were small ponds of fresh-water (Plate CV).

The most marked feature was the wonderful abundance of bird life, for almost all the birds frequenting the shores of the continent were found nesting there. Adelie Penguins were in greatest numbers. Besides the large rookery on one of the smaller islets, there were numerous rookeries of fifty to one hundred birds each on Haswell Island itself. In most cases the penguins made their nests on the rock itself, but, failing this, had actually settled on snow-drifts, where they presented a peculiar sight, as the heat of their bodies having

caused them to sink in the snow, their heads only were visible above the surface.* One bird was observed carrying an egg on the dorsal surface of his feet as the Emperor Penguins do. Feathers were scattered broadcast around each rookery. These result from the numerous fights which occur and are also partly derived from the bare patch of skin at the lower part of the abdomen which provides the necessary heat for incubation when the bird is sitting. Most of the birds had two eggs in a well-advanced stage of incubation, and it was a difficult task to find a sufficient number fresh enough for culinary purposes. Attached to each rookery was a pair of Skua Gulls, who swooped down and quickly flew off with any eggs left for a moment untended.

The Emperor Penguins had their rookery on the fast sea-ice, about a mile east of Haswell Island. The birds covered 4 to 5 acres, but there were undoubted signs that a much larger area had been occupied. We estimated the numbers to be 7,500, the great majority being young birds. These were well grown, most of them standing as high as the shoulders of the adults (Plate CVI, Fig. 3).

They were all very fat, covered by a grey down, slightly darker on the dorsal than on the ventral surface, with dark tails and a black, straight beak. The eyes were surrounded by a ring of grey plumage, and this again by a black band which extended over the skull to the root of the beak. Thus the markings on the young do not correspond with those of the adults. A few of the larger chicks had commenced to moult, the change of plumage being observed on the flippers.

Daily we watched large numbers of adults departing from and returning to the rookery. The direction in which they travelled was north, towards open water, estimated to be 20 miles distant. Although more than once the return of the adults to the rookery was carefully noted, we never saw the young birds being fed, old birds as they entered the rookery quietly going to sleep.

Hoadley, on his first visit to the island, had seen Antarctic Petrels flying about, and a search revealed a large rookery of these on the eastern side. The nesting-place of this species of petrel had never before been discovered, and we were all elated at the great find. About three hundred birds were found sitting in the gullies and clefts, as close together as they could crowd. They made no attempt to form nests, merely laying their eggs on the shallow dirt. Each bird had one egg about the same size as that of a domestic fowl. Incubation was far advanced, and some difficulty was experienced in blowing the specimens with a blow-pipe improvised from a quill. Neither the Antarctic nor any other petrels offered any resistance when disturbed on their nests, except by the expectoration of large quantities of a pink or green, oily fluid.

The Cape Pigeons had just commenced laying when we arrived at the Island. On the first day only two eggs were found, but, on the fourth day after our arrival, forty were collected. These birds make a small shallow nest with chips of stone.

The Silver-grey or Southern Fulmar Petrels were present in large numbers, especially about the steep north-eastern side of the island. Though they were mated, laying had scarcely commenced, as we found only two eggs. They made small grottoes in the snow-drifts, and many pairs were seen billing and cooing in such shelters.

The small Wilson Petrels were found living in communities under slabs of rock, and Hoadley one afternoon thought he heard some young birds crying.

Skua Gulls were present in considerable force, notably near the penguin rookeries. They were breeding at the time, laying their eggs on the soil near the summit of the Island. The neighbourhood of a nest was always betrayed by the behaviour of these birds who, when we intruded on them, came swooping down as if to attack us.

Although many Snow Petrels were seen flying about, we found only one with an egg. The nests were located in independent rocky niches but never in rookeries.

Vegetable life existed in the form of algae in the pools, lichens on the rocks and mosses which grew luxuriantly, chiefly in the Adelie Penguin rookeries.

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*The correct explanation appears to be that whilst hatching their eggs a snow-storm had intervened and buried or partially buried them.—ED.

Weddell Seals were plentiful about the Island near the tide-cracks; two of them with calves.

Though the continuous bad weather made photography impossible, Hoadley was able to make a thorough geological examination of the locality. On December 2nd the clouds cleared sufficiently for photography, and after securing some snapshots we prepared to move on the next day. Dovers built a small cairn on the summit of the island (Haswell Id.) and took angles to the outlying rocks.

On the 3rd we packed our specimens and left for the mainland at 9.30 a.m., arriving at the land ice-cliffs at 2 p.m. The snow surface was soft, even slushy in places, and the heat amongst the bergs along the coast of the mainland was very oppressive. After we had dug out the second sledge and re-arranged the loads, the hour was too late for sledging, so Dovers took another observation in order to obtain the rate of the half-chronometer watch. While on the Island, we had examined the coast to the west with glasses and concluded that the only way to get westward was to ascend to a considerable altitude on the Ice-Cap, which, as far as the eye could reach, descended to the sea-level in long cascades and falls. We had expected to place a depot somewhere near Haswell Island, but such procedure was now deemed inadvisable in view of its distance from what would probably be our direct return route.

A start was made next day against an opposing wind, the sledges being relayed up a steep hillside. Later on, however, a turn was made more to the west, and it was then possible to haul both sledges at the same time. The surface was soft, so that after every halt the runners had to be cleared. The distance for the day was 5½ miles, and the night's camp was at an altitude of about 1,500 feet, located just above the broken coastal ice.

During December 5th and 6th a snow-storm raged and confined us to our tent. The high temperature caused the falling snow to melt as it touched the tent, and, when the temperature fell, the cloth became thickly coated with ice.

On the 7th, the march was resumed, by skirting a small valley at an approximate altitude of 2,000 feet. The Ice-Cap ahead descended in abrupt falls to the floe. Having a fair wind and a smooth surface, we made good headway. In the afternoon we ran into a plexus of crevasses, and the surface was traversed by high ridges. The snow-bridges in many cases were weak, and several gave way while the sledge was crossing them. A chasm about 50 feet deep and 100 feet long was passed, evidently portion of a crevasse, one side of which had been raised. Later in the afternoon the surface became impassable and a detour to the south was rendered necessary. This difficulty arose near the head of the valley, in which situation the Ice-Cap fell in a series of precipitous terraces for about 1,000 feet.

At midday on the 8th we were compelled to continue the detour over a badly crevassed surface, ascending most of the time. On that night, camp was pitched again amongst crevasses. The sledge-meter showed only 2 miles 1,100 yards for the afternoon, relaying having been necessary.

The sledges slipped along in the morning with a fresh breeze in their favour. The sky was covered with rapidly scudding, cirro-cumulus clouds, which, by midday, quite obscured the sun, making surrounding objects and even the snow at our feet indistinguishable. After continuing for 4½ miles, we were forced to camp. In the afternoon a heavy snow-storm commenced and persisted throughout the following day.

Though snow was still falling on the morning of the 11th, camp was broken at 10 a.m., and we moved off rapidly with a strong wind. During the morning the surface was gently undulating, but it mounted in a gradual ascent until nightfall. In the latter part of the afternoon the sun was clouded over, and steering had to be done by the aid of the wind. To the north we had a fine view of Drygalski's "High Land" (Drygalski Island), perceiving a distinct seaward ice-cliff of considerable height.

As there were no prominences on the Ice-Cap that could be used for surveying marks, Dovers had considerable difficulty in keeping a reckoning of our course. The trouble was overcome by building snow-mounds and taking back-angles to them with the prismatic compass. At this juncture we were about 10 miles from the shore and could see open water some 30 miles to the north. Frozen fast within the floe were great numbers of bergs.

We started off early on December 12th with the aid of a fair breeze over a good surface, so that both sledges were easily hauled along together. The course was almost due west, parallel to the coast. Open water came within a few miles of the ice-cliffs, and, farther north, a heavy belt of pack was observed. When the sun sank lower, the bergs on the northern horizon were refracted up to such a degree that they appeared to be hanging from the sky.

The aid rendered by the sail under the influence of a fair breeze was well shown on the following day. In four hours, on a good surface, both sledges were transported 7 miles. When we moved off, the wind was blowing at 10 to 15 miles an hour. By 10 a.m. the sky became overcast and the wind freshened. Camp was pitched for lunch at 11 a.m., as we hoped that the weather would clear again later, but the wind increased and snow began to fall heavily in the afternoon, so we did not stir. The storm continued throughout the following day and it was impossible to march until the 15th.

Continuing the ascent on the 16th out of a valley we had crossed on the previous day, we halted on the top of a ridge within view of Gaussberg, which appeared as a small dark object bearing due west. The course was altered accordingly towards this object and everything went smoothly for 10 miles. Then followed an area where the ice fell steeply in waves to the sea, crossed by crevasses which averaged 50 feet in width. The snow-bridges were deeply concave, and the lower side of each chasm was raised into a ridge 5 to 10 feet high. Making fast the alpine rope on to the sledges, one of us went ahead to test the bridge, and then the sledges, one at a time, were rushed down into the trough and up on the other side. Dovers fell into a crevasse and though he did not suffer personal damage, the chronometer watch which he carried and relied upon for longitude observations received rough treatment. The glass was broken and the watch stopped. There was a spare glass in the equipment which was used to repair the damage. Fortunately, only three hours earlier, the chronometer watch had been compared with a good hack watch so that it could be reset fairly accurately. Nevertheless, some error* was introduced henceforth into calculations for position. After crossing ten or more crevasses we were forced to camp by the approach of a rapidly moving fog driven before a strong westerly wind. While camp was being prepared, it was discovered that a tin of kerosene on the front sledge had been punctured causing the loss of a gallon of fuel. Fortunately, we were well within our allowance, so the accident was not serious. Soon after tea our attention was drawn to a pattering on the tent like rain, caused by a fall of sago-snow.

In the morning the weather was clearer, and we saw that it was impossible to reach Gaussberg by a direct route. The ice ahead was cleft and split in all directions, and, in places, vertical faces stood up to a height of 100 feet. The floe was littered with hundreds of bergs, and in several localities there were black spots which resembled small rocks, but it was impossible to approach close enough to be certain. Retracing the way out of the broken ice, we steered in a south-westerly direction, just above the line of serac and crevassed ice. The coast here trended to the south-west, forming the eastern side of Drygalski's Posadowsky Bay. The going was heavy, the surface being covered by a layer of frost-crystals deposited during the night. A fog came up again early in the afternoon and had quite surrounded us at camping time. During the day there were fine clouds of ice-crystals in the air, and at 8 p.m. a fog-bow was seen in the east.

Turning out in the morning, we saw Gaussberg peeping over a ridge to the west, but were still prevented from steering directly towards it by the broken surface. When we had advanced 10 miles, a heavy fog brought us to a halt at 5 p.m.

On the 20th, in spite of a sticky surface, 13 miles were covered on a west-south-west course. The ice-cap continued to be undulating but free of crevasses. The altitude was between 2,500 and 3,000 feet.

In the morning, after travelling 2 miles, we came in sight of Gaussberg again and steered directly towards it. The surface was good with a downward grade. At 5¼ miles a depot was made of the small

* The map published in *The Home of the Blizzard* is copied directly from Dovers's route survey and includes errors arising from the damage sustained by the chronometer watch. In the folding map accompanying this report any such errors have been eliminated so far as possible by accepting the position of Adams Island and of Drygalski Island as fixed by observations from the *Aurora* in 1914 and adopting the position of Gaussberg as determined by the Gauss Expedition, then replotting Dovers's survey from the daily data in his excellently kept field note-book.

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sledge and most of the food, in expectation of a clear run to the mountain. Not far ahead, however, were two broken-backed ridges intersecting the course, and a detour had to be made to the south to cross them higher up.

Mid-Summer Day, December 22nd, was spent in the tent, a move being impossible on account of the high wind. In the afternoon we walked ahead a short distance and reconnoitred six or seven crumpled ridges. Though the barometer had been falling ominously for twenty-four hours, the bad weather did not continue.

Gaussberg was reached in the afternoon, after our track had passed through 17 miles of dangerous country. For the first few miles the surface consisted of a series of steep, buckled ice-ridges; later, it was snow-covered, but at times literally cut into a network of crevasses.

The only approach to Gaussberg from the plateau is from the south. To the east and west there are magnificent ice-falls, the debris from which litters the floe for miles around.

December 24th and Christmas Day were devoted to examining the mountain. Dovers made a long series of observations for longitude, latitude and magnetic variation, while Hoadley examined the rocks and took photographs. See Plate CVI, Fig. 2; Plate CVII and Plate CIV, Fig. 1.

On the southern side, the ice-cap abuts against this extinct volcano at an elevation of about 400 feet above sea-level; the summit of the mountain rises another 800 feet. On the north, the rock descends to the floe. Gaussberg is pyramidal in shape, falling steeply from a ridge at the summit. The sides are covered with a loose rubble of volcanic fragments, square yards of which commence to slide at the slightest disturbance. This renders climbing difficult and accounts for the large numbers of isolated blocks fringing the base.

At the summit two cairns were found, the bamboo poles which had previously marked them having blown over. Further examination revealed many other bamboos which had been used as marks, but no other record of the visit of the German expedition, ten years before, was met. Bird life was not plentiful, being limited to a few Skuas, Wilson Petrels and Snow Petrels; the latter nesting under slabs of rock. There were large quantities of moss where thaw-water had been running.

The ice and snow near the mountain showed evidences of marked thawing, and we had difficulty in finding a favourable spot for our camp.

Christmas Day was gloriously fine, with just sufficient wind to counteract the heat of the sun. At midday the Christmas "hamper" was opened, and it was not long before the only sign of the plum-pudding was the tin. In the afternoon we ascended the mountain and left a record in a cairn at the top. By the route followed, Gaussberg was 215 miles from "The Grottoes," but relay work had made the actual distance covered 300 miles.

We had been away from home seven weeks, and, though there was sufficient food for an outward journey of another week, there was no indication that the country would change. Further, from the summit of Gaussberg one could see almost as far as could be marched in a week. Accordingly it was decided to commence our return on the 26th, making a course almost due east, thus cutting out numerous detours which had to be taken on the outward journey.

We left the mountain on December 26th, pursuing a course to the south of our outward track so as to avoid some crevassed ridges. Ascending steadily against a continuous head wind, we picked up the second sledge at midday on the 28th.

Next day all the gear was transferred to one sledge and a course made direct to the Helen Glacier; the other sledge being abandoned.

On December 31st, after a day's blizzard, the surface was found to be covered with sastrugi of soft snow 18 inches to 2 feet in depth. In crossing a wide crevasse, the sledge became bogged in the soft snow of a drift which had a deceptive appearance of solidity. It took us ten minutes to extricate ourselves, and, after this, crevasses were negotiated at a run.

A violent blizzard raged during the following day—the first of the New Year, 1913. This proved to be a blessing, for it made the surface more crisp and firm. In the morning the sun was obscured and nothing was visible but the snow at our feet, so that steering was very difficult. In the afternoon the sun broke through, a strong westerly wind sprang up and we moved along at a good pace, covering more than 13 miles before camping.

On January 3rd the track bordered on the edge of the plateau, the surface being almost level, rising gently towards the south.

After a violent blizzard of three days' duration, which confined us in the tent, we continued on the same course for four days, averaging about 11 miles each day. The surface was good, but a strong south-easter blew practically all the time and reduced our speed considerably.

At 10 a.m. on January 9th a fog-bank was observed in the east. This rapidly approached, and in 15 minutes was quite close. There was now a splendid display of rings and arcs, caused apparently by minute ice-crystals which filled the air without obscuring the sun or sky. First an arc of prismatic colours appeared in the east, and in a few seconds the sky seemed literally to be covered with other arcs. At first they seemed to be scattered indiscriminately, but after a short time several arcs joined and we could discern a symmetrical arrangement. The sun was surrounded by a ring, the lower portion of which was broken by an inverted arc; two other arcs were visible on either side. A large ring appeared encircling the zenith, intersecting the first and passing through the sun. Two pairs of arcs were also seen, one pair in each ring. Excepting the arcs and ring about the zenith, which was greyish-white against the blue sky, the arcs showed prismatic colouring. The display lasted 10 minutes and ended with the disappearance of the ice-crystals.

From our camp on the night of January 10th, broken country could be seen ahead. To the north, open water was visible, and to the north-east the Shackleton Shelf, so that we were nearing home at last. Here, a heavy snow-storm delayed us for two and a half days, and it was not till the afternoon of January 13th that we were able to move ahead.

The next day was dull, the sun being quite obscured; and the only check upon the steering was the south-easterly wind. At midday the thermometer registered 35° F. in the shade, and the surface became quite sticky. After tea we walked ahead for a couple of hundred yards to the summit of a ridge where the full extent of the Helen Glacier was laid before us. It was evident that our position was some miles north of the true course, but, considering the absence of steering marks and the constant overcast weather, we considered ourselves lucky in being so close to it.

The bad weather continued and snow fell during the following day. On the 16th the light was better, and we pushed into a strong wind which freshened to the force of a moderate gale before we had travelled 2 miles. Approaching a steep ascent we were compelled to camp. The morning brought an improvement, and the crossing of the Helen Glacier was commenced a mile or two above the outward course.

At midday on January 18th, over treacherous ice, in the face of strong winds, we were making good headway towards Junction Corner. Almost daily for a fortnight a Wilson Petrel had visited us, the only form of life seen on the return journey.

On the 19th we were not able to move until 3.30 p.m., when the wind, which had been blowing with the force of a gale, subsided. During the afternoon a magnificent view of the Helen Glacier was obtained, and in the west we could see Haswell Island and Drygalski Island.

Continuing on the same course, throughout the following day, we picked up the Hut with the binoculars at 5 p.m. There now came a quick descent to Junction Corner.

On the lower levels there was clear evidence of thawing having occurred. The firm surface of snow which had been present on the outward journey was now converted into rough ice, over which we walked painfully in finnesko. Névé and ice surfaces were covered with sharp spicules, and the sides and ridges of crevasses were unmistakably thawed.

Leaving Junction Corner at 6 a.m., we steered a course for the Hut, running parallel to the edge of the glacier. At 3 p.m. the mast was sighted, and, later, the Hut itself. When within half a mile of "The Grottoes" we saw three figures on the floe and guessed that the Eastern Party had returned. In a few minutes greetings were heartily exchanged and they had welcomed us home.

LAST DAYS ON THE SHACKLETON ICE SHELF.

On January 22nd a well-marked water-sky appeared to the north and west, indicating that the sea-ice was broken out to the west of what was styled "the Western Barrier" (the large grounded berg a few miles west of the Grottoes) as far as the Helen Glacier.

By this time the surface around the Hut was very bad, for particles of soot and dirt scattered about over the surface, catching the sun's heat, had caused deep pitting and thaw, until it resembled a newly ploughed field. The snow had melted off the roof of the Hut and a strip of the west wall was showing. On the other three sides the ice came just over the verandah eaves. The body of the Hut was now embedded in the ice for thaw and refreezing had so converted all snow adjacent to the structure.

This day Harrisson put the finishing touches on his deep water fish-trap and its hoisting gear. Every available scrap of copper wire was used to make a line which it was hoped would be sufficiently long to reach bottom. He chose a place in a newly-frozen-over water lead 300 yards from the cliff. The new ice on this was 4 inches thick but below it there were bushels of exceedingly thin crystal plates of ice. These were about 1 inch broad and several inches long, often loosely aggregated to form masses. When the hole was thoroughly cleared of ice the improvised winding drum mounted on a sledge was placed in position and the wire lowered; but the full length of the wire, 290 fathoms, did not reach bottom. It was too late to try another spot, so the wire was wound up and left for the night.

The next day snow fell in quantity so all hands were occupied with indoor jobs. Harrisson skinned the Emperor Penguins he had secured on the 19th. He found them "stuffed to the beak with half-digested fish, like sardines." On further examination, a few small crustaceans were found amongst the fish remains.

More seals were got for meat on the 24th, which proved a fine bright day. By the aid of glasses, Moyes reported that the sea beyond the fast-ice was quite clear of drift-ice, so the prospect of early relief by the *Aurora* was very bright.

The 26th being a Sunday, all hands, except Kennedy who had observations to take at the Hut, went north over the sea-ice to reach the open water.

Many Weddell Seals were found along open leads. One of these had large wounds, inches long, on the back just behind the flipper and opposite on the stomach: this suggested the bite of jaws that must have had a gape of nearly 3 feet. Wild concluded that it had been seized by a Killer Whale.

More of the sea-ice was found to have broken out, but the ice-front was still 7 miles from the Hut. As the sea-ice was a good deal cracked and heaving slightly in a subdued swell, they did not tarry long on the sea-front. Two score or more seals were up along the front of the fast-ice; all Weddells except two Sea-leopards. A number of Adelie Penguins and several bands of Emperors were met. Skuas were about in numbers. The sledge was loaded up with specimens, then as the ice was cracking ominously, a hasty retreat to the Hut was begun, which was reached at 6.30 p.m.

January 27th was spent skinning the trophies of the previous day and in securing further seal meat and blubber stocks in case of a second year's detention.

On the 28th more seal meat was cached and Harrisson spent the day sounding through the fast-ice and improving his gear for lowering the bottom-trap. Wilson Petrels, Skuas, Giant Petrels and a Snow Petrel were sighted. A cold wind made Harrisson's task difficult. The temperature for the day ranged from 24° F. to — 4° F.

The following day there was a fresh breeze and snow falling until evening, but the 30th opened beautifully clear and bright although a cold breeze took much of the pleasure out of it.

Harrisson lowered his trap to the bottom, which was at that spot 260 fathoms. Two holes had to be dug through the snow and thin ice in a frozen lead. In clearing these holes of ice great trouble was occasioned by the platy ice crystals that came to the surface in great quantities. Harrisson found two or three very small fish embedded in the ice crystals. A number of Skuas were shot for food, for the party had developed a great liking for these birds, and cooked them in a variety of ways.

The 31st was a cloudy day with some wind and snow. Harrisson and Wild hauled in the bottom trap and to their satisfaction found in it five fish of an interesting type, and hundreds of amphipods of at least two species. When opened up, one of the fish contained seventy-seven amphipods in its stomach, all swallowed whole and uninjured. The trap was baited and lowered again. The wind increased later, putting an end, for a time, to operations on the sea-ice.

On February 1st Harrisson had a great disappointment, for soon after he had started winding up the fish-trap there was a jerk and sudden lightening of the load—the wire had parted and the trap was lost. On hauling in a lobster-pot type of trap made of muslin stretched over a frame, which had been suspended at 10 fathoms, Harrisson found in it two or three tiny fish. Hitherto it had contained only amphipods. In the afternoon this lobster pot was lowered to the bottom to take the place of the lost trap.

The 2nd was a beautiful day. Harrisson hastened to the sea-ice and started to wind up the lobster-pot. Alas! the wire parted once more: that was the end of the lobster-pot. Disgusted with his luck, he hastened off in company with Hoadley and Watson to visit the sea face of the fast-ice still located some miles to the north. Along the big lead at Ice Island Point there were a score or so of seals basking on the ice. The lead off Seal Point had widened to 20 or 30 feet and just as they reached it, a Killer rose and "blew" in the lead. They were then still a quarter of a mile from the open water but the remaining section of the sea-ice was swinging to the swell and appeared very nearly detached. At this point a score of Adelie Penguins were moulting under the cliffs. Scores of Weddell Seals were in sight. Several Skuas were seen but no other birds except Wilson Petrels. The Hut was reached at 8 p.m.

The 3rd was a day of dull and threatening weather with snow in the evening. The 4th opened with a high wind but absence of drift. An overcast sky reflected the dark water area in the north. On February 5th it was snowing and blowing but improved greatly during the 6th. Wild and Jones out on the fast-ice shot four Skuas and four Giant Petrels; Snow Petrels also were seen. The 7th was a day of poor weather and drifting snow: Conditions were little better on the 8th.

The weather was further improved on the 9th so Harrisson took the dogs and a sledge north over the fast-ice to the sea-front. Seals were found there in great numbers, apparently all Weddells except one Sea-leopard and a Crab-eater. A group of Emperors were lounging nearby and a Snow Petrel was observed following along a lead in the fast-ice searching for food.

The weather of the 10th and 11th was disappointing and little outdoor work was done. Harrisson set about making another kind of marine trap but required good weather to test it out. In bad weather on the 12th the new trap was lowered to the bottom; but could not be visited on the 13th for a strong blizzard continued all day.

On February 14th there was still a stiff breeze and some drift. Most of the men were engaged securing seal meat and blubber for the emergency cache. The open water was found to be within 4 miles of the Hut, the high wind having broken out a lot of the fast-ice. Harrisson again opened up the lead at the trap and hauled it up successfully. In it were seven fish of the same species as caught in the earlier haul and one of another species like a gurnet; numbers of amphipods were still clinging to the penguin bait. The trap was rebaited and lowered again.

The others who had been engaged getting seal meat had found in the uterus of one a tiny, perfectly formed embryo not more than 2½ inches long. Later some Skuas and a Giant Petrel were shot.

February 15th was bright and sunny but with a cold wind blowing. A Silver-grey Petrel and an Antarctic Petrel were sighted in the morning. Harrisson hauled in his trap but found nothing in it, evidently owing to the fact that it was not lowered right onto the bottom, but only to within 10 fathoms of the mud. Care was then taken to lower it to the full length of the wire. Seven or eight seals were along the lead nearby and a Wilson Petrel flew over.

As it was overcast and snowing, the 16th was a poor sort of day to be exploring on the fast-ice near the sea-front; however, Harrisson undertook to do so in search of items of biological interest. He went north to the open sea and there found numbers of Weddell Seals and three Crab-eaters. About forty penguins (Emperors) took to the water as he approached. As they swam along the ice-front Harrisson found that by running he could keep pace with them. "They made as much noise coming along as a vessel would make." Some came ashore later, and one was selected and killed for its skin. An Adelie suffered the same fate.

A couple of whales rose near the edge of the fast-ice and blew. One rose again quite close to Harrisson who described the event thus: "Saw the long sharp jaws, looked like an exceedingly long mouth, a light streak, and the great animal surged up and passed under the floe beside me, not its own length away when its back was out of water. It had a ridge on top of the head, at the after end of which was a large sunken blow-hole. A smallish curved fin, well back, bluish grey."

The dogs attached to the sledge with the carcass of an Emperor and an Adelie on board gave chase to an Emperor which tobogganed for all he was worth, half hidden in the snow he threw up. The Emperor was just about a match for the dogs thus loaded, and eventually won the race.

The Emperor was opened up but nothing found in the stomach except a few pebbles; but some 2 or 3 feet of the intestine was full of tape-worms. No petrels other than Wilson and Giant Petrels were seen.

On arrival back at the trap Harrisson wound it up to find in it an octopus, four of the curious fish caught before and thousands of amphipods clinging to the bait.

When the trap was hoisted on the 17th it contained, besides amphipods, only one fish, a cod-like species. Harrisson skinned one of the Emperor Penguins taken at the sea-front. It weighed 57 lb., the length from end of the tail to end of the beak was 3 ft. 9 in., from the base of the flipper to top of the head measured 15 inches; the girth of the body below the flipper was 2 ft. 11 in.

On the 18th the trap yielded one more fish and amphipods. Later an isopod fell from the fish; it must have been in its mouth. A seal and some Adelies were procured for food. An Adelie when opened up was found to be full of shrimps.

On the 19th Harrisson, Watson and Hoadley went over the fast-ice to examine the life along the sea-front. About thirty Adelies and a dozen seals were met close by the sounding machine. Along leads near the sea a couple of score of Emperors and some Adelies were met. A number of Emperors were pithed for skins; they all had tape-worms in their intestines.

The haul of the trap on the 20th was a great success. Quantities of thin platy crystals 3 by 2 inches came up with the wire. In the trap were 16 fish, but all of the one species, stuffed to the mouth with amphipods.

On the 21st a number of boxes packed ready to go on board the *Aurora* were sledged from the Hut to the edge of the shelf-ice. Then Wild and Hoadley went north to the edge of the fast-ice. There they found Emperor Penguins, Weddell Seals and a Crab-eater. Harrisson skinned another Emperor and found it also infested with tape worms.

When attempting to haul up the fish-trap on the 22nd, Harrisson lost the lot, the copper wire parting at the sheeve of the derrick at the third turn of the winding. With all the copper wire lost, this work came to an end. Adelie Penguins, Weddell Seals, Wilson Petrels and Skuas were in evidence on the sea-ice.

The wind increased during the day and in the afternoon was blowing hard and snow was falling.

The morning of Sunday, February 23rd, opened fine. The fast-ice had by then broken out to the lead where Harrisson had his sounding machine. Wild and Jones had gone down to visit the fast-ice when Jones soon returned with the news that the *Aurora* was in sight. Wild cheers followed. Then off they went with a sledge load of boxes for the sea-front. Their troubles were over.

OPERATIONS AT MACQUARIE ISLAND

EARLY DAYS ON THE ISLAND.

The *Aurora* departed from Hasselborough Bay on December 22nd (1911) in continuance of her voyage south. The party left to man the Expedition Station on the Island included G. F. Ainsworth, meteorologist and leader, L. R. Blake, cartographer and geologist, H. Hamilton, biologist, and C. A. Sandell and A. J. Sawyer* in charge of the wireless installation (Plate CX, fig. 2).

They temporarily resided in one of the sealers' huts at the south end of the Isthmus (Plate CVIII and Plate CIX, fig. 1). For a time the greater part of their energies were concentrated upon the erection of a living hut at the north end of the Isthmus and upon the completion of the wireless plant on the summit of Wireless Hill at an elevation of 350 feet above the living hut (Plate CX, fig. 1).

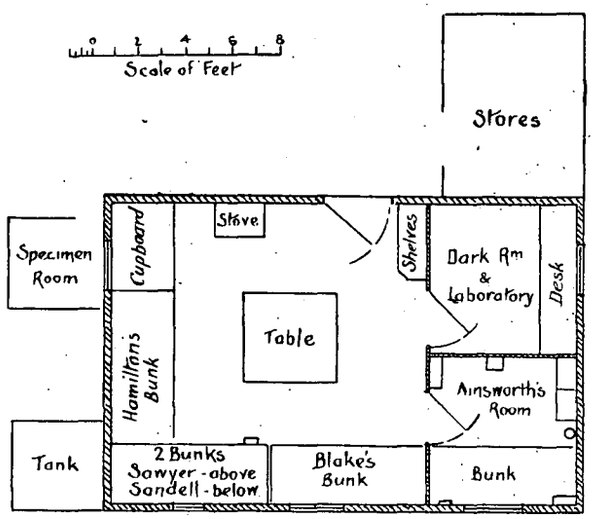

FIG. 17. Plan of the Macquarie Island Hut.

A spur of Wireless Hill leads down from the summit to the vicinity of the living hut and a track connecting the two localities was established by that route. At a later date the Wireless Station and the Hut were linked by telephonic communication.

The Hut was very limited in size and of simple construction (Text fig. 17). Baltic pine boards covered an oregon frame and a course of heavy tarred paper was supplied to be included between the inner and outer walls with the object of excluding draughts. The roof was of galvanised iron and for holding rain-water from the roof the party obtained a tank from the wrecked vessel *Clyde* lying on the beach nearby. A cooking range was the only source of heat supply in the building.

Knowing that the Island lay in the track of violent westerly gales, we had intended when designing this structure to have it erected in the lee of adequate shelter from storms. Before departing south from the Island, I had selected a spot for it which appeared to offer a maximum of wind shelter. This was on

* A popular story of the doings on Macquarie Island has been supplied by Ainsworth and appears in " The Home of the Blizzard " (Heinemann) London, 1915. The meteorological data are published in tabular form as Vol. V, Series B. The geography and geology are dealt with in Vol. V of Series A. Auroral observations, magnetics and reference to wireless transmission appear in other volumes of the Series B Reports. In this present account the conditions of life on the Island have been summarised by me and the day by day development of the scientific programme is outlined.

the east side of a massive rock monolith which would protect it from the westerlies (Plate CIX, fig. 2). To the north there was the high mass of Wireless Hill and adjacent on the eastern side lay another breakwind, Hut Hill, as it was subsequently called. Later experience showed that the choice of site was a good one.

The Hut was sufficiently completed by December 30th to be occupied and all gear was then shifted in. The construction of a dark-room, of the laboratory and of out-houses was dealt with thereafter as occasion permitted. The general work of erection and installation of the wireless station was completed (Plate CXI) by the middle of January, 1912, but several weeks followed during which tests were made and improvements introduced. On the night of February 13th, communication was finally established with the outside world, and maintained thereafter during the whole period of occupation. However, the constant gales severely tested the exposed sections of the plant with the result that on several occasions the aerial system carried away, causing break-downs for a day or more at a time. On some occasions, atmospheric and other interferences would make communication difficult or temporarily obliterate signals, but on favourable occasions all eastern Australian and New Zealand stations, New Guinea and Fiji were within range. Ships as far distant as Cape Horn were contacted (a good record for a 1½-kilowatt long-wave set of that date). However, it was not until the next year (1913) that regular communication was maintained with our Antarctic Station. This delay was due to the fact that the hurricanes of Adelie Land had prevented the completion of the erection of the wireless masts until the summer of 1912–13.

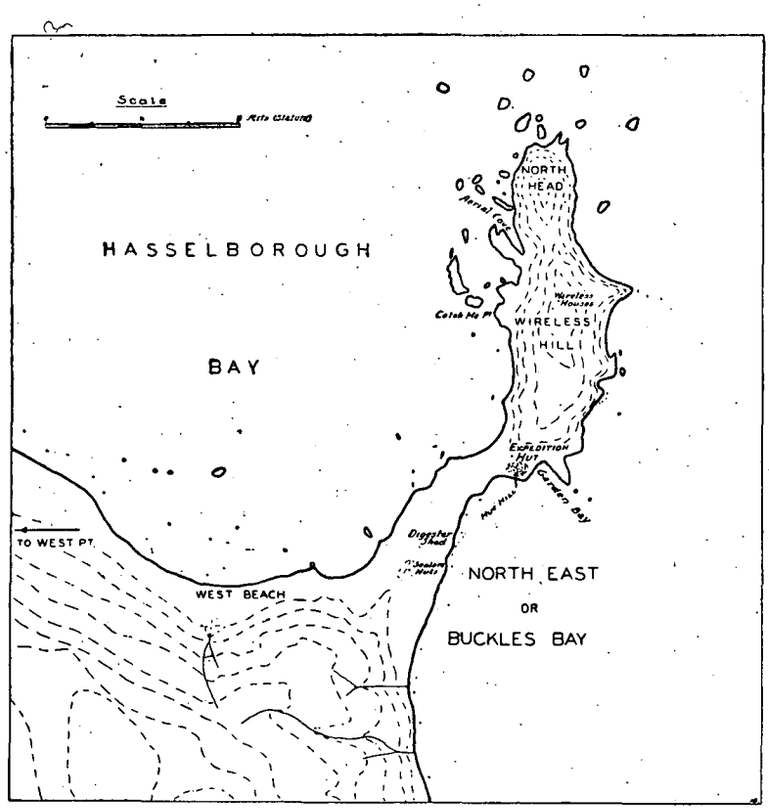

FIG. 18. Map of the North End of Macquarie Island.

Ainsworth, who was an officer of the Commonwealth Meteorological Bureau, was attached to the Expedition staff for the duration of the undertaking. His special duty was the collection of meteorological data. He was appointed senior officer in charge of the Expedition Island Station.

By means of wireless, daily weather summaries for Macquarie Island were transmitted to the Weather Bureau at Melbourne. Later, in 1913, the Adelie Land weather was relayed through Macquarie Island to Melbourne.

The wireless plant was in charge of Sawyer as operator and Sandell as engineer responsible for the engine, generator and transformer. The lay-out of the Wireless Plant is illustrated in text-figure 19. There also are insets with details of the Engine House and Operating Room.

The wrecked vessel *Clyde* (Plate CXII, fig. 1) cast up on the North-East Beach, was a permanent source of firewood used to augment the meagre supply of coal left by the *Aurora*. It also provided valuable planks for building purposes.

All but two of the sealing party, which we found in occupation on arrival at the Island, had returned to civilization on board the *Toroa*. Tom and Alec, remained to collect blubber during the winter and await the return of the main party in time for the elephant season of the following spring.

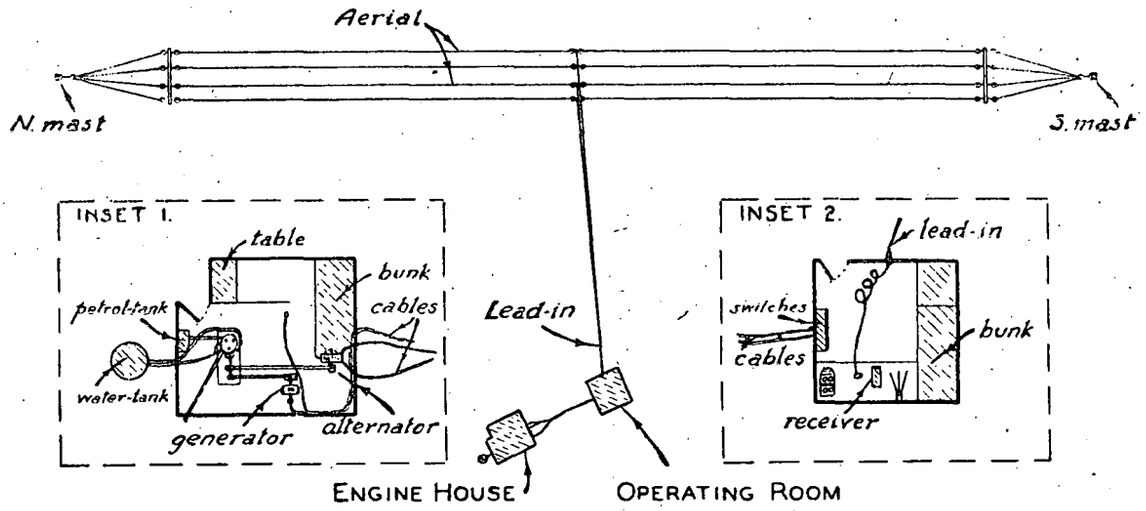

FIG. 19. Lay-out of wireless installation. Inset 1 is Engine House. Inset 2 is Operating Room.

Twelve sheep and several fowls had been landed as prospective food supplies. The sheep which thrived and grew fat were drawn upon monthly throughout the year. The fowls became acclimatised in time and their eggs were appreciated. The eggs of some species of penguin, particularly the Gentoo, are very palatable, and contributed greatly to the food economy of the Party. Of course, the Sea-elephants and the native bird life were a never-ending source of meat. However, the flesh of most of those animals has a distinct taste, often not agreeable to the civilised palate. Consequently, only few such possible sources of food were drawn upon. A source of really palatable meat lay in the rabbits and Wekas (Maori Hens) which had been introduced to the Island by sealers before the year 1880 and were at this time available in considerable numbers.

Early in January when the broader features of the establishment of the station had been completed, the regular scientific programme began to operate. Ainsworth (Plate CXIII, fig. 1) was occupied with the meteorological observations and permanently resident at the Expedition Hut. In addition to the usual meteorological instruments, he also had charge of the tide-gauge.

The wireless officers during most of the period often slept at the Wireless Station though they had their meals at the Hut. This procedure was adopted because their work occupied them until after midnight, and in stormy weather the return journey to the Hut in wind and darkness was difficult (Plate CXIII, fig. 2).

The geologist and cartographer, Blake, and the biologist, Hamilton, had to visit all parts of the Island and were frequently away from the Expedition Hut for long periods at a time. They had a small tent for this work but generally made use of caves and abandoned sealers' huts which, though in a state of dilapidation, still existed at several places down the east coast. This field work entailed a great deal of walking and carrying of packs and provisions. Some use was made of a boat belonging to the sealers and later a dinghy was available. These boats suffered damage negotiating rough waters among the marginal

rocky reefs and rather frequent repairs were necessary. Another factor limiting the utility of this form of transport at Macquarie Island is the prevalence of heavy seas in that region. However, opportunities whenever possible were seized to transport by boat quantities of stores to depots laid at suitable localities down the east coast. From the *Aurora* a depot of provisions had already been laid at Caroline Cove at the south-west corner of the Island.

Blake (Plate CXIII, figs. 3 and 4) and Hamilton commenced field operations early in January. On January 5th (1912) Hamilton obtained mallophaga both from a Tern and from a Skua Gull. January 6th was spent examining the North End promontory which Blake discovered to be mainly composed of volcanic agglomerate permeated by tachylite veins. Seventy-six Sea-elephants were counted around North Head.

January 7th.—Walking around by the beach to West Point,* a distance of about 3 miles, they passed about seventy Sea-elephants lying about on the shore and on the vegetated flat above the beach. At West Point a wide raised beach platform was found between the highlands and the sea. This is a peaty morass, springing and trembling underfoot to such an extent that it was named Feather-bed Terrace, (Plate CXVIII, fig. 1). The rocks exposed in the cliff face of that corner of the Island were found to be coarse gabbro. Returning to the east coast via the highlands, they found the summit of the Island wind-swept. Tussock-grass vegetation grows profusely to the lee of the hills, but on the weather (west) side of the highlands, lichens and mosses are the only vegetation.

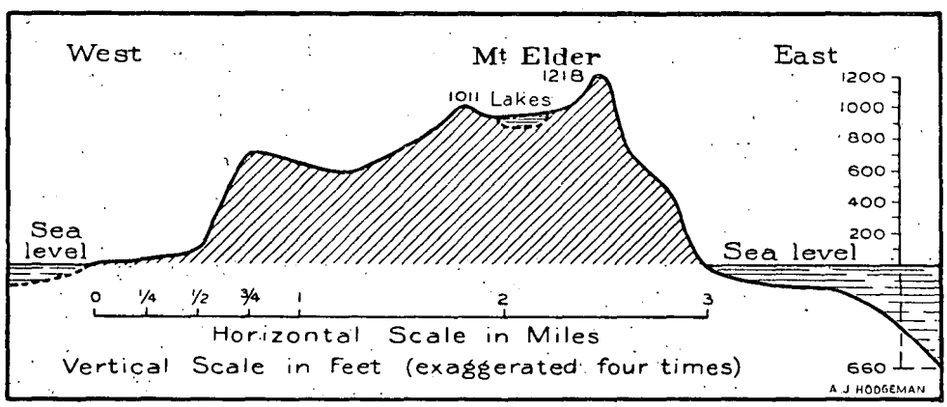

FIG. 20. A profile cross-section of Macquarie Island throught Mt. Elder.

January 9th.—At 9.20 a.m. Blake, Hamilton, Sandell and Sawyer accompanied by the two sealers, set out down the east coast in the sealers' motor launch. They had on board a quantity of stores to be depoted. The run south was easy for the weather was good, the only wind being a light westerly. Stores were first landed at Sandy Bay† about 5 miles down the coast. There the sealers' hut (Plate CXIX, fig. 2) was found to be in a dilapidated condition; no door, one end out and no floor. Continuing the journey at 10.20 a.m., several waterfalls were passed between Sandy Bay and Green Gorge.‡ The beach terrace as far as Lusitania Bay was found to be lined with the rookeries of Royal Penguins.

The wind changed into the north-east during the day so it was decided not to attempt to return to the North End until the weather was more favourable for the time could be well spent transporting stores overland from Lusitania Bay to the South End hut.

Some years ago the King Penguin rookery at Lusitania Bay covered a very large area, but by this date, owing to unrestricted slaughter for their oil over a period of many years, the number of the birds had been reduced to a dangerously low figure, if they are to continue to exist in this quarter of the world. On account of the fewness of the birds remaining, the sealers had ceased their depredations about the year 1895. The remains of the boiling-down shed and a hut still existed when our party reached the Island.

* This is referred to in the 1917 Admiralty Chart as Handspike Point. † Named Ballast Bay in the 1917 Admiralty Chart.
‡ Stars Gulch of the 1917 Admiralty Chart.

On arriving at the King Penguin rookery (Plate CXVIII, fig. 2) at Lusitania Bay, the sealers hut (Plate CXIX, fig. 1) was found to be even worse than that at Sandy Bay. Blake wrote: "In fact it is indescribable. Hamilton and self slept in one bunk; two others in another and one on a form. Not intending to stay we brought no blankets so we are in for a very cold and sleepless night.

"After a very sleepless night we turned out about 10 a.m. Had breakfast and dinner combined on stewed Wekas and "dry-tack" biscuits. At 1 p.m. we set out for South End, each carrying a pack containing part of the stores for that place. We passed two Victoria Penguin rookeries en route. It now began to rain, making things pretty miserable. The last 2 miles of walking was through a tussocky swamp, and was accompanied not only with extreme discomfort, but with a little risk to one's limbs and life. In crossing this swamp one has to jump from tussock to tussock and occasionally one strikes a floating tussock and is precipitated with unerring certainty into an icy cold slimy mud, from which one has some trouble to extract oneself. There are several very large Royal 'rookeries' here; one, which is probably low estimate, contains about 1,000,000 birds. (Later the area found to be 16½ acres—could not contain more than 720,000 at 1 to square foot—D.M.)

"The hut here is in a fairly good condition, having a good 'range' and also a good 'bogy.' Hamilton and self cut a lot of dead tussock grass and filled two bunks with it; this makes much better sleeping than hard boards."

January 11th.—After an early departure and a long walk by way of the beach, Lusitania Bay was reached about 8.15 a.m. The boat was launched at 9 a.m. and they arrived at the Hut at the North End at about noon.

January 12th.—In preparation for surveying the topographical features of the Island, Blake spent this day and several to follow in adjusting the theodolite and erecting pickets for sighters on all the main prominences from North Head to the Nuggets.* On these journeys Blake was usually accompanied by his dog "Mac" (short for Macquarie), a spaniel. Mac was constantly harassed by Skuas for they regarded him as a menace to their nests. In a gully leading up to Mt. Elder on the west side, Blake found a lump of copper ore (chalcopyrite and malachite).

January 17th.—Hamilton helped Blake to lay out a base-line for his survey, three-quarters of a mile long on the highlands of North Mountain.

January 18th.—Asbestos and more copper minerals were found on the northern slopes of Mt. Elder. After triangulating in this area during the day, Blake camped the night with the sealers who were operating at the Nuggets, boiling down Royal Penguins for their oil.

He described the business as follows: "The method employed in obtaining the oil from these birds is as under. About 2,000 birds are driven into a small wire-netted yard and the gates are closed; a couple of men then enter with sticks and picking out the 'one year olds' (which I might state are the only 'fat' ones at this time of the year) they give them a knock on the head. When all the fats have been picked out, the gates are opened and the remainder are driven out none the worse for their adventure. The birds are then packed in huge boilers called 'digestors' and steam is turned on to the pressure of 30 lb. per square inch for 12 hours. The oil is then run into settling tanks and subsequently barrelled, while the refuse passes into chutes and into the sea. The 'one year olds' are 'fats' during the months of latter January, February. Towards the latter end of February the old birds become 'fats'; they having left their young some three weeks previously, go out to sea and return as 'fats' to moult, when they also are used for oil.'

Next day Blake returned to the Expedition Hut and plotted the field observations.

January 21st.—When working in the vicinity of the Nuggets, Hamilton secured a fine specimen of an albino penguin and an example of what was regarded at the time as a hybrid Royal Penguin; the latter was subsequently discovered to be a Sclater Penguin, evidently strayed from the rookery of these birds at the Auckland Islands. At this time Hamilton remained for several days camped with the sealers at the Nuggets. Blake continued mapping in the northern end of the Island (Plate CXV).

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* Finger and Thumb Point of the 1917 Admiralty Chart.

January 24th.—Blake in following the coast from the Hut around to Eagle Bay saw hundreds of Sea-elephants lying on the beach, generally in groups, packed together like sardines. He found a nest containing nine eggs of the only species of duck inhabiting the Island.

January 25th.—Hamilton collected a lot of small fish and invertebrate life from rock pools. By this time also he had made a useful collection of micro-lepidoptera in the neighbourhood of the Hut.

January 27th.—In the second gully on the east coast, south towards the Nuggets from the Isthmus, Blake found a reef carrying bornite, pyrites and galena. Crystals of these minerals were used by Sawyer with good effect as detectors for the wireless.

January 28th.—Hamilton and Blake when marine collecting found several species of small crabs. Other members of the party visited Eagle Cave on the west coast and returned with three young ducklings of the Grey Duck. Attempts to rear these failed. These birds were to be seen on the Island at practically all times of the year and regularly nested there. It seems unlikely, therefore, that they are merely migratory as was suggested at one time by Hamilton.

January 29th.—The day broke fine and clear, so Blake packed a swag weighing 65 lb. and set out for Sandy Bay where he was to camp for a time. On arrival there at 4.45 p.m. he killed a Sea-elephant for blubber to supply a slush-lamp; the latter he made out of an empty food tin and a piece of sacking for a wick. He then built up the end of the hut as well as possible in the absence of nails. A fire was made in an old oil-drum and his wet clothes dried. It rained all through the night and next day so Blake, after working over the hills during the day made back to the Expedition Hut for the night to await better conditions.

Hamilton obtained small fish and starfish in rock pools at the North End. He also examined three Albatross nests, each with young, on the cliffs of Wireless Hill.

January 31st.—A heavy sea raging at this time had disturbed beds of rotting kelp on the western beach, exposing millions of kelp fly larvae. Skuas and Gulls were feeding on them.

For the next few days a terrific gale continued, resulting in a steadily rising sea which culminated on February 5th (Plate CXVII, fig. 1). Spray was flung across the Isthmus and over Anchor Rock which stands 70 feet high out of the waters of Hasselborough Bay. During this time Hamilton had collected botanical specimens chiefly including fungi, mosses, lichens and seaweeds. He remarked: "*Coprosma repens* is in flower and fruit. All *Pleurophyllum* seems to be in seed now."

February 7th.—The weather now permitted Blake to go on with his survey at Sandy Bay. Hamilton accompanied him. They arrived at 12·45 p.m. and set about repairing the hut. Some sheets of iron and Sea-elephant skins were used to this end. On arrival they killed a Sea-elephant on the beach. Three hours later they visited the carcase and found that it had been completely cleaned by the Skuas (Plate CXX, Fig. 4).

The next day they climbed to the highlands and worked across towards South-West Harbour, then back to Sandy Bay. Good examples of the Island vegetation were met. Three different species of ferns were found. Also they came upon seven finch-like birds feeding on the seed of the Maori Cabbage. Three were shot for the collection.

Blake carried on with work in this area until the 16th, then packed up and returned to the Expedition Hut. Hamilton had returned to the North End on the 11th, where he had spent some time digging out the nests of night birds (prions and petrels). He had secured an external parasite from a Victoria Penguin.

February 18th.—Hamilton shot a white-crested Tern; also he collected a fish that had been thrown up on the beach by the sea.

February 19th.—Blake returned to the Nuggets and Sandy Bay completing his survey in that area during the next two days.

On visiting the big Royal Penguin rookery above the Nuggets Blake recorded: "The penguin rookeries in Nuggets Gully are all deserted, all the old birds having gone out to sea and are just beginning to come back fat to moult. Saw rabbits west of Mt. Elder, yellow and black in colour." He arrived back at the Expedition Hut on the evening of the 21st, thereafter remaining for some days to compute and plot his survey.

February 29th.—Blake and Hamilton proceeded to Sandy Bay to continue with field work in that vicinity. The following day they went to the vicinity of the Brothers Point.* There they had great sport catching Wekas for the larder. They had been shown by the sealers how best to secure a bag of these palatable birds. Blake recorded the method adopted as follows: "A bird is captured either by shooting or stunning with a stone; the person operating then takes the bird in his hand and lying on his stomach shakes the bird, at the same time emitting a cry like the cry of the bird (or if the bird be alive it will call itself). The hens being curious birds immediately peep around the tussocks to see if they can diagnose the row, and seeing a bird with ruffled plumage and apparently dancing up and down, they come to the conclusion that the captured bird is looking for a fight and being descendants of a breed of fighting birds, they immediately attack the captured bird, only to be grabbed by the free hand of the operator.

"The birds belong to the rail family and are brown to black in colour and are about the size of a half-grown pullet. They were introduced here from New Zealand and when originally imported were much lighter in colour; the birds feed mostly on the kelp fly, and to adapt themselves to their surroundings have taken on a much darker hue, to suit the colour of the kelp."

That same day they saw another species of white-crested Tern on the rocks of Sandy Bay; also Blake found a large external parasite on a Gentoo Penguin.

The weather deteriorated and they returned to the Expedition Hut on March 3rd.

March 9th.—A male Sea-elephant 16 feet long, killed by the sealers, was found to contain the beaks of 50 cephalopods and abundant nematodes.

The following day Hamilton found the Shag rookery (Plate CXXI, fig. 2) at Aerial Cove deserted. A sponge was washed ashore. A new species of Patella and a number of brachiopods were secured. Sandell visited the West Point area and reported "hundreds" of ducks.

At West Point the largest Shag rookery on the Island was found but it also was abandoned at this time. The nests are a solid structure of terrestrial vegetation, seaweed and mud built up to 15 inches in height on the rocky reefs adjacent to the shore.

March 14th.—A 16-ft. Sea-elephant killed to-day was found to yield 1,600 lb. of blubber.

During much of March the weather was too bad for Blake's surveying programme. He continued collecting near the Base and spent much time on plans and testing minerals obtained. The minerals zinc blende and galena were added to his list of discoveries.

WINTER BRINGS THE SEA-LEOPARDS.

March 21st.—Hamilton visited the albatross nests at the North End and found the young had not passed the downy stage.

March 25th.—An extensive cave was found on the hill face, 80 feet above sea-level at the spot known as Catch-me on the north-east side of Hasselborough Bay.

The following day there was an exceptionally low tide. Hamilton took advantage of this and collected cork from pools. Some fine sea-anemones were got.

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* Brothers Point of the older Admiralty Chart has been renamed Tom Ugly Point in the 1917 Admiralty Chart.

April 3rd.—Blake while working in the neighbourhood of the Nuggets discovered a glacial moraine, the first evidence of glaciation yet proved on Macquarie Island.

April 10th.—Hamilton found a parasite embedded in the blubber of a Sea-elephant. The sealers told him that such are not uncommon.

From this time on during the winter, snow was of frequent occurrence.

April 21st.—Hamilton visited the Sooty Albatross nests at North End. Little change in plumage was noted since last visit.

April 22nd.—Blake and Hamilton collected specimens in the neighbourhood of the Nuggets. One erratic picked up was scored with glacial grooves ½ inch deep. The Nuggets Royal Penguin rookery was visited but found to be entirely deserted. The whole rookery area was ankle deep in rotting feathers and liquid mud.

April 23rd.—Blake and Hamilton set out on a trip down to Lusitania Bay where they were to operate for some time. Sandy Bay was reached by 10.15 a.m. but snow squalls had already commenced and continued all day. The weather was too bad (dense mist) for travelling over the hills so they laboriously clambered over the rocks along the coast, in places having to scale cliffs to get beyond some rocky points.

A cave was discovered south of Brothers Point. Wet to the skin they pushed on south through several deserted Royal Penguin rookeries, finally reaching Green Gorge at 3.30 p.m. There they found a small cave in which they decided to camp for the night. A Sea-elephant was killed for blubber, which together with a little driftwood provided a fire for drying clothes.

During the day they had passed on the shore an old 21-ft. long warrior Sea-elephant. He was blind in both eyes, his tusks were gone and he was scarred all over. The stench proceeding from him was awful. Apparently he had come out of the sea to die.

April 24th.—The journey to the Lusitania Hut was continued under the greatest difficulties. The rain descended in torrents, their boots disintegrated so that they arrived exhausted at 12.30 p.m. with the soles of their feet much cut by the nails of their boots and by rocks. On the way they had passed several Sea-elephants over 20 feet in length.

April 29th.—Hamilton and Blake returned overland to the Expedition Hut, travelling a distance of 24 miles over frozen highlands often knee deep in snow. Blake remarked upon the glacial character of the topography of the highlands west of Lusitania Bay.

May 11th.—About this time work was restricted to within a few miles of the Hut. This day Hamilton killed a female Sea-leopard which carried a foetus a foot in length. Sea-leopards frequently came ashore on the Macquarie Island beaches (Plate CXXIII, fig. 4); altogether the Expedition Party killed 36 during their two years of occupation of the Island. They prey mainly upon the penguins.

May 14th.—Victoria Penguins had completely deserted the Island but Gentoos were still in evidence about the beaches.

May 17th.—Some of Blake's time was occupied at this period of the year on stellar observations, and in helping Ainsworth with the tide-gauge. Heavy seas had wrecked the tide-gauge in its original position in the boat harbour at Aerial Cove. It was later transported and erected at Garden Bay near the Hut. Even there heavy seas troubled it and eventually washed it away entirely. However, Ainsworth was able to secure a long enough continuous run to supply the necessary graphs for tidal analysis.

May 24th.—A high westerly gale with low temperatures raged at this time. Hamilton found ticks on a small female Sea-elephant ashore in Garden Bay.

May 27th.—Cestodes and nematodes were collected from a small female Sea-leopard killed to-day. Penguin and Shag feathers were found in the stomach.

May 29*th.*—Three male Sea-leopards were got, two of them 10 feet long. The following day two dozen ducks were seen at Aerial Cove. These birds though common enough down the west coast were not often seen at the North End.

June 3*rd.*—Three more Sea-leopards were killed on West Beach. These animals came ashore at Macquarie Island more abundantly in winter than in summer. Low temperatures, below freezing point, were often recorded during day time at this period of the year.

June 7*th.* The *Aurora* came to anchor in North-East Bay this afternoon and remained at the Island until the 22nd. During this time Captain Davis transported a quantity of stores to Lusitania Bay to form a depot to supply Blake for the continuance of his survey. It was a very stormy period and contact between the ship and shore was limited.

June 25*th.*—There had been much rough weather lately and this was an exceptionally windy day. Hamilton visited the nests of the Sooty Albatross at North Head but found the young had departed. Sea-elephants were few on the beaches at this time of the year but odd ones kept appearing.

June 28*th.*—A westerly gale accompanied by snow with very high sea raged all day long. A big sea swept across the Isthmus south of the Hut.

The following day examination of the beaches revealed that the exceptionally high sea had done considerable damage shifting some of the Expedition stores depoted above the beach.

June 30*th.*—The eight remaining sheep were found to be in good condition. A Sea-leopard 11 ft. 6 in. long was shot.

July 5*th.*—Five small fish were caught in a trap which Hamilton had devised. The marine biological collection was steadily being augmented even in this stormy period of the year. A pure albino Giant Petrel was secured.

July 9*th.*—Blake whilst collecting and photographing over the hills to-day stated that his breath froze on his moustache and beard. " It was hard work plodding along with a 20-lb. camera in snow which was waist deep in places."

July 16*th.*—A grand display of aurora polaris was observed this evening.

July 17*th.*—Thousands of Macquarie Island Shags were seen flying over the Isthmus from Aerial Cove. It was thought that they were after a special kind of food which had appeared in the sea.

The following day Hamilton discovered large numbers of marine worms under the stones in Garden Bay.

July 26*th.*—Hamilton shot five Sea-leopards this day. Their stomachs were full of kelp and nematode worms. A female carried a large foetus.

Rats which had evidently escaped from sealing ships had multiplied on the Island to such an extent that their depredations at the Hut were often serious. The damage was mostly among Hamilton's collections of eggs and skins. To combat the menace, rat hunts were instituted periodically which entailed moving all the cases of stores and specimens.

August 2*nd.*—Hamilton found a number of spiders under moss near the Shag rookery at Aerial Cove. The same appeared under moss at a deserted penguin rookery. There were very few Gentoo Penguins about the Island at this time.

August 6*th.*—Though Sea-elephants were now very few around the shores, Hamilton and Sandell visiting the West Point area to-day saw some fine examples near Eagle Bay. They collected a large bag of Wekas for food. Skua Gulls which had now returned to the Island were observed to be mating.

August 8th.—Hamilton and Sandell found spiders and ticks with eggs at Aerial Cove. Land shells were found under tussock-grass at Garden Bay. Blake who was at Sandy Bay for a couple of days at this time reported several Giant Petrels. A splendid example of an albino Giant Petrel was got a few days later. These birds are seen all the year round at Macquarie Island. Large rookeries occur, some on flats near the sea, others on high terraces.

August 13th.—Skuas were now numerous. " . . . they are screeching and fighting all around the Isthmus."

August 17th.—Hamilton found beetles and spiders under stones in a Victoria Penguin rookery. He remarked that the Shags had commenced to make their nests. Another tape-worm was collected from a Sea-elephant.

The following day two notothenia type of fish were caught and adhering to one of them parasitic mites were discovered. Beetles were also collected at a rookery in Garden Bay.

THE SEA-ELEPHANTS RETURN.

Blake had left the Hut on the 17th to take up residence at Lusitania Bay. He carried a swag weighing 98 lb. The first night was spent at Sandy Bay. The following day the weather changed turning to mist and rain. He ascended the hills at 9 a.m. and, though soaking wet, pushed on through the mist trying to make a course south. At the end of 7½ hours he came out on to the coast again at Green Gorge only 5 miles south of Sandy Bay. So he decided to camp in the cave found on the earlier trip. Mac had caught two Wekas which served Blake for tea and breakfast. Next morning he continued on down the coast in somewhat better weather arriving at Lusitania Bay at 4 p.m.

He did not return to the North End of the Island until September 15th, but during much of that time was unable to carry on with his survey owing to continuous fog.

August 30th.—Hamilton found some very large Sea-elephants in the water and on the shore at West Beach.*

August 31st.—At Aerial Cove Hamilton found large Sea-elephants. Evidently the large ones were now returning to the Island. Gentoos were seen to be making a rookery and the Shags were adding to their nests.

At this time Blake, at Lusitania Bay, recorded an unusual proceeding. " I noticed a very interesting sight to-day and also on another occasion. The Dominican Gulls were teasing a Sea-leopard. One bird would settle on the water in front of the seal which would then snap, but only to be dodged by the bird. As the seal's head came out of the water, several other gulls which had been hovering overhead, would swoop down and peck at the seal's eyes. This goes on for hours at a stretch."

September 8th.—Unable to proceed with his survey of the highlands, Blake spent much time watching the seal and bird life about Lusitania Bay. The most interesting feature there is the big King Penguin rookery, the only rookery of these birds in Australasian seas. Blake recorded: " It is very amusing to watch them, they are so serious in everything they do. A body of fifty or so will parade the beach in single or double file, as regularly as clock-work. One bird keeps some yards in front of the others: when he stops, all the rest do the same. This goes on every 20 yards or so. If they pass another party of birds they all stop, bow and then move on again or else stay for a few minutes and yarn.

" I noticed a very amusing incident a few days ago. A large body of these penguins were marching along the beach, when they suddenly came to a halt and began to talk in a very excited manner. After some time three birds stepped to one side and began to yarn, separating a few minutes later. The other birds

* The name by which was known the beach on the Hasselborough Bay side of the Isthmus.

split up into three bodies and stood behind the other three birds, which were now some distance apart. The individual members of each party then began to yarn to each other and continued to do so for some time. However, to make a long story short, two of these parties joined forces and marched away leaving the third to its own devices."

Blake at this time reported that there was yet no sign of Royal Penguins at the southern rookeries but was on the lookout for them as they should soon be returning.

Numerous large bull Sea-elephants were scattered all over the beaches; they had come up for the mating season.

Blake further remarked: "There is no doubt about the Skua Gulls being robbers. I have never seen them fishing yet. They chase other Gulls and steal their food which they have caught. Carrion is another favourite dish of theirs. They are disgusting birds; they gorge themselves on carrion which they then retch up so that they can return for another feed."

"There is no doubt that some of my friends would smile to see me having a meal. A piece of seal meat in one hand and a pot of cocoa in the other. The heart and tongue of a Sea-elephant is a fine dish, once you get over the initial dislike of same."

September 11*th.*—Blake's diary records: "A fine day at last. Killed a Sea-elephant for blubber (for fuel). Ascended the hills and set in position numerous pickets for sights in connection with my survey. I visited the cache at Caroline Cove, everything there A-1; it will be a terrible job to pack anything from there to the Lusitania Hut as the Cove is flanked by precipitous cliffs.

"There is a big Giant Petrel rookery here, containing about 400 birds. I examined six nests and in each case the eggs showed signs of incubation when broken. They build a beautiful nest of grass and other vegetation about 6 inches in height; it contains only one egg. When I approached the nest the birds gave vent to their usual mode of defence, namely, retching up an evil-smelling, greenish fluid, which can be thrown about 6 feet. However, most of the birds are very tame and can be lifted out of their nests."

"There is a Royal Penguin rookery there also; it is situated in a creek about 600 feet above sea-level."

On the 13th Blake moved up to Green Gorge. There among other things he inspected Gentoo Penguin rookeries. "I visited two Gentoo rookeries and found that the birds had begun to lay. The Gentoos (Plate CXX, fig. 3), unlike the other penguins here, do not dig out the tussock and other grasses and so make a bare patch for the rookery. They make nests in the short grass and sit on them like any other ordinary bird. The site selected is generally near a running gully and often at a height of 100 feet above sea-level. The eggs, three in number, are perfect spheroids. If the eggs are continually removed from their nests the birds will keep on laying (Plate CXX, Fig. 3).

As his boots were about worn out, Blake then decided to return to the Expedition Hut at North End but on the following day a heavy mist obscured everything so the journey was postponed. The day was spent more or less in idleness. He wrote: "One eats down here. Instead of the spoonful of porridge and two hen eggs, I can manage a plate of porridge full to the brim, six penguin eggs, each of which would make two hen eggs, and a plate of hoosh."

"There is an 18-ft. bull Sea-elephant about 10 yards from the hut door. I am afraid that if he starts bellowing he shall have to 'move on.' He has two tremendous scars on the lumbar portion of his back; one of them is about the size of a dinner plate and 1½ inches deep." Blake returned to North End next day.

In the meantime the sealing vessel *Rachel Cohen* had arrived and was anchored at the Nuggets.

September 18*th.*—A heavy gale drove the *Rachel Cohen* out to sea. Ten Gentoo eggs were got at Aerial Cove.

September 22*nd.*—The first Sea-elephant pup was born to-day. The Gentoos were all laying now. Forty eggs were collected.

EXPLORATIONS BASED ON LUSITANIA BAY.

September 28th.—Blake and Hamilton departed in a dinghy, which they christened the *Blubber*, to take up residence again at Lusitania Bay. On the way they called at a Gentoo rookery near Lusitania Bay, and collected two hundred and sixteen eggs for eating. They noticed that the Royal Penguins had returned, probably a few days before this.

The following day a young Sea-elephant, about three days old, was skinned. At this stage they are about 3 feet long and covered with long black soft fur. Later in the day, as there was a stiff north-east wind blowing they decided to sail down to South-East Bay; one of the objects being to secure from the hut there a cooking range to be installed at the Lusitania Bay hut. The seas were tremendous and they experienced some difficulty in landing, eventually having to get ashore just north of South-East Reef for it was too rough to sail around into South-East Bay.

At this stage Blake wrote: "On examination of the depot here we found that rats had eaten all the biscuits. There is a large Royal Penguin rookery here. It is interesting to watch them build their nests; they carry stones and bones in their beaks and build a mound out of them, with a slight depression in the centre. There are numerous fights, the result of stealing one another's stones. Some birds lay two eggs but the majority only one. On looking out to sea from the depot here one wonders, at first, at the cause of the spray away out at sea. When this spray comes nearer the shore it is found to be caused by hundreds of returning penguins shooting out of the water; this is their means of rapid travel at sea.

September 30th.—They returned to Lusitania Bay in the afternoon after an exciting passage through the fringing reef, for tremendous seas were running.

For some days following Hamilton spent much time in photographing and in skinning and skeletonising Sea-elephants. A large worm was got from a Sea-leopard.

Blake continued with his survey bringing back to the hut from time to time rabbits and ducks to replenish the larder.

October 10th.—They visited the Giant Petrel rookery above Caroline Cove and collected seventy-three eggs. The food depot at Caroline Cove was visited and moved to a drier place. Some sugar and biscuits were packed back to Lusitania Bay.

October 12th.—On this day a pair of Sooty Albatrosses were observed to be seeking nesting places.

October 15th.—A very cold south-west wind was blowing. Blake wrote: "Hamilton and self ascended the hills and laid down a base line equal to 2,830·5 feet. It was terribly cold up there, especially handling the steel tape. It was the coldest day I have felt. The wind was very strong and once it blew the theodolite over, but luckily it fell into a soft snow drift.

October 16th.—When on the hills due west of Lusitania Bay, Hamilton and Blake met a Giant Petrel rookery from which they collected fifty-four eggs. When overlooking the west coast they sighted large colonies of Royal Penguins and Sea-elephants. Late in the afternoon, as the Royal Penguins were now laying, they visited the rookery 1½ miles north of Lusitania Bay and collected 36 dozen eggs for food.

October 21st.—Blake found two Skua nests but the birds had not yet laid their eggs. Hamilton left Blake and returned in the boat to the Expedition Hut at the North End. On the way he left some firewood and survey pickets for Blake at Green Gorge.

October 22nd.—During operations to-day Blake found Skua nests with eggs. "This bird builds a nest of grass and leaves, generally situated on a flat near to freshwater. Each nest contains two eggs. It is not possible to photograph the birds on the nest as they leave it when approached."

October 24th.—Blake wrote: "Old 'Bill' in the Sea-elephant rookery in front of the hut has only one cow left now, the others have all gone away."

Hamilton recorded that at Aerial Cove the Shags had completed their nests.

October 25th.—On this day Ainsworth and Sandell returned from South-West Harbour with the first Skua eggs collected this season at the north end of the Island. Also they reported finding young Giant Petrels hatched out. Blake, located at the south end of the Island, entered for this day: "Finished the field work (of geographical survey.—Ed.) of the southern portion of the Island to-day. The Rockhopper Penguins have returned to the Island. At South Head I caught a burrowing petrel. They issue forth only at night. I noticed two pairs of Sooty Albatrosses building their nests."

It should be realised that good fine days suitable for survey work happened only occasionally. For much of the time Blake was held up by fog and rain. The 28th was a fine day and he made the most of it, covering about 15 miles over the hills before evening when he returned, foot-sore and weary; so treated himself to a special dinner, it being his birthday.

October 31st.—Blake recorded: "Climbed Mt. Hamilton and when I had done so another low cloud descended; so I returned to the Hut. About noon the cloud lifted so I climbed the mountain again and struck a fog this time. This is the seventh time I have climbed the mountain and had no luck. I waited on the top this time for two hours and then the fog cleared, so I was able to observe angles from this station.

November 2nd.—From Blake's diary: "Visited the Rockhopper Penguin rookeries about 1½ miles south of the hut. They are all busy building their nests. The nests are built on the face of a steep scarp, and are made of tussock and stones. They seem to like building under large rocks. Visited a Gentoo rookery and collected 4 dozen eggs. These eggs are by far the best for eating. Numerous large young bull Sea-elephants line the beaches, but they seem quite sociable and do not fight. All the cows have completely disappeared. The pups have all lost their fur and are silver-grey in colour.

November 3rd.—"The Macquarie Island Shag has begun to lay. I obtained sixteen eggs to-day. Gentoo Penguins have chicks. The Biddy-bids (*Acaena adscendens* and *A. sanguisorbae*), the tussock-grass (*Poa foliosa*) and *Pleurophyllum hookerii* have commenced to flower." It should be remarked here that on October 28th Hamilton reported finding *Pleurophyllum* in flower on the highlands to the west of the Nuggets rookery.

The next day Blake packed his swag and walked through to the Expedition Hut at North End.

Hamilton recorded that the Shags at Aerial Cove had laid eggs on the 5th. He found the first Sooty Albatross eggs on the 3rd. On the 4th he witnessed a courting dance when a pair of Sooties had selected a nesting site. "I was able to approach within a few feet of the birds and watch closely the evolutions. The female bird was sitting on the ledge when the male approached and gently touched her with his beak, making at the same time a noise resembling the sound of vomiting. Both birds then stood up, put their beaks together, and both made gutteral sounds. Then a walk round in a circle completed the evolution.

"Further observations had to be postponed as the birds were then photographed and caught by hand for specimens. When the female bird is sitting the male flies up and down in front of the nest."

SANDY BAY AS A BASE FOR OPERATIONS.

November 6th.—Blake and Hamilton again packed their swags and proceeded to Sandy Bay, this time by boat. Returning to the wreck of the *Jessie Nichol* on Nuggets Beach they collected timber with which they made a new floor for the hut at Green Gorge. The improvements also included both a door and a window.

November 7th.—Blake recorded: "Climbed cliff and examined several Sooty Albatross nests but they contained no eggs. Visited the Royal Penguin rookery. Hamilton and self collected some dozen Skua eggs; also dug out several petrels, but they have not laid as yet." Hamilton reported that he found *Azorella selago* in flower. A marked growth in *Stilbocarpa polaris* and tussock-grass was noted this month and the latter commenced to seed.

November 8th.—"Crossed over the Island to the western coast and travelled south for about 2 miles. Collected numerous Skua eggs. There were Giant Petrel rookeries along this part of the coast. Some of the nests contained young birds. We found a large prawn in one's puke. Saw three specimens of a new petrel."

November 9th.—"Left hut at 7 a.m. Visited Green Gorge and secured the theodolite which had been cached there since operating from Lusitania Bay. Climbed the hills to Station S. but low cloud descended before I could observe from same. Mist came down very thick so descended the hills on to the west coast which I followed north. I passed through two very large Victoria Penguin rookeries and obtained one egg. Climbed up a waterfall into the hills again. While doing so a piece of rock gave way and precipitated me into a large pool of freezing water 25 feet below. By Jove! it was cold. I was carrying sixteen Skua eggs at the time; these broke and I received a shower of young chickens and egg all over my head. I reached the hut at Sandy Bay about 4 p.m. wet through and hungry. Had to sit rolled up in a blanket while my underclothes dried. When collecting eggs to-day a Skua attacked Hamilton and he received a black eye, the result of a blow from the bird's wing."

November 10th.—"Wind from the north-north-west and low misty cloud over the Island. Hamilton went to North End for stores while I stayed on at the hut (Sandy Bay) and dried my clothes. Ainsworth shot a new (for here) migratory bird yesterday. Hamilton collected several Dominican Gull eggs to-day. Word has been received that to-morrow the *Aurora* leaves Hobart for here."

November 11th.—"Fished for one hour and received only one bite. Visited Brothers Point, egg and rock collecting. Packed back a biscuit tin full of Rockhopper Penguin eggs for eating."

Heavy rain and snow again hampered Blake's work though it was now mid-November. On the 14th they found a squid in a Gentoo's nest. Hamilton returned to the North End on the 16th, but Blake continued in the vicinity of Sandy Bay until the 18th when he also made his way to headquarters through heavy snow squalls from the south-west.

BACK AT NORTH END.

On the 17th Hamilton discovered that rats had damaged his collection of Gentoo eggs. The rat hunt which ensued accounted for twenty-seven rats. That same day, he and Sandell visited the Shag rookery at West Point and collected 23 dozen eggs (Plate CXX, Fig. 2).

November 19th.—On the hills at the back of the sealers' huts Hamilton collected three Sooties and one egg.

November 21st.—Seventeen dozen Rockhopper Penguin eggs were collected for cooking. The *Aurora* made the Island in the early evening.

November 23rd and 24th.—Blake remained on board the *Aurora* and assisted Captain Davis in a programme of soundings around the north end of the Island. The ship departed on the 25th.

November 26th.—Hamilton caught two fish; one a cod type 16 inches long covered with leaches; the other was a leather-jacket.

December 2nd.—Blake returned to the Sandy Bay hut to conduct geological field work in that area. One of his most interesting discoveries was the finding of fossil bird bones at 15 feet above sea-level in a post-glacial conglomerate.

On the 2nd he observed that the Royal Penguins had chicks a few days old. On the 3rd he obtained a Sooty Albatross egg and came across young Skuas only a few days old. The Sea-elephants were moulting at this time.

When at Green Gorge on the 3rd, Blake saw a large creature like a Black-fish, located about 1 mile off-shore, leaping out of the water every 5 minutes or so. He got back to the Expedition Hut on the 5th.

December 6th.—Blake cemented a large ring-bolt into a rock in Garden Bay as a Bench Mark.

December 9th.—Hamilton fishing from the boat caught one fish 12½ lb. weight and many other smaller ones but of the same species.

December 10th.—Blake and Hamilton set out with a heavy load in the *Blubber* to take up residence again in the Lusitania Bay hut. Soundings were made on the way south. It was found that some of the King Penguins had already laid their eggs.

December 12th.—Several Prion burrows were examined and both the common species were found to have laid their eggs. The following day two dozen fish were caught on a line.

December 14th.—A visit was paid to the Shag rookery and young were found in the nests. On the hills above Lusitania Bay, Hamilton collected fifteen eggs of the small Prion and nine eggs of the large Prion. These " night birds " of the sealers are to be seen around the coasts of Macquarie Island in summer but not in winter. They nest in thousands on the higher slopes of the Island on hillsides and on flats. They nest in winding burrows, as much as 6 feet in length, terminating in an enlargement at the end. On the 16th he was again after these eggs and got twenty-three of the small and fifteen of the large.

December 17th.—Hamilton found a Mutton Bird nesting ground, collecting eleven eggs and four birds. Mutton Birds nest in large burrows, about 6 inches in diameter, sloping down, with a circular chamber lined with tussock-grass at the end. Many burrows have two entrances. In another nesting area at the North End eggs were got as early as November 30th.

December 25th.—A very dull misty day. Some time was spent fishing from the boat resulting in a catch of over 90 lb. weight of fish.

EXPLORATIONS AT SOUTH END.

December 27th.—At 10 a.m. they left in the *Blubber* to visit the South End rookery. On this day's happenings Blake's diary is illuminating. " Very heavy surf at South End. Wind too strong to return to Lusitania Bay so we had to attempt to land, or else sail on to Antarctica. Here one has to pass through a narrow passage in the reef; it is just wide enough to take the dinghy and oars without touching. We waited our chance outside (or thought we did) for a lull in the surf, then we pulled for all we were worth. We were about half way through the passage when a tremendous wave came in after us. We rushed along on top of its crest until almost through—in another second we would have been all right—when crash! over we went, the next thing I remember was flying through the air, then plunk ! ice-cold water. The first thing I noticed when I came to the surface again (I didn't touch bottom) was a large rock. I swam towards it and clambered on top, only to be washed off. However, I scrambled on again and looked around. Hamilton was clinging on to the boat which was being swept towards the shore; so he was right. Another large wave came and off I was swept again. When I scrambled on again I got a better grip so did not get swept off again. I waited until there was a bit of a lull and then jumped as far as I could off the rock and let the waves take me in towards the shore. I soon felt bottom on a reef and climbed up out of the water. Hamilton was still on the boat which was now alongside the reef. He threw me the painter and after a long struggle we worked the boat around into the harbour and then ashore. The boat was stove in two places; but they will be easily fixed."

Some valuable gear was lost but their blankets which were packed in a tin case floated ashore all right, though very wet. The oars also came ashore in the evening. With the aid of a big fire their clothes and blankets were dried.

A survey of the great Royal Penguin rookery which is located at the extreme southern tip of the Island showed it to be 16½ acres in area and to contain about 620,000 birds.

From there they visited Caroline Cove and South-West Point. At the latter locality a Mollymawk rookery was found on steep cliffs, containing not more than forty nests. Two nests were examined; one contained an egg, the other a chick about a week old. The nest is very similar to the Sooty Albatross, made of grass and mud.

December 29th.—They returned to Lusitania Bay which was reached after a stiff pull.

January 2nd (1913).—Hamilton and Blake were still continuing with operations, based on Lusitania Bay. Blake wrote: "Ascended the hills and worked south to Waterfall Lake. Descended to the West Coast, and made a geological examination of the rocks to a point immediately west of the southern end of Major Lake. Then ascended the hills there and returned to the Hut at Lusitania Bay. The whole of the coast traversed was a seething mass of penguins, both Royal and Rockhoppers. It was almost impossible to walk; one had to kick the birds out of the way. The Rockhopper especially were very annoying; they set up an infernal noise immediately they are approached and they deal very sharp blows with their beaks."

January 6th.—A geological investigation of the west coast, northward to Mt. Waite was made, returning directly across the hills. A good sandy beach was encountered most of the way along the coast, where there were comparatively few penguins but Sea-elephants were plentiful.

January 8th.—Hamilton and Blake packed their gear on board the *Blubber* and returned to the Expedition Hut at North End.

On arrival at the Expedition Hut Hamilton was depressed to find a considerable portion of his bird skins covered with mildew. A great deal of his time throughout the year had been spent in taxidermy and a splendid collection of skins had been made. However, before the end of the two years of occupation on the Island, these hard-won trophies had been seriously depleted by the depredations of rats and the unfavourable climatic factor.

SUMMER DAYS.

January 11th.—Hamilton dug out Mutton Bird nests in the North Head locality and got five.

During the period 9th to 24th, Blake was engaged on all suitable occasions on geological work and photography around the north end of the Island. A portion of the time otherwise available for field work was occupied in cooking and domestic duties at the Hut, for Ainsworth had arranged that every member of the party shared equally in this work. Ainsworth, Sandell and Sawyer made visits only to nearby localities, for their duties kept them permanently employed in the vicinity of the Hut.

January 17th.—Sandell found a narrow seam of lignitic coal under peat near the top of Gadget Gully.

January 19th.—A small earthquake was experienced at 11.17 a.m. Such phenomena were frequently recorded at the Island; more detailed reference is made thereto in Volume V of these Reports.

January 23rd.—On an excursion to the West Point area Blake found a nest of the Grey Duck containing eight eggs.

January 26th.—The sealing vessel, the *Rachel Cohen*, arrived at the Nuggets and brought with it mails from Australia. The ship brought additional plant for digesting penguin and seal blubber. This was rafted and floated ashore from the anchorage.

January 29th.—A warm but foggy day. Hamilton collected a number of insects including a new species. He also took blood smears from a number of birds and secured a tape-worm from a Dominican Gull.

February 4th.—Blake packed his swag and departed for Sandy Bay where he spent several days in geological field work. On arrival there he noticed a duck with young. Two days later when on the western highlands about a mile north of Mt. Waite he discovered a Wandering Albatross and its nest. On the 7th he returned to the Expedition Hut.

February 8th.—The Macquarie Island Party picked up the message sent out from our Antarctic Wireless Station that I had returned to the Main Base but that Ninnis and Mertz had lost their lives.

February 12th.—Macquarie Island picked up news of Captain Scott's triumph and fate.

February 17th.—Hamilton collected more parasites embedded in the blubber of Sea-elephants and continued with botanical and marine collections. During February and March, Blake spent most of his time contouring the northern end of his map of the Island.

February 24th.—During a heavy westerly gale an 8-ft. shark was washed on shore at Hasselborough Bay.

March 6th.—The change in programme arising out of the continued occupation for another year of the Main Base in Antarctica had completely altered the Macquarie Island Party's plans. They were to have been picked up by the *Aurora* in March and the station closed. Now, however, I had arranged by wireless with the Party that they should continue to man the station for a second year, and be picked up by the *Aurora* in December when on her way south to relieve the Main Base Party in Antarctica. However, the Island Party's provisions were beginning to run low. They were, therefore, pleased to catch forty fish on this day. Fishing was regularly undertaken on good weather occasions during this month, often with good results, for example on the 25th, Hamilton and Sawyer caught ten 5-lb. fish.

March 14th.—News was received of the safe arrival of the *Aurora* at Tasmania. As the sealing vessel *Rachel Cohen* was scheduled to leave Hobart for Macquarie Island within a short time, arrangements were made for her to transport stores for our Party. The *Aurora* was accordingly laid up for the winter and Captain Davis sailed for England.

However, owing to financial difficulties, the owner of the *Rachel Cohen* was not able to get the vessel away for several months. It was then late in the season and she had to face very heavy weather with the result that she did not reach the Island at all, but arrived in New Zealand in a damaged condition. These unfortunate happenings resulted in an acute shortage of ordinary food at Macquarie Island, and our Party was at last reduced to living almost entirely on Sea-elephant meat "straight."

As a consequence of this shortage of provisions the regular work of the party was considerably interfered with for much time had to be spent each day foraging at a time of the year when animal life is scarcest and the weather at its worst.

THE FOOD SITUATION BECOMES SERIOUS.

April 2nd.—Snow-storms early in April heralded winter. Much of the animal life began to leave the Island. On this day Hamilton and Sandell visiting the Royal Penguin rookery at the Nuggets reported that there were only about a dozen of the birds left. However, Gentoos were observed building nests. To the south of the Nuggets numbers of small Sea-elephants were still on the beaches. On the highlands they saw seventeen ducks, but succeeded in bringing back only Wekas for the larder.

In this same area Ainsworth and Blake had got ten rabbits and four Wekas on the 24th; Hamilton and Sawyer got nineteen Wekas and a duck on the 26th. Apart from meat they were now restricted to one loaf of bread each per week.

May 3rd.—A cow Sea-elephant to-day yielded an embryo 18 inches in length, with nails and whiskers well developed.

May 4th.—Blake set out in the *Blubber* for Green Gorge. "Spread tent fly over the mouth of the cave and proceeded to make things as comfortable as possible. The cave is 14 feet wide at the entrance and 7 feet high. It tapers back in a pyramidal form for a distance of 15 feet. Made a good bed out of a quantity of dead tussock-grass; I say good, but there were still a lot of rocky projections to enter one's back. The stove I made for burning blubber gives off terrific heat and warms the place up, but is very sooty. Secured six Wekas for food."

May 5th.—A south-westerly gale with snow made it a bitterly cold day. Rockhopper Penguins had now completely deserted this part of the Island. Four rabbits and three Wekas were caught for food. On the 6th Blake got seven Wekas.

May 7th.—Blake left Green Gorge in the *Blubber* and made Lusitania Bay and took up residence in the hut there. On the 9th he noticed several young Wekas just losing their down. During the whole period of their residence at the Island, the Party did not succeed in finding a single nest of the Weka. Each day Blake had to spend time collecting Wekas and rabbits for food.

May 11th.—Hamilton, located at the North End, reported that the Rockhopper Penguins left the Island from that area about this day.

May 13th.—Blake at Lusitania Bay recorded: "Made two attempts to launch the boat to-day, but too much surf. Finished biscuits and jam to-day. Ascended the hills. Caught four rabbits and one Weka. Observed a flash of lightning at 5 p.m. (lightning was observed at Macquarie Island only on several occasions throughout the two years' occupation). The wind was from the west-by-south, with heavy rain. Tea to-night consisted of Sea-elephant's heart and the stems of the plant *Stilbocarpa polaris* for a vegetable.

May 14th.—"The wind was too strong to move to-day. Had the record blow—74 miles per hour from the west."

May 15th.—"Wind from the south-south-west. Ground frozen. Sea very heavy. Went to Caroline Cove to visit depot for stores and found that a heavy sea had washed everything away. From there I went to the South-East Bay depot and found three tins of fish and half a tin of jam. I was so hungry that I sat down in the snow and ate a tin of fish. Arrived back at Lusitania Bay at 4.30 p.m. Caught three rabbits. Wind north-north-west this evening with a heavy fog."

May 16th.—"Too rough to set out to-day."

May 17th.—"Up at 6.30 a.m. Launched boat at 8 a.m. after an exciting time. After I had rowed about 2 miles the wind rose from the north-north-west and was, consequently, a head wind. After I had rounded Victoria Point* the wind was very strong so I had to put my back to it; got within 1 mile of Green Gorge and was beaten, so had to run back to Lusitania. The sea had now made and as I had exhausted my strength pulling I had some trouble in landing, not being able to dodge the waves. When nearly ashore the breakers got me and turned the boat over. However, in the end I managed to get ashore with the loss of only a table-knife and a quantity of game.

May 18th.—"Spent all day drying and cleaning the instruments and my clothes. Feel very weak after yesterday; have strained myself in the abdomen pulling boat up into the tussock out of reach of storm waves."

May 19th.—"Left Lusitania at 7.45 a.m. with swag up. Had been very heavy snow and had a very arduous hike, making North End in 11 hours. Had several bad falls and have strained my groin. Will have to spell for a while. Thank goodness will be able to get some food now."

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* The Admiralty Chart of 1917 refers to this as Saddle Point.

May 24*th.*—Ainsworth and Hamilton went foraging to Eagle Bay. They shot five terns and saw two new sea birds.

June 1*st.*—Blake writes: "Packed swag and with Hamilton left for Eagle Cove. Collected drift-wood in the afternoon and made cave fairly comfortable. Heavy snow and sleet all day. Wind from the east. Made fire and dried clothes."

June 2*nd.*—Very long night (4.30 p.m. to 7 a.m.). Collecting specimens all day. Found a boulder, 18 inches by 12 inches, of pink granite of very coarse texture on Eagle Point."†

They returned to the Expedition Hut the following afternoon.

June 12*th.*—Blake discovered that a large erratic, weighing about 21 tons, weathered out of the glacial till at Nugget Point was of a rock occurring *in situ* at Eagle Point.

June 15*th.*—Blake's work on the hills this day was very trying on account of wind and low temperature. He registered 19° F. though at sea-level at the Hut it was 23° F. "Beard and moustache frozen stiff. Attempted to sound lakes but ice not thick enough."

June 30*th.*—A survey of the Nuggets Creek Royal Penguin rookery was made by Blake and found to measure 8½ acres. The following day he and Hamilton packed their swags and set out for Sandy Bay conducting geological and zoological observations from there until July 4th when, late in the day, he returned to the Expedition Hut.

July 9*th.*—It is recorded that Sea-leopards were becoming plentiful. Two were killed on West Beach. Both of these were females. The larger was 10 feet long and 6 feet in girth; she was carrying a well-developed pup. The following day Hamilton skinned an 11-ft. male Sea-leopard. Sea-leopards become numerous on the beaches of Macquarie Island during the month of July and remain plentiful for about three months; they then dwindle in numbers and are rarely seen on the beaches until the following winter.

July 13*th.*—Word was received that at last the *Rachel Cohen* had left Hobart for the Island with food stores. However, high gales followed each other rapidly for some time after this date and it was obvious that the vessel was having a bad time. In the meantime, the Macquarie Islanders were every day spending parts of the day foraging for game to keep them going.

July 21*st.*—The sealers found a Gentoo's egg at Sandy Bay.

August 3*rd.*—Blake spent the day on the hills near the Nuggets. "Mainly employed in geological work—collected several specimens from the till. Mac caught one rabbit. The wind reached 62 miles and was pretty constant about 60 miles for some time. Blown over several times. One had to sit down for a spell every 20 yards. It took me an hour to do one mile."

August 4*th.*—They had been living on a pure meat diet for some time now. "Topographical work to-day. Will finish next fine day, thank goodness. Am beginning to feel it a bit now climbing about the hills on meat 'straight'."

August 6*th.*—The Islanders received news that the *Rachel Cohen* had been towed into Stewart Island, New Zealand, in a battered condition and that the New Zealand Government was considering dispatching their vessel *Tutanekai* with food to Macquarie Island.

August 7*th.*—Visiting Eagle Point on a foraging trip, it was discovered that the large bull Sea-elephants had begun to appear again for the breeding season.

† Evidently transported from Antarctica by floating ice.—Ed.

August 9th.—News was received that the *Tutanekai* would leave New Zealand for the Island within a few days. The wireless operator, Sawyer, found that his health was being undermined by prolonged sojourn at the Island and it was arranged that he should take this opportunity to return to New Zealand. Henceforth, Sandell was in full charge of the wireless station, a certain amount of help with the engine being given by Ainsworth and other members of the party.

RELIEF ARRIVES AND SUMMER COMES.

August 20th.—The *Tutanekai* came in sight at 7 a.m. There was great rejoicing. Bad weather hampered the landing of stores, so that this job was not completed until noon next day. The ship immediately departed with Sawyer on board. The Islanders fell to preparing a memorable feast.

Sandell came upon and killed what he described as a hybrid seal, regarded as a cross between a Sea-elephant and a Sea-leopard. Similar creatures were reported at other times on the Island. However, after the Island Party had visited Antarctica some months later, they realised that their "hybrid seals" were Antarctic Crab-eater Seals. Possibly stray Weddell Seals also reach Macquarie Island.

During this year the headsman of the sealers and several others remained on the Island after the summer season was over. Now they commenced operations for the new season, killing their first bull on the 27th.

September 3rd.—Blake and Hamilton left with stores on the *Blubber* for Sandy Bay. No seals were to be found on the beaches for blubber for a fire. Heavy snow-falls in the evening. The next day a Sea-elephant came ashore and provided the necessary blubber.

September 5th.—Hamilton reported that the Gentoos near Brothers Point had their nests well advanced.

September 7th.—Blake's entry reads: "A hellish day. Strong gale wind reaches 65 miles at the Meteorological Station on the Isthmus but it must have been 80 miles down the creek here. It almost blew our hut away. We had to lash it down with ropes. The roof used to lift fully 9 inches and we thought the walls would cave in. In the afternoon the wind abated a little so we drove 6-inch spikes through the rafters to keep the roof on."

September 8th.—"A nice calm day. Traversed the west coast to the first Rockhopper Penguin rookery about 2½ miles down. Found a shale in the volcanic series but no fossils. Saw two new birds. Shot twenty-four Wekas, one duck, and two rabbits. Earthquake at 2.36 a.m."

Hamilton wrote that they found Giant Petrels building their nests, and two eggs were got. Also he saw two small birds like starlings, and found large bull Sea-elephants fairly numerous on the west coast, they are now returning to the Island for the breeding season (Plate CXVII, Fig. 2).

September 10th.—At Nuggets Beach they found a seal "either a new one here or a hybrid. It is about 6 feet long; fur like the leopard but has spots all over the back and no dark fur; muzzle very sharp and whiskers 6 inches long; sex, male. Teeth like the one we found near Green Point." This was evidently a Crab-eater.

September 11th.—Another fierce gale. Geological work was conducted at Brothers Creek. The Gentoo rookery there was inspected and two eggs were secured. On the 13th Blake again visited the Brothers rookery and collected four more penguin eggs. They saw six finches. In the afternoon the Gentoo rookery near the *Jessie Nichol* wreck was visited and twenty-nine Gentoo eggs got. A cow Sea-elephant was up on the beach at Sandy Bay. Hamilton went across to the west coast and reported eighty cows up, some having pups (Plate CXXII, fig. 2). He collected nine Gentoo eggs and saw a pair of finches. Two more finches were seen on the 14th. On the 15th "the first Royal Penguin came up to-day."

September 16*th.*—Packed and depoted stores to the south of Brothers Point. " Collected fifty Gentoo eggs. Noticed a bull Sea-elephant that had evidently come off second best in a fight, his snout was almost torn off."

The following day Hamilton put date pegs on the nests of the Gentoos, near Sandy Bay. On the 18th he shot one of the finches.

September 19*th.*—Blake and Hamilton packed swags and started out for Lusitania Bay. Numerous bull Sea-elephants were seen on the way but few cows. Several Royal Penguins were observed in each of the rookeries. Rats were found to have destroyed some of Hamilton's skins at the Hut. The return journey to Sandy Bay was undertaken next day, and to the Expedition Hut the following day.

During the following month both Blake and Hamilton spent much time operating from the Sandy Bay hut but returned at frequent intervals to the Expedition Hut at North End.

October 7*th.*—When working around the west coast at Feather-bed Swamp, Blake recorded very big Sea-elephant rookeries each of from two hundred to four hundred cows. At Aerial Cove Hamilton reported that there were forty cows with nearly as many pups. The cows return to the Island in the latter half of September and the young are born very soon after they appear on the beaches.

October 10*th.*—Hamilton weighed a young Sea-elephant which proved to be 115 lb.

October 15*th.*—Sandell saw a Rockhopper Penguin in the rookery at the foot of Wireless Hill.

On the 17th when near Sandy Bay, Blake recorded that Sooty Albatrosses were numerous. Hamilton found that these birds congregate, pair off, and look for nesting sites late in September. The nests which are usually solitary are frequently found on ledges of rock at about 200 feet above sea-level on the cliffs facing the sea. The nests are circular mounds of clay and tussock-grass, about 6 inches high and 2 feet in diameter. One egg only is laid.

October 24*th.*—Blake visited a Gentoo rookery near Sandy Bay where the eggs had been marked and found that the eggs laid on September 15th had incubated and that the eggs laid on the 16th were just coming out. This gave the period of incubation as thirty-eight days. Eggs were observed in a Skua's nest. Finches were seen in the hill west of Sandy Bay.

October 30*th.*—Blake's entry reads : " Wind north-west, almost a dead calm. Packed camera and set off for Sandy Bay. On turning the last point I noticed to my surprise that the tussock-grass had been burnt and on getting closer—that the hut was burnt to the ground. The wood was still smouldering in one place and the ground and stones were quite warm. Should think that the fire had occurred within the last twenty-four hours. Property lost consisted of sextant, blankets, sleeping bag, tent fly, books, boat's compass, underclothes, socks and a host of other things. The worst loss to my mind is my specimens, all that I've collected this season. However, I will pack them away, but they will be useless for museum specimens. Hamilton lost a lot of gear. This has put a damper on my field work, as have no blankets. Returned to North End by 1.30 p.m."

November 14*th.*—The news was received that the *Aurora* was due to arrive at the Island on the 22nd.

Sandell who had very successfully carried on wireless communication with the outside world and had been carefully recording the effect of visible manifestations of aurora polaris on wireless transmission now reported : " I have proved to my satisfaction that the aurora in some forms most certainly affects wireless."

November 18*th.*—The sealer, *Rachel Cohen*, arrived. The packing of geological specimens was completed and they were transported to the boat harbour in readiness to be embarked on the *Aurora*.

November 28th.—The *Rachel Cohen* cleared the Island at 10.30 p.m. and the *Aurora* anchored in Hasselborough Bay later in the evening. With the *Aurora* came a party of three men appointed by the Commonwealth Meteorological Bureau to take over and carry on the weather station at the Island.

H. Power, an officer of the Bureau, was in charge for the year 1914. On November 29th the Commonwealth Fisheries Investigation vessel *Endeavour*, directed by H. C. Dannevig, arrived at the Island bringing A. C. Tullock to relieve H. Power. While there, the *Endeavour* spent an afternoon trawling to test the ground around the Island. In regard to this test, Tullock states in his report to the Director of the Meteorological Bureau, dated December 31st, 1915: "Mr. Dannevig got a splendid collection of fish, many of the species which neither he nor his biologist had seen before. Mr. Dannevig also tried the reefs for crayfish but was not successful, although a few crabs were caught in the nets."

Unfortunately, the *Endeavour* after leaving the Island disappeared without trace; consequently, there is no information available regarding the nature of that catch of fish.

Harrisson, who had spent a year in Queen Mary Land as a member of the Western Base Party and on return to Australia had been appointed by the Fisheries Dept. as biologist on the staff of the *Endeavour*, was lost in this catastrophe.

Other members of the Commonwealth Meteorological Dept.'s parties during 1914 and 1915 were F. J. Henderson and J. Ferguson. The members of the parties during these two years are shown in Plates I and II of Volume III, Series B of these Reports. The individuals there portrayed are from left to right: Plate I, A. C. Tullock, F. J. Henderson, J. Ferguson; Plate II, F. J. Henderson, H. Power, J. Ferguson.

CARTOGRAPHY

The first part of this volume outlines in historical retrospect the operations of the various units of the Expedition, recording our discoveries and progressively demonstrating the geographical environment in the widely spread regions visited. It now remains to deal more specifically with cartographical features and the map record submitted in this volume.

MACQUARIE ISLAND

There had not previously been in existence any reasonably accurate map of Macquarie Island. Now, however, it has been charted in great detail by Leslie Blake, who worked by a system of triangulation from a measured base line. The coastline and broader topographical features were dealt with during the first year of occupation. During the second year, contour lines at 200 feet intervals were plotted for the whole Island, and at 50 feet intervals for a distance of 4 miles south from the north end. From the *Aurora* and from small craft, soundings were systematically made around the Island and in all necessary detail at the various anchorages. However, as Macquarie Island is the subject of Volume V of this series of reports, no further reference thereto will be made here.

KING GEORGE LAND

Originally this name was applied to land which we discovered to the east of the Mertz Glacier. At that time the land which we discovered between Point Alden and the Mertz Glacier was referred to as Adelie Land, although it lay beyond the limits of the Adelie Land discovered by Admiral Dumont D'Urville in 1840. When in 1924 the French Government formally proclaimed sovereign rights over Adelie Land, basing their claim upon the fact of its discovery by D'Urville, we then included British Adelie Land in the territory of King George Land. Consequently, King George Land as now defined is Antarctic land lying east of the 136th degree of east longitude and extending to the vicinity of Oates Land.

The Union Jack and the Australian Ensign were formally hoisted to the masthead of the Hut, Cape Denison, in March, 1912, when the region was proclaimed British Territory.* On February 21st, 1913, by wireless telegraphy from Cape Denison, a message was sent through Lord Denman (Governor-General) requesting permission to designate this new territory " King George Land." A reply was received on the 27th of the month granting our request.

THE DETERMIMATION OF LONGITUDE AT CAPE DENISON.

The Expedition was well supplied with ship's chronometers, consequently a reasonably accurate longitude fix for Cape Denison was secured when the *Aurora* lay there at anchor unloading equipment in January, 1912. The mean of the twelve chronometers then on board yielded unusually reliable time data. The ship during that voyage was not fitted with wireless. However, when in 1913 the shore wireless station was operating, it offered a special opportunity for accurately fixing a reference meridian for King George Land. Thus this was the first longitude determination relating to any part of Antarctica fixed with such a degree of accuracy.

This was one of Robert Bage's undertakings. An Astronomical Hut was built for housing a 10-inch transit instrument which had been supplied by Mr. Baracchi, the then Government Astronomer in Melbourne. A solid pillar was first constructed to carry the instrument; around this a hut with a meridional slot in the roof was constructed. This Astronomical Hut was located as shown in text figure 10.

We had in commission at Cape Denison five ship's chronometers, respectively, Barraud 921, Fletcher 3609, Casseres 655, Poole 3559, and Dent 1676. This battery of chronometers assisted Bage in his quest of accuracy in determining a reference meridian.

Dr. J. M. Baldwin, of the Melbourne Observatory, organized a programme of wireless time signals despatched to our station at Macquarie Island and then relayed on to us in Antarctica.

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* A further proclamation of sovereignty was read by me in January, 1931, when I again visited the locality during the operations of the B.A.N.Z.A.R. Expedition. On that occasion a copy of the proclamation enclosed in a copper cylinder was deposited in a cairn on Anemometer Hill.

The proper working of this system appears simple enough in theory but results were achieved only after prolonged operations, for the conduct of the work was affected by several uncertain factors. The first of these lay in the fact that wireless communication was intermittent owing to the interference of the aurora polaris and of statics and frictional electricity emanating from the ever drifting snow. Then when all other factors were favourable, the stars would more often than not be blotted out by thick drifting snow descending from the plateau. However, Bage eventually completed his observations and Dr. Baldwin's report thereon is herewith submitted.

REPORT ON THE LONGITUDE DETERMINATION.

By J. M. Baldwin: 1914, *June* 26.

Determination of Local Time at Cape Denison : 1913, *Sept.* 23.

Wire Intervals determined 1913, Sept. 23, from υ Octantis. (Wire I away from lamp.)

Wire.	Transit.	Interval.	Equatorial Interval.
		s.	
I	22 17 45	+ 475·3	+ 29·75
II	13 50	+ 240·3	+ 15·04
III	9 47·5	— 2·2	— ·14
IV	5 50	— 239·7	— 15·01
V	1 56	— 473·7	— 29·65
Mean	22 9 49·7		— ·01

Determination of Level Division—

	Mean Reading (screw end +.)	1 Div. ″	Range Microm./Bubble.	Temp.
1912, June 14	+ 40	1·664	307/173	
	0	1·875	388/194	+ 32° F.
	— 40	1·771	376/199	
		″		
1912, Aug. 27	+ 20	1·409	78/50·2	
	0	1·616	181/101·5	+ 6° F.
	— 20	1·777	97/49·5	

*	β Argus. S.P.	γ Pavonis.	β Aquarii.	ξ Aquarii.	ε Pegasi.	γ Gruis.	α Aquarii.	υ Octantis.	η Aquarii.	C.P.D. —63° 1589. S.P.	θ Argus. S.P.	λ Aquarii.
Lamp ...	E	E	E	E	E	W	W	W	W	W	W	W
Level ...	14W 2E	4W	4W	6W	10W	14W	18W 18W	37W	31W		29W	27W
Mean ...	d. 1·50 W	d. 0·25 W	d. 1·00 W	d. 1·25 W	d. 2·00 W	d. 3·50 W	d. 4·50 W	d. 6·88 W	d. 8·50 W	d. 7·50 W	d. 7·50 W	d. 7·00W
					½ sec.	½ sec.	½ sec.		½ sec.	½ sec.	½ sec.	½ sec.
I	21 7 56·5	—	21 20 53·5	21 27 3·9	21 33 98·0	21 42 202·0	—	22 17 45	22 24 212·5	22 32 42·0	22 32 127	22 41 235·6
II	7 12·5	—	21 8·8	34·5	128·9	164·0	21 55 114·5	13 50	181·9	110	197	204·9
III	6 31·0	—	24·0	65·0	160	126·0	84·5	9 47·5	151·5	179	266	174·0
IV	5 46·35	21 14 21·5	39·2	96·5	191·5	88·5	53·8	5 50	121·5	249	335	143·3
V	—	15 0·0	54·2	127·0	221·5	49·0	—	1 56	91·2	318	401·5	112·0
	6 51·59	14 40·75					21 55 42·13					
	— 21·03	— 54·40					+ ·04					
Mean ...	21 6 30·56	21 13 46·35	21 21 23·94	21 27 32·69	21 34 19·99	21 43 2·95	21 55 42·17	22 9 49·70	22 25 15·86	22 33 29·80	22 34 12·65	22 42 26·98
Rate to 22h. ...	+ ·31	+ ·26	+ ·23	+ ·19	+ ·15	+ ·10	+ ·03	— ·06	— ·15	— ·20	— ·20	— ·25
Aberr. ...	+ ·02	— ·02	— ·01	— ·01	— ·01	— ·01	— ·01	— ·13	— ·01	+ ·02	+ ·02	— ·01
Level ...	— ·34	+ ·07	+ ·05	+ ·07	+ ·05	+ ·42	+ ·20	+ 11·40	+ ·37	— 1·23	— 1·23	+ ·40
t	21 6 30·55	21 13 46·66	21 21 24·21	21 27 32·94	21 34 20·18	21 43 3·46	21 55 42·39	22 10 0·91	22 25 16·07	22 33 28·39	22 34 11·24	22 42 27·12
× — t	+ 5 41·04	+ 5 36·43	+ 5 38·04	+ 5 37·89	+ 5 37·78	+ 5 40·91	+ 5 40·02	+ 5 54·75	+ 5 40·61	+ 5 38·03	+ 5 37·44	+ 5 41·14

The rate has been taken as 0·35s. per hour from comparisons with Barraud 921 and Poole 3559 before and after the observations.

Normal equations have been formed, the equations of condition arising from stars 2 and 10 being given weight ½. The successive elimination equations are—

$$+ 41{\cdot}744a - 84{\cdot}417c - 5{\cdot}306\ \triangle\theta - 86{\cdot}041 = 0$$
$$+ 110{\cdot}871c - 26{\cdot}150\ \triangle\theta + 86{\cdot}248 = 0$$
$$+ 4{\cdot}158\ \triangle\theta + 2{\cdot}556 = 0$$

The resulting values are—

$a = + {\cdot}117$s. $c = - {\cdot}923$s. $\triangle\theta = - {\cdot}61$s. (Assumed correction + 5m. 40s.)

Mean error of observation of weight 1 is $\pm$ 0·63s.

Mean error of $\triangle\theta$ is $\pm$ 0·31s.

The residuals in the successive equations of condition are—

+ ·734s., + ·701s., + ·315s., + ·462s., + ·554s., — ·429s., + ·181s., — ·002s., — ·409s., — ·953s., — ·356s., — ·924s.)

Hence when Dent 1676 indicates Sept. 23d. 22h. 0m. 0s.

the local sidereal time is Sept. 23d. 22h. 5m. 39·39s. $\pm$ 0·31s.

The Longitude of Transit Hut, Cape Denison.

In transmitting time to Adelie Land by radiotelegraphy, the operator at the Melbourne Observatory sent out a preliminary signal consisting of a series of X's (Morse code) lasting approximately from 10h. 59m. 0s. to 10h. 59m. 50s. Victorian Standard Time, followed by a dash commencing at 11h. 0m. 0s. and lasting one second. These signals were recorded also on the tape chronograph and so compared with the transit clock. The chronometer time at which this last signal reached Macquarie Island was noted (to the nearest half-second). The operator at Macquarie Island (C. A. Sandell) sent out a dot each second from 11h. 29m. 0s. to 11h. 29m. 50s. (chronometer time) followed by a dash at 11h. 30m. 0s. (chronometer time). The chronometer times at which these reached Adelie Land were taken to the nearest tenth of a second (observer, R. Bage).

A determination of local time at Adelie Land, resting on observations of twelve stars with a portable transit instrument, was made on September 23, 1913, by R. Bage.

Observed errors of Transit Clock, Melbourne Observatory—

1913, Sept.	22d.	9h.	47m.	Victorian Standard Time.		28·99s.	fast on	Melbourne	Sidereal	Time.
,,	23	7	50	,,	,,	29·36	,,	,,	,,	
,,	30	8	10	,,	,,	32·85	,,	,,	,,	

Signals from Melbourne, Sept.	22d.	22h.	43m.	30·88s.	Sept. 25d.	22h.	55m.	21·78s. Transit Clock.
Correction to Transit Clock			—	29·01			—	30·42
Melbourne Sidereal Time		22	43	1·87		22	54	51·36
Greenwich Sidereal Time		13	3	7·72		13	14	57·21
Greenwich Mean Time, Sept.	22d.	0h.	59m.	59·89s.	Sept. 25d.	0h.	59m.	59·72s.
Signals received at Macquarie Island ...		10h.	58m.	38·5s.		10h.	58m.	18s. Chronometer Time.
Chronometer error ...		9	58	38·61 fast		9	58	18·28 fast.
Daily rate of chronometer				6·78s. losing.				
Interval between receiving and sending			31m.	21·5s.			31m.	42s. Chronometer Time.
Correction to interval ...			+	·15			+	·15
Signals sent from Macquarie Island,	Sept. 22d.	1h.	31m.	21·54s.	Sept. 25d.	1h.	31m.	41·87s. Greenwich Mean Time.
Received at Adelie Land ...		0	4	19·5		0	4	40·5 Barraud 921.
Error of Barraud 921 ...		1h.	27m.	2·04s. slow.		1h.	27m.	1·37s. slow.
Daily rate of Barraud 921				0·22s. gaining.				

Comparison of chronometers, Sept. 23—

Barraud 921 ...	21h. 39m. 50s.	24h. 12m. 50s.
Dent	20 38 37·5	23 12 3·5

And from transit observations, Sept. 23—

Dent	22h.	0m.	0s.		
Local Sidereal Time	22	5	39·39	± 0·31s.	
Interpolated reading of Barraud 921 ...	23	0	58·71		
Correction to Barraud 921	+ 1	27	2·04	at Sept. 22d. 0h. 4m. 19·5s.	Chronometer time.
Correction for 22h. 57m. ...	—		0·21		
Greenwich Mean Time, Sept. 23d.	0h.	28m.	0·54s.		
Greenwich Sidereal Time ...	23	12	34 59·66		
Longitude of Transit Hut	9h.	30m.	39·7s. E.		

The maximum error in this result that would appear possible is about 2 seconds, arising chiefly in the receiving at Macquarie Island, with the consequent error in the correction to Barraud 921 on September 22, and the error in its assumed rate.

In the above, only Chronometer Barraud 921 has been used. Other chronometers were available and were compared with Barraud 921 as follow :—

1913—		h.	m.	s.		h.	m.	s.		h.	m.	s.
Sept. 22	Fletcher 3609	12	41	40	Fletcher 3609	12	38	40	Fletcher 3609	12	42	20
	Barraud 921	0	15	58·6	Casseres 655	20	16	6·3	Poole 3559	22	54	0·5
Sept. 23	Fletcher 3609	12	58	20	Fletcher 3609	12	57	20	Fletcher 3609	13	1	30
	Barraud 921	0	32	42·5	Casseres 655	20	34	50·5	Poole 3559	23	17	12
Sept. 25	Fletcher 3609	12	45	20	Fletcher 3609	12	46	40	Fletcher 3609	12	48	0
	Barraud 921	0	19	49·1	Casseres 655	20	24	18·9	Poole 3559	23	11	36·5
					h. m. s.				h. m. s.			
Sept. 23	Barraud 921	21	39	50	24 12 50	Poole	3559		20 22 30	23	0	0
	Dent 1676	20	38	37·5	23 12 3·5	Dent	1676		20 40 26·9	23	17	57·9

From the wireless signals, the corrections to Barraud 921 were obtained on September 22 and 25. Using these, the following corrections are obtained.

1913.	Barraud 921.		Fletcher 3609.	
	Chronometer Time.	Correction.	Chronometer Time	Correction.
	h. m. s.	h. m. s.	h. m. s.	h. m. s.
September 22	0 4 19	+ 1 27 2·04	12 41 40	— 10 58 39·36
September 23	.....	.....	12 58 20	— 10 58 35·69
Interpolated	0 32 42	+ 1 27 1·81	.....	36·04
September 25	0 4 40	+ 1 27 1·37	12 45 20	— 10 58 29·53
		s.		s.
Daily rate (Sept. 22-25)	.....	0·22 G	.....	3.28 L

1913.	Casseres 655.		Poole 3559.	
	Chronometer Time.	Correction.	Chronometer Time.	Correction.
	h. m. s.	h. m. s.	h. m. s.	h. m. s.
September 22	20 16 6	+ 5 23 54·34	22 54 0	+ 2 49 40·14
September 23	20 34 50	+ 5 23 53·81	23 17 12	+ 2 45 42·31
Interpolated	.....	53·41	.....	41·91
September 25	20 24 19	+ 5 23 51·57	23 11 36	+ 2 37 53·97
		s.		m. s.
Daily rate (Sept. 22-25)	.....	0·92 G	.....	3 54·43 G

For September 23 two values are given for the corrections; the former is got by interpolating for the correction of Barraud 921 and using this correction in finding the correction to the other chronometers, the latter is obtained by interpolating between the errors on September 22 and 25. The differences are + ·35s., + ·40s., + ·40s., respectively.

Assuming each chronometer to give a determination of equal weight, gives an additional correction to be applied to Barraud 921 of magnitude — ·29s. Hence—

	Chronometer time :	Correction.
Barraud 921	Sept. 23d. 0h. 32m. 42s.	+ 1h. 27m. 1·52s.
Poole 3559	23 17 12	+ 2 45 42·02

From the transit observations, September 23—

Local Sidereal Time ...	22h.	5m.	39·39s. ± ·31s.			22h.	5m.	39·39 ± ·31s.	
Dent 1676	22	0	0			22	0	0	
Barraud 921	23	0	58·71	Poole 3559		21	42	2·6	
Correction at 0h. 32m. 42s.	+ 1	27	1·52	Correction at 23h. 17m. 12s.		+ 2	45	42·02	
Rate for interval		+	·03	Rate for interval ...		+		15·50	
Greenwich Mean Time ...	0	28	0·26	Greenwich Mean Time ...		0	28	0·12	
Greenwich Sidereal Time ...	12	34	59·38	Greenwich Sidereal Time		12	34	59·24	
Longitude of Hut	9	30	40·0	Longitude		9	30	40·15	

Taking the mean of these two, the longitude of the Transit Hut at Cape Denison is

9h. 30m. 40.1s. East.

DETAILED MAPPING OF THE VICINITY OF THE MAIN BASE STATION.

The area of King George Land mapped in greatest detail is that of the immediate neighbourhood of the Main Base Station at Cape Denison. During the winter of 1912, Stillwell carefully executed by plane-table and level a detailed contour map of the mainland area in that locality. This map-plate is reproduced in colour as a frontispiece to this volume. Apart from its obvious geographical value, this is an extremely useful record for comparison of the relation of ice and rock existing at some time in the future with that of the year 1912. Thus the rate of advance or recession of the inland ice sheet will be clearly indicated.

Names by which many of the minor features of the Cape Denison rock area were known to us are indicated on this map. So also is recorded the location of the huts and the instrument sites. Most of these named objects do not call for explanatory remarks. Descriptive notes relating to several of these are here tendered.

Memorial Hill is where a large wooden cross with commemorative tablet was erected to the memory of Ninnis and Mertz, who perished on the far-eastern sledge journey. The Azimuth Mark is where a peg was secured in the rock as a sighter in connection with determinations of magnetic declination which were periodically made at the Absolute (magnetic) Hut. The Bench Mark (B.M.) to the east of the Living Hut, where it is engraved on the surface of the gneissic rock, is a base-level established in connection with tidal observations, and represents a height of 29 ft. above mean-tide level. The Boat Harbour is suitable only for the accommodation of small craft, such as launches. It would be a dangerous procedure to attempt to winter any sort of craft in the vicinity of Cape Denison, either in the Boat Harbour or outside it, on account of the extreme hurricanes which periodically sweep the area.

The lakes shown in Stillwell's map are all very shallow, except in the case of Round Lake, which has some depth. A recent rock moraine just above the lake level extends continuously from John O'Groats to Land's End. From it all the finer material has been carried away by thaw waters and by wind. The violence of the hurricane winds removes all gravel, unless it is embedded in ice.

The scattered islets to the east and the Mackellar group to the north were mapped by myself during the year 1913. Most of these appear in the text as Fig. 4, which also includes the area of the anchorage to the west of Cape Denison. The best anchorages are shown on the map. Bearing Bluff is a conspicuous face of the ice-cliff coastline of Commonwealth Bay to which bearings were taken to locate position when steaming

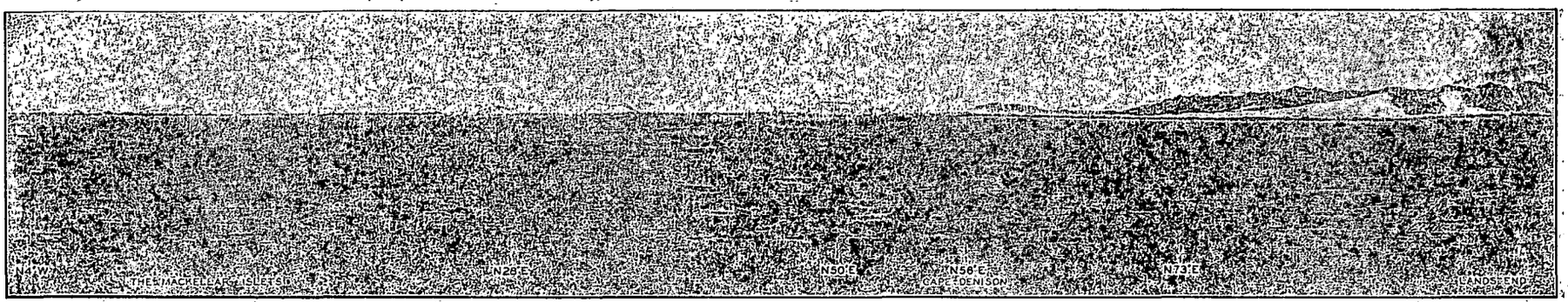


FIG 21. View from the Deck of the *Aurora* when at the anchorage off Cape Denison, January, 1912. The bearings given are to certain of the more prominent points in sight.

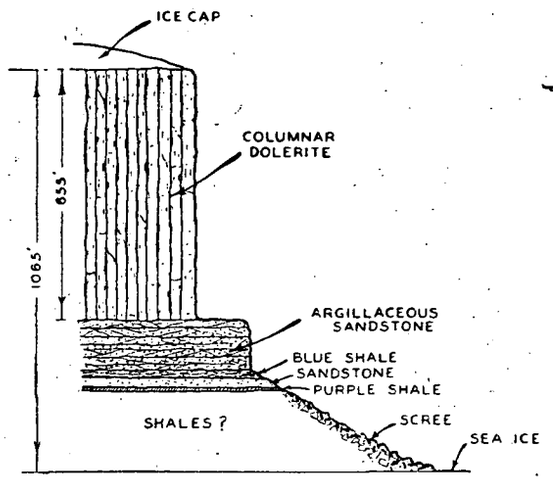


FIG. 22. Section at Horn Bluff.

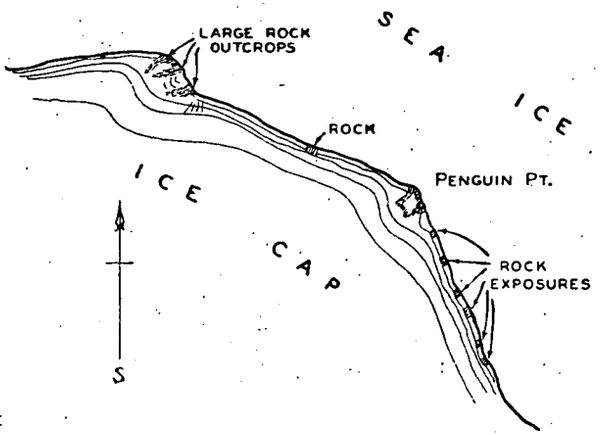


FIG. 23. Coastline near Penguin Pt.

in to drop anchor. A sketch by Harrisson of the view to the east from the anchorage occupied by the *Aurora* in January, 1912, is reproduced in the text as Fig. 21. This shows the Cape Denison rocks and the Mackellar Islets.

No further description concerning the Cape Denison area need be included here, for elsewhere in these Reports (Vol. III of Series A) Stillwell has dealt in considerable detail with the physiography of the neighbourhood of the Main Base Station.

THE ROUTE SURVEYS OF SLEDGE PARTIES.

The sledging parties which radiated out from Winter Quarters at Cape Denison were all equipped with theodolites for determining position and for mapping the topographical features of the country traversed. Having so many sledge parties in the field, we were short of chronometer watches, so that only one such watch was carried by each party. It is strongly recommended that each party should have at least two such watches. This would result in more reliable rating, and would provide an assurance against the unfortunate circumstance which arises when the single chronometer watch carried is found to have stopped from one cause or another.

In these route surveys the work was assisted by the provision of sledge-meters, which recorded the distance travelled between observing stations. These meters which trundle along behind the sledges were invaluable. They operated smoothly and efficiently on firm névé surfaces. Over soft snow in the height of summer they were apt to give trouble owing to the balling of snow on the wheel. Over the broken, hard ice of the coastal slopes and across the more deeply furrowed surfaces of the plateau, the constant jarring caused the steel spokes to snap, necessitating frequent repairs.

Marching directions were kept either by prismatic-compass or sun-compass. Several of the latter were made by Bage during the winter months. Need for these sun compasses was due to the sluggishness of the magnetic needle, owing to proximity to the Magnetic Pole.

All parties were provided with aneroid barometers for recording heights. In addition, a hypsometer was carried on each of the four main undertakings.

As the operations of Madigan's east coast party were conducted mainly over the frozen surface of the sea, their barometric observations were a useful control over those of the Far-East and Southern Parties operating successively further inland on the ice-cap. As a result much useful data has accrued relating to the profile of the inland ice surface. This has been recorded on our map of King George Land in the form of widely-spaced contour lines, which should be sufficiently accurate to give a good general idea of the surface relief.

Stillwell, in his survey of the Charnockite Coast, was able to operate in greater detail than was the case on other sledge journeys, where distance covered was a prime object. The method adopted by Stillwell was to follow around the coast within about a mile of the sea and at several hundred feet above it, occupying observing stations spaced about every five-eighths of a mile apart. Sights were obtained from each station on to the islands of which the position and, to a certain extent, the size were thereby fixed. The line of transverse was carried close to the ice cliffs, so that the number of islands hidden from view were as few as possible. In addition, offsets were paced from the stations to the cliff edge whenever they could be made. The ordinary method of back and fore sights was adopted, and snow or ice mounds were used as station marks. The extremities of the transverse were fixed astronomically.

All sledge parties logged meteorological observations at suitable intervals each day. These data have already been published in Vol. V, Series B of these Reports.

It was also the business of the navigating member of each party to determine magnetic declination when conditions were suitable. In the case of the Southern Party, one of whose main objects was magnetic observations bearing upon the location of the South Magnetic Pole, an excellent series of magnetic data, including declination, dip and force, was obtained along a traverse of 300 miles in length towards the Magnetic Pole. The east coast party also was equipped with a dip-circle and Madigan secured dip readings at a number of stations. All magnetic data from sledge journeys have been published in Vol. I, Series B, of these Reports. As a result of these observations of terrestrial magnetism, the position of the South Magnetic Pole has been established with considerable accuracy.

GAZETTEER OF KING GEORGE LAND.

Maps resulting from field operations in King George Land appear in this volume as Text Figures 4, 13, 14, and 23, and Map Plates I, IV, V, and VI, and a Folding Map. In amplification thereof, a brief reference to each of the named features is herewith provided. Further information is given in the narrative section of this volume. The locations are accurately placed on the maps.

AINSWORTH BAY (G. F. Ainsworth of the A.A.E.) is a sweeping recession of the coast.

AURORA PEAK (*S.Y. Aurora* of the A.A.E.) is a large and high nunatak which overlooks the Mertz Glacier Valley on its western margin. In an ascent of the peak, the East-Coast Sledge Party determined its height as 1,750 feet. The out-cropping rock is a charnockitic pyroxene gneiss.

BAGE, CAPE (R. Bage of the A.A.E.) is a prominent point on the coast. Notable rock outcrops were observed by Madigan's party in that locality.

BLAIR ISLETS (J. H. Blair of the A.A.E.) are a small group to the west of Cape Gray.

BLAKE, CAPE (L. R. Blake of the A.A.E.) is another rocky point on the coast of King George Land.

BUCHANAN BAY (J. Y. Buchanan of the *Challenger* Expedition, patron) is a sheltered bay on the western side of the Mertz Glacier Tongue. It is occupied by open water, free from ice during the summer months. No useful anchorage is offered, for the water is too deep on its sheltered eastern side and on the western side, though some shallow soundings were got, its value is discounted by the proximity of a dangerous lee shore during south-east blizzards.

BUCKLEY BAY (George Buckley of New Zealand, patron) is a wide, sweeping stretch of the coast between the Organ Pipe Cliffs and the Ninnis Glacier Tongue. When observed, it was occupied by a sheet of bay-ice which, it would appear, does not break out until late in the summer.

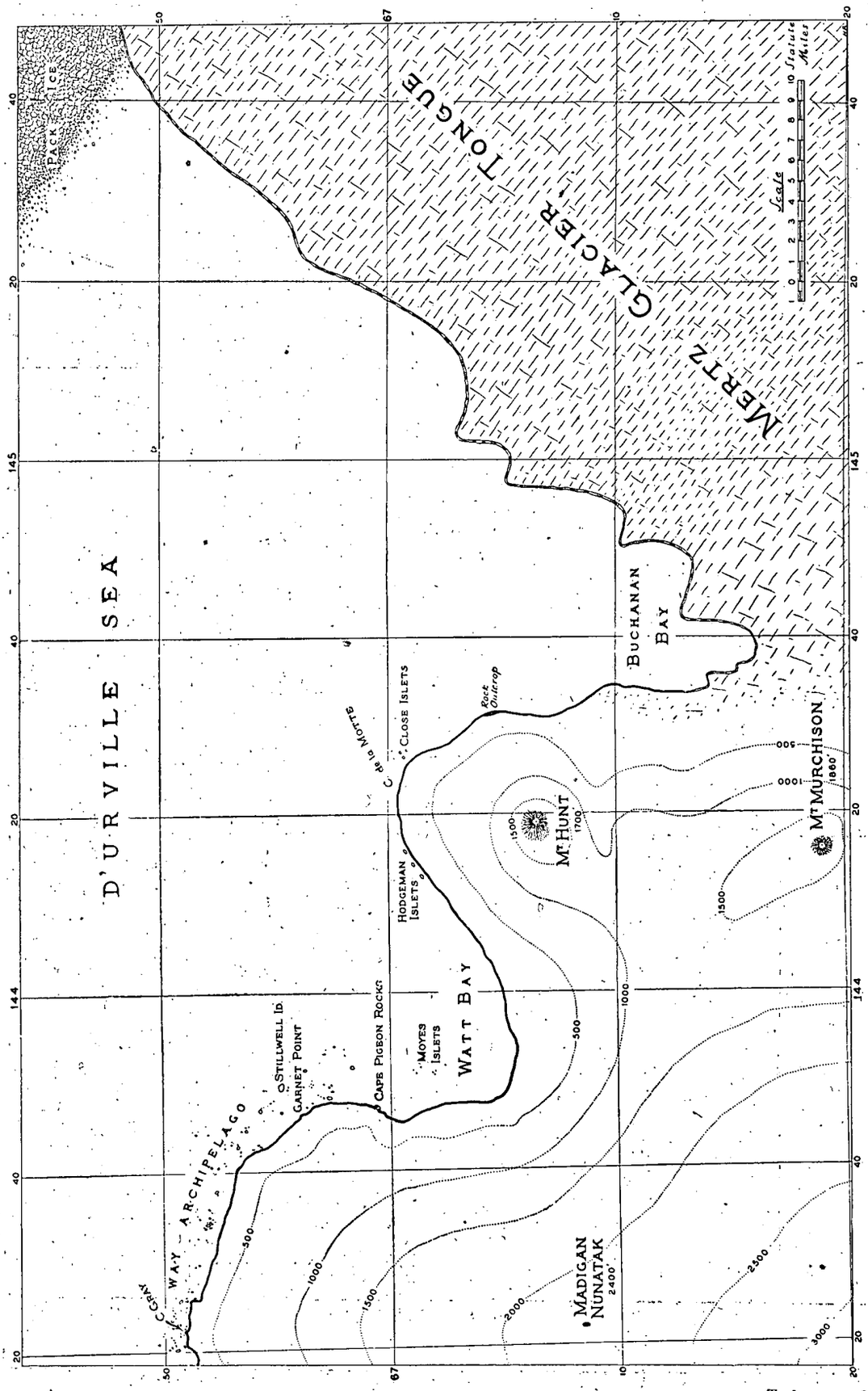
CAPE-PIGEON ROCKS is the name applied to two rugged, rocky peninsulas connected by an ice causeway, the whole extending about half a mile in length. The rock is terminated on the seaward side by a cliff about 100 feet high. Access to the ice-cap from this point is by way of an ice slope easy to negotiate with loaded sledges. The bulk of the rock is a coarse grey felspar-garnet gneiss, which is traversed by basic dykes. Bird life in summer is very abundant, the special feature being a large Cape Pigeon rookery.

CHARNOCKITE COAST.—This name has been given to the interesting island-fringed coast examined by Stillwell's party. The name commemorates the fact that rocks of the charnockite series are of common occurrence in that area. Stillwell's sledge party surveyed this stretch of coast in great detail.

CLOSE ISLETS (J. H. Close of the A.A.E.) are several small off-shore islets, almost entirely ice-capped.

COMMONWEALTH BAY (The Commonwealth of Australia) in its more restricted application denotes the embayment of the coast limited on the east by Cape Denison and the Mackellar Islets, and on the west by the ice cliff coastline as far as Cape Hunter. A useful anchorage is to be found to the west of and within a mile of the actual point of Cape Denison. As the prevailing high winds come off the land from the south to south-east quarter, comparatively calm water is available in that locality. The chain of islets extending north from Cape Denison staves off icebergs and ice pressure coming down with the wind and current from the east. A chart of the anchorage appears as Text Figure 4. The bottom is extremely uneven, and much of that under 20 fathoms appears to be rock. On such a bottom anchoring operations may give trouble.

COOK BAY (Joseph Cook, Prime Minister of the Commonwealth of Australia, 1914) is a wide-open embayment on the King George Land coast. It is bounded on the south by a steep crevassed



Portion of King George Land and the Mertz Glacier Tongue.

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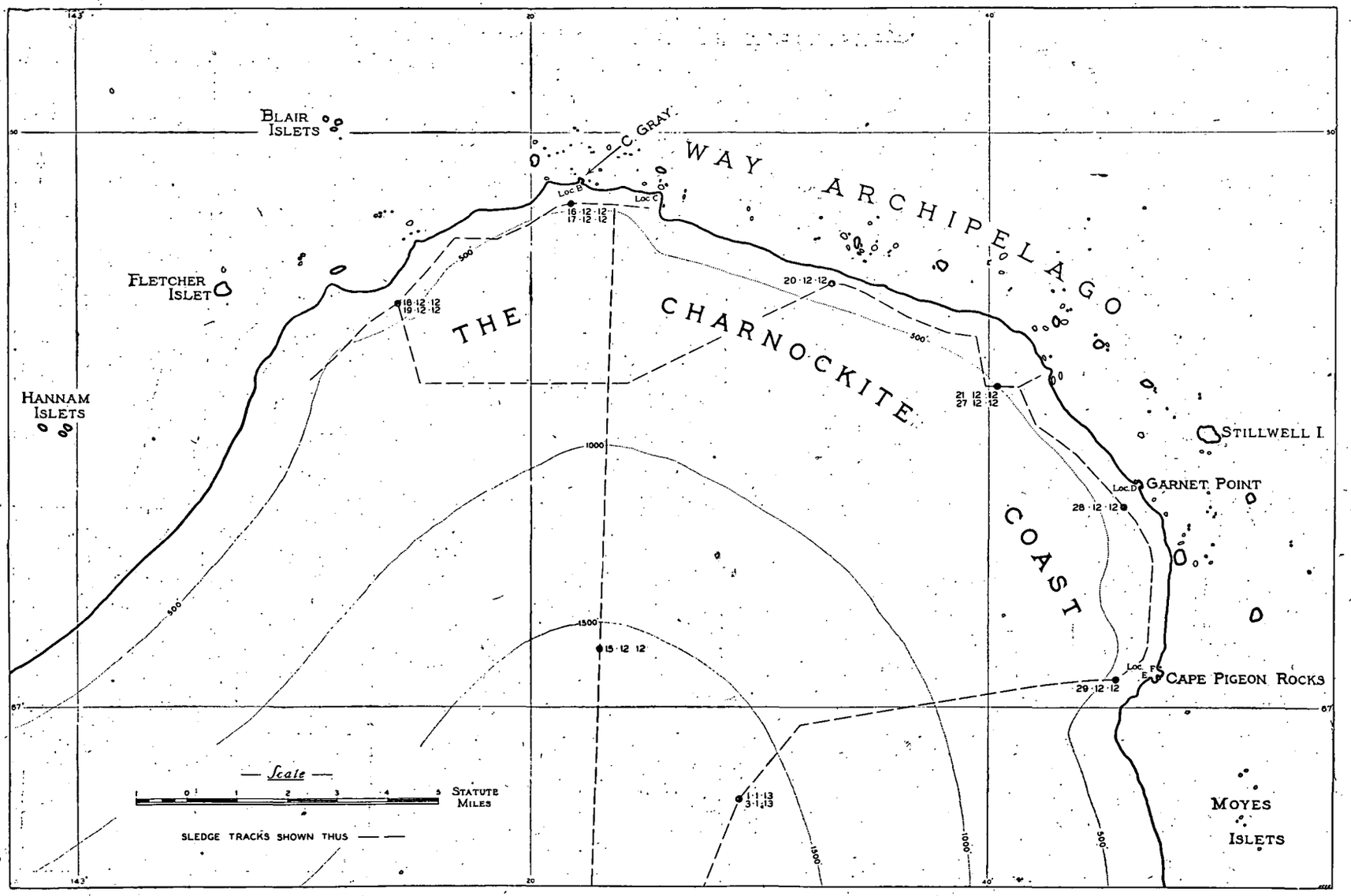
To face page 309.



The Charnockite Coast and Sledge Tracks of the Near-East Party.

ice-cliff coastline, and on the west by the more gently-sloping ice coast of the Cape Freshfield Peninsula. When sighted early in December, the sea surface was covered by consolidated pack-ice of the previous year in which some large icebergs were embedded.

CORRELL NUNATAK (P. E. Correll of the A.A.E.) is a rocky outcrop on the western margin of the Mertz Glacier, located somewhat over 20 miles inland from Buchanan Bay.

DEAKIN BAY (Sir Alfred Deakin, Australian Prime Minister in 1910) is a wide-open bay on the coast of King George Land. It was roughly delineated by the Far-Eastern Sledge Party. Several small islets were observed situated close inshore along its western and central margin. When under observation in early December, it was uniformly covered with smooth bay-ice which extended out to the limit of the horizon.

DE LA MOTTE, CAPE (C. P. de la Motte of the A.A.E.) is the northern point of the ice-cliff coastline of the Mount Hunt promontory. I have not definitely given the name Mount Hunt Promontory to this promontory—it is the promontory on which Mount Hunt stands.

DENISON, CAPE (Sir Hugh Denison of Sydney, patron) is the northern point of a rock outcrop on the coast measuring 1,800 yards in an east-and-west direction, and 1,100 yards from north to south. It was on this rocky area that the Expedition's Main Base Station was established. The actual point lies 130 yards west of the meridian of the site of the Transit House, whose position was established as lat. 67° 0′ S., long. 142° 40′ E. (see Map Plate I).

DIXSON ISLAND (Sir Hugh Dixson of Sydney, patron) is an ice-encased rock mass obstructing the outflow of the Ninnis Glacier. Were the Antarctic Ice-Cap to melt, Dixson Island would be seen to stand in the entrance to the Ninnis Glacier fiord.

DOOLETTE BAY (G. P. Doolette of Perth, patron) is located at the western junction of the Ninnis Glacier Tongue with the land. It is occupied by a sheet of thick bay-ice which doubtless seldom breaks out.

FISHER BAY (Andrew Fisher, Prime Minister of Australia, 1911) is the embayment between the coast and the south side of the Ninnis Glacier Tongue. When observed by our sledge parties in early January, it was still occupied by bay-ice.

FLETCHER ISLET (F. O. Fletcher of the A.A.E.) is a rocky islet lying off the coast west-south-west of Cape Gray.

FRESHFIELD, CAPE (Douglas Freshfield, one-time President of the Royal Geographical Society) is a prominent feature on the coast of King George Land. It is the top of a northward-trending peninsula, approximately located by the far-east sledge party on observations at a distance of about 20 miles. At Cape Freshfield the ice-covered land is hooked to the west, appearing to offer a sheltered cove for vessels, safe from the heavy ice pressure from the east which must operate in that neighbourhood. Southward, a gently-rising ice surface, free from crevasses, leads up on to the high ice plateau of the interior. Cape Freshfield, therefore, appears to offer an ideal location for a coast base for exploratory operations. However, it may not be accessible to ships every summer, owing to prevalence of heavy pack-ice along that coast. Only in February and early March can open water be hoped for in that locality.

GARNET POINT was charted and named by Stillwell's party. The rock outcrop is a coarse garnet gneiss. A very steep ice slope connects it to the land ice-cap.

GRAY, CAPE (Percy Gray of the A.A.E.) is actually a small rocky island 250 yards long and 100 yards in width. It is joined to the ice-cap of the mainland by an ice ramp. The rock is mainly a charnockitic gneiss, but some bands are richly garnetiferous. Adelie Penguins and several kinds of petrels nest there.

HANNAM ISLETS (W. H. Hannam of the A.A.E.) are three islets half-way between Cape Denison and Cape Gray, lying some 4 or 5 miles off the coast.

HODGEMAN ISLETS (A. J. Hodgeman of the A.A.E.) comprise several small ice-capped islets lying close inshore.

HORN BLUFF (W. A. Horn of Adelaide, patron) is a striking rock bastion projecting from beneath the ice-cap as a coastal cliff face 1,065 feet in height. It was discovered by the east-coast party. A sedimentary formation occupies the first 410 feet above the sea-ice. Above that to the top there is a vertical face of dolerite 653 feet in height, which is arranged in great organ pipe columns. The appearance of the rock outcrop in cross section is illustrated in the sketch (Fig. 22) supplied by Madigan. An account of this notable feature is also given by him in his report on the operations of the east-coast sledge party. Madigan further remarked: "The organ pipes reached their greatest height at the south end and became gradually lower towards the north, coming down to about 700 feet at 3 miles along from its highest exposure, where there was a break in the continuity of the rock wall, and a small glacier 300 yards wide was encountered. Beyond the region of this glacier the face curved round to the west-north-west for another 3 miles at least. Many outcrops of rock were seen at intervals along the coast on the west side of the Bluff, many quite of the magnitude of the Horn Bluff itself, but there was no rock showing in the bay to the east."

Bird life is extremely abundant in this locality in summer, the rocky ledges of the high cliffs presenting an exceptionally favourable terrain for nesting operations.

HUNT, MOUNT (H. A. Hunt, Commonwealth Meteorologist), 1,700 feet above sea-level, is the summit of the ice-dome covering the Cape de la Motte promontory.

HUNTER, CAPE (J. G. Hunter of the A.A.E.), lies 8 miles west-north-west of Cape Denison. It is a rocky promontory in an otherwise unbroken stretch of ice cliff coastline between the Cape Denison exposure and the vicinity of Cape Discovery. The rock formation at Cape Hunter is about a quarter of a mile long, and rises to a height of 90 feet. It is composed of ancient sedimentary rocks, steeply dipping and trending in the direction of its length. These rocks have been altered to the state of phyllites and sericite schist. On its west side the land-ice has receded sufficiently to provide a small sheltered bay, and so a comfortable landing-place for small craft is to be found on the north-west side of the rock area. In summer the steep rocky ledges are everywhere occupied by birds, for at that time of the year portion of it is an immense rookery of Antarctic Petrels. There is also a small rookery of Adelie Penguins. Snow Petrels, Skua Gulls and Wilson Petrels are to be found nesting in fewer numbers.

HURLEY, CAPE (J. F. Hurley of the A.A.E.), is the corner of the coast where it turns in from the fiord occupied by the Mertz Glacier.

LASERON ISLETS (C. F. Laseron of the A.A.E.).—A chain of small ice-capped and rocky islets lying a few miles east of Cape Denison.

MACKELLAR ISLETS (C. D. Mackellar of London, patron).—The group extends for several miles north from the rock exposure on the mainland in the vicinity of Cape Denison (see Text Fig. 4). Most of the islets are ice-capped, but others are bare rock. None reach more than 40 feet above sea-level, and most of the rock surface is flat. The size and distribution of the various islands are shown on the map, page . It will be seen that only two are of any size. These are designated respectively the Greater and the Lesser Mackellar Islet. The former is about 1,000 yards in length, and is separated from the other by only a narrow channel, which is frozen over in winter.

Between the main group of islets and the mainland there are many reefs, some breaking the surface of the sea, others below the surface. The bottom in this area is uneven, but always shallow, and where more than 4 fathoms deep is usually densely covered with a thick growth of giant sea-weed.

The reefs and islets on the south side of the group are all heavily capped with ice which has accumulated thereon from the freezing of waves and spray breaking over them during the southerly hurricanes. The islets of the north-central area are so well sheltered that they remain throughout the year with little or no covering of snow or ice. It is on these islands, particularly the Greater and Lesser Mackellar Islets, that bird and seal life are to be found in abundance during summer time. There Adelie Penguin rookeries are scattered irregularly

over the whole surface, the total number of birds being of the order of 200,000, at least. As many as twenty pairs of Skua Gulls were observed nesting in the vicinity of the penguin rookeries, and there were probably not less than fifty nests of Snow Petrels and a hundred nests of Wilson Petrels in the crevices among the rocks. Also there were observed several Giant Petrels, but no evidence that they nest anywhere in the vicinity. Sleeping on the ice-foot more than 500 Weddell Seals were counted.

The dominant rock of these islands is a grey granitic gneiss, very similar to that on the adjacent mainland, but of a more uniform character. In the more northern areas, the rock is less foliated, and in its massive form grades into a granite showing only little evidence of stress.

One notable feature is that all the rock exposures are encrusted with saline matter, which, on the flat areas, accumulates as saline slush. This is derived from the salt spray blown over the islets by the hurricanes which descend from the adjacent ice plateau. Patches of penguin guano are scattered over the surface, in all amounting to about 500 tons.

MADIGAN NUNATAK (C. T. Madigan of the A.A.E.) is a rocky exposure reaching 2,400 feet above sea-level. It was first visited and examined by Stillwell's party. They found it to be a small jagged ridge trending north and south, with a length of 160 yards and a breadth of 50 yards. It rises from the level of the ice surface at the south end to 60 feet above it at the north end. It is located almost due south of Cape Gray and distant therefrom 18½ miles. The rock is, in the main, a pyroxene gneiss of the charnockite group. Stillwell determined its position as lat. 67° 8½′ S., longt. 143° 20′ E., but in the replotting of our charts for this volume we have adjusted the original longitude observations in accordance with that finally accepted for the Base Station at Cape Denison. This adjustment and later check determinations make the longitude of Madigan Nunatak to be 123° 22¼′ E.

MCLEAN NUNATAKS (A.L. McLean of the A.A.E.) are three rocky outcrops at the head of the valley of the Mertz Glacier, located where great icefalls descend from the plateau.

MERTZ GLACIER (Xavier Mertz, who perished on the far-east sledge journey) is a major effluent of ice from the Plateau. It occupies a deep fiord, extending for 45 miles inland from Buchanan Bay. In width it averages over 20 miles, and its floor is far below sea-level. The descent from the ice-cap is steepest on the western side, along which margin nunataks outcrop as shown in the map.

MERTZ GLACIER TONGUE, in the year 1914, had a length of over 45 miles, and a width of over 20 miles. In its central portion the elevation of the surface above sea-level is apparently of the order of 200 feet.

MOYES ISLETS (M. H. Moyes of the A.A.E.) are a group of small islets standing off the coast on the west side of Watt Bay.

MURCHISON, MOUNT (Roderick Murchison of Melbourne, patron), is an ice-dome rising to 1,860 feet above sea-level, immediately overlooking the valley of the Mertz Glacier on its western margin.

MURPHY BAY (H. D. Murphy of the A.A.E.) is the recession in the coast to the west of Cape Bage. A number of rocky outcrops were observed along its shores.

NINNIS GLACIER (B. E. S. Ninnis, who lost his life on the far-east sledge journey) is a major feature of the coast. An immense volume of ice descends from the Plateau to the sea by this route.

NINNIS GLACIER TONGUE, a very notable shelf-ice formation, is the seaward extension of the Ninnis Glacier. The length when examined by the east-coast party was found to be at least 75 miles. The breadth averages more than 20 miles, and the height of its surface above sea-level is about 175 feet.

THE NODULES, discovered and named by the southern sledge party, are disturbances in the surface of the ice-cap, apparently due to the presence of a submerged rock peak.

ORGAN PIPE CLIFFS are in the nature of high rocky palisades of columnar dolerite overlooking the sea to the west of Cape Blake. Sighted by the far-east sledge party

PENGUIN POINT was discovered, named and mapped by Madigan's east-coast party. For some miles along the coast in its vicinity there are a number of rock exposures. These are shown in Madigan's plan, Text Figure 23. Madigan's report states: "At Penguin Point itself the ridge of rock is 318 feet high, running back into the ice-cap for about a quarter of a mile. The ice has retreated from the top of the rock, exposing an area which is much weathered. Gravel and small stones are distributed on the summit. The sides are vertical faces. The rock is a coarse-grained granite (granodiorite), with large porphyritic felspars. The latter stand out on all the weathered faces. The granite is very homogeneous in character over all the exposure, but occasional dark included patches were observed.

"To the south-east of Penguin Point rock outcrops occur at intervals as indicated on the plan. These exposures were mainly vertical faces of rock about 150 feet in height, framed in ice.

"The largest rock exposure of the area is situated on the west side of Penguin Point, distant 4 miles (see Fig. 23). There two ridges rise from the sea-ice to a height of 255 feet and extend west more than half a mile before passing under the Ice-Cap. They are separated by a small glacier 150 yards wide. Here, also, the rock is granite, but more weathered than at Penguin Point. Also a greater accumulation of gravel littered the flat top of the ridges. Some small garnets were met with, and several quartz veins intersected the granite. The dark patches included in the granite were both larger and more frequent than at Penguin Point. Here there were no precipitous faces, the rock being scaleable at all points."

Moss, lichen, and much bird life are features of these rocky areas, particularly that to the west of Penguin Point.

POLLOCK, CAPE (Professor J. A. Pollock, of the Expedition Advisory Committee), is the northern extremity of Dixson Island.

SPENCER, CAPE (Sir Baldwin Spencer, Director in 1911 of the National Museum, Melbourne), is the eastern corner of the great gulf occupied by the Ninnis Glacier. There is at present no rock outcropping in the neighbourhood.

STILLWELL ISLAND (F. L. Stillwell of the A.A.E.), the largest member of the Way Archipelago, is a small, steep, rocky island rising to a height of 120 feet. It is stocky in shape, and about a quarter of a mile in diameter. The highest point is near the north-west corner. A landing was made in a tiny rocky cove on the south-west side. The more obvious rock formation is a coarse garnet-felspar gneiss. Another feature of special interest is the occurrence in the light-coloured gneisses of dark-coloured bands, apparently originally intrusive basic dykes, but later converted to amphibolites, some of which are garnetiferous. The rocky slopes are occupied by plentiful bird life in the summer months. There is an Adelie Penguin rookery and a large rookery of Silver-grey Petrels. Snow Petrels, Wilson Petrels and Skuas also nest there. Several Weddell Seals were met with basking in sheltered coves.

WATT BAY (W. A. Watt, Premier of Victoria in 1911) is a recession in the coast bounded by ice cliffs resting on rock below sea-level.

WAY ARCHIPELAGO (Sir Samuel Way, chancellor of Adelaide University in 1911) comprises more than 120 islets, of which the largest is Stillwell Island. They are distributed close offshore, none exceeding 4 miles from the mainland, in the form of an arc, around the Charnockite Coast. Their distribution and a good idea of their individual size is illustrated in Map Plate V., which has been plotted from Stillwell's detailed survey.

WEBB, CAPE (E. N. Webb of the A.A.E.) is the western entrance to the fiord of the Ninnis Glacier. It was sighted by the east-coast sledge party, but at too great a distance to determine the presence or absence of rock exposures.

WHETTER NUNATAK (L. H. Whetter of the A.A.E.) is a small rock outcrop on the coastal ice slopes near the sea, situated about 8 miles east of Cape Denison. It is known only by distant telescopic observations.

WILD, CAPE (Frank Wild of the A.A.E.), is a rocky point observed by the east-coast party.

ADELIE LAND

Adélie Land was discovered and so named (after his wife) by Admiral Jules Sebastien César Dumont-D'Urville, of the French Exploring Expedition* of 1837–40. They came in sight of this high ice-capped land on 20th January, 1840. The point on the coast which came first under notice was named Cap de la Découverte (see Map Plate VII). Five days were spent off the shores of this new land before they were driven north out of touch with it. The reports of the expedition include a good account of the character and appearence of the land as viewed from ship's deck, and this is illustrated by a beautifully reproduced map of the coast. However, the inaccessibility of the precipitous ice-cliff coastline prohibited members of the expedition effecting a landing on the mainland. They were able to land on a small rocky islet situated adjacent to the coast at a locality named by them Pointe Géologie. There a set of magnetic observations and observations for position were made and rock specimens collected.

A gale followed, and, after it had subsided, the French ships attempting to follow the coast further to the west were driven to the north. They followed around the margin of what their description indicates was a region of consolidated pack-ice and shelf-ice. No land was then in sight, but a massive and novel shelf-ice formation (possibly no more than a gigantic shelf-ice berg) caused them to speculate upon its real nature. To appreciate their uncertainty, it should be borne in mind that shelf-ice formations were unknown up to that time. To the precipitous ice walls of a shelf-ice formation at the northern extremity of the ice jam the name Côte Clarie was given.

It is interesting to note that the sea to the west of Cape Pepin for a width of about 4 degrees of longitude is to-day occupied by an impenetrable ice jam.

Late in February the French Expedition arrived back again in Hobart, and D'Urville immediately caused to be inserted in the *Hobart Town Courier and Van Dieman's Land Gazette* of 28th February, 1840, an official account of their discovery as an advertisement publishing their territorial claims. The new territory is there described as follows: "La partie reconnue, d'environ 150 milles d'étendu est comprise entre le 66° et 67° degré de latitude Sud d'une part; entre 136° au 142° degré longitude E. de l'autre." Thus the limits of his land discovery were fixed, and the east and west boundaries of Adelie Land remain respectively the 136th and 142nd degree of east longitude.

The United States Exploring Expedition,† under the command of Lieutenant Charles Wilkes, was in the vicinity of Adélie Land almost at the same time as the French Expedition, but did not sight Adélie Land until 28th January, 1840‡. It is notable that Wilkes took his ship into shallow water in an embayment in the coast, Piner Bay, where a sounding proved the depth to be only 30 fathoms. Rocks were observed on the nearby shore. A gale of wind coming off the land then blew the *Vincennes* far away. After the storm Wilkes did not return to investigate further the locality of Piner Bay.

On the first Antarctic voyage of the *Aurora*, Captain Davis followed around the coast at a distance from the shore. He roughly noted its outline, but did not delay to chart it accurately, for the prime object was to land a western-base party on Antarctic shores further to the west than the limits of Adélie Land. Additional observations concerning this coast were made during the third Antarctic voyage of the *Aurora*. Still later, during the 1931 voyage of the *Discovery* (B.A.N.Z.A.R. Expedition), we further improved the chart. On the latter occasion the detailed examination of the coast of Adélie Land, including landings upon some of the rocky exposures, could have been effected but for the fact that we had been requested not to set foot upon French territory, in case such action should meet with disapproval in France.

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* "Voyage au Pole Sud et dans L'Océanie." The scientific reports were published in Paris in 1847.

† "Narrative of the United States Exploring Expedition," Vols. 1 to 5; printed in Philadelphia, 1845.

‡ We are informed that this should read January 27th, for their calendar was one day out, allowance not having been made for the day gained when they passed westward of the 180th meridian.

The map (Plate VII) accompanying this report is in agreement with that of D'Urville so far as concerns the neighbourhood of Point Geology, but differs elsewhere, more particularly in the eastern section. Inaccuracies are to be expected in D'Urville's map, since so much of it was plotted from observations far from the shore.

Our map should, in the main, be more accurate, for we have the benefit of several visits to the area. However, on none of those cruises did we linger on the coast of the French territory, and, indeed, when passing by, were seldom near enough to the land to effect really accurate delineation of the coastline. Nevertheless, our chart should be reasonably accurate east of Cape Discovery and from Point Geology to the west as far as Cape Bickerton. The accurate mapping of the coast between Cape Discovery and Point Geology yet remains to be done. We do not agree with the French chart in this latter section.

So far as concerns the coastline beyond Cape Bickerton and as far as the 136th meridian, all we can say with certainty is that high land does continue so far to the west. From the deck of the *Aurora* at noon on January 2nd, 1914, we had a good view of the ice-cap of the high land at the western extremity of Adélie Land. It was very clear weather on that day, and a long, unbroken stretch of the coast as far as the 136th meridian was then in view. Nevertheless, we were unable to accurately fix the coastline at the extreme western end on account of its remoteness from the ship. It may well be that the section indicated in broken line in Map Plate VII is located a few miles further to the south than is there shown.

Except in the case of Point Geology and Cape Robert, we have had difficulty in determining just what features on our map correspond to those named by D'Urville. All that can be said of these as shown on our map is that they have been appended to what appear to be the corresponding objects on the French chart. For instance, the coast in the vicinity of Cape Discovery is certainly further south than indicated by D'Urville, and this, on account of the angle from which it was observed by him, would place it further east as well as south of the French position.

Wilkes's map is evidently intended to indicate only the general trend of the coast and to give a rough approximation of its position. Consequently, the identification of his Piner Bay has been a matter for decision. The longitude given by Wilkes for this feature would place it just to the west of Point Geology, but nothing at that spot answers to his description. Consequently, we must conclude that his longitude is at fault, and that Piner Bay is a few miles further to the east as shown on our map, where agreement with Wilkes's description of the bay is satisfactorily met.

The coast between the Dumoulin Islets and Cape Discovery appears to offer good opportunities for geological and biological observations, and calls for further investigation.

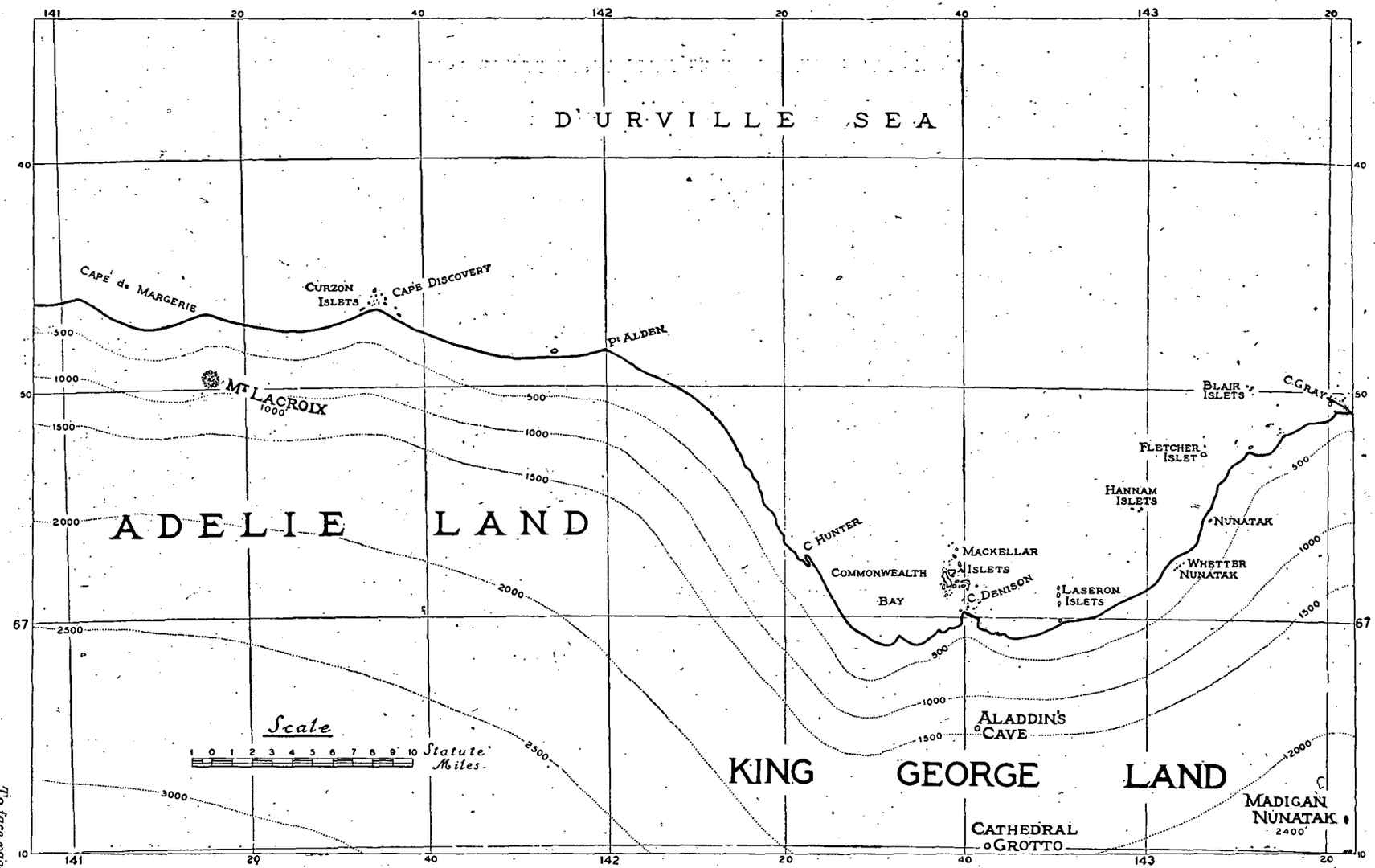
Everywhere along this coast steep ice slopes lead inland to the high plateau, the general character of which was ascertained by Madigan's spring reconnaissance party and Bickerton's western sledge party. Except on the coast itself, no rock exposures were observed rising above the ice-cap.

GAZETTEER OF ADELIE LAND.

The following named features appear on our map (Plate VII) :—

ALDEN, POINT is merely a corner on the ice cliff coastline, where it turns south towards Commonwealth Bay. It was named by Wilkes as the easternmost point of land visible as he approached the Adélie Land coast on January 30th, 1840.

BICKERTON, CAPE (F. H. Bickerton of the A.A.E.) was located on the map from the *Aurora* in January, 1912, and from the *Discovery* in January, 1930. Bickerton's western sledge party which crossed the plateau of Adélie Land also came in sight of this feature.



Adelie Land and King George Land adjacent to the Cape Denison station.

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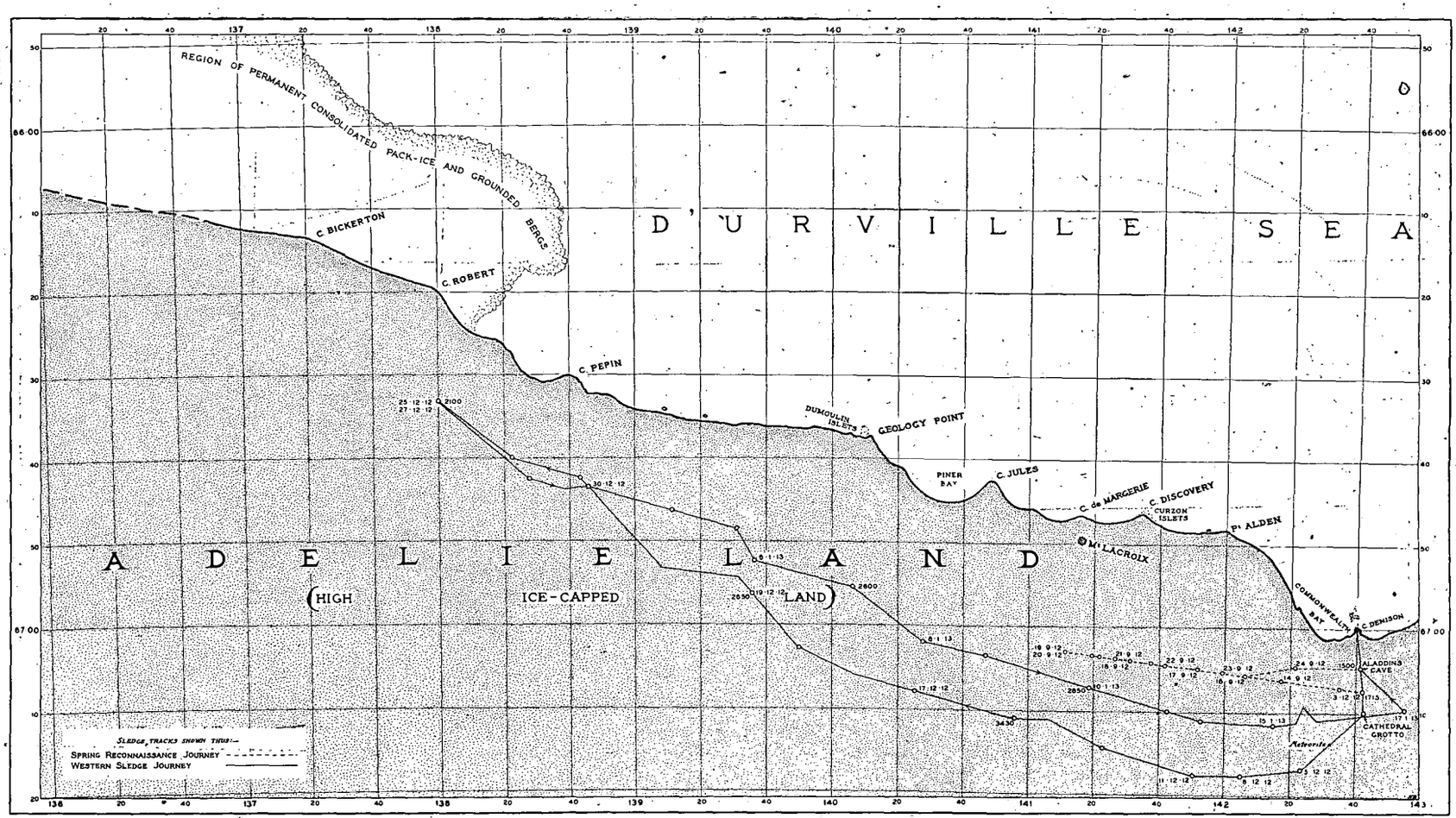
To face page 315.



The coast of Adelie Land and sledge tracks of the Western Sledge Party.

CURZON ISLETS (Lord Curzon, President of the Royal Geographical Society, 1914) are grouped along the coast in the neighbourhood of Cape Discovery. These rocky islets trend towards the north, and are continued for some distance further as a submerged reef. In January, 1912, Captain Davis observed the sea breaking over this reef.

DE MARGERIE, CAPE (E. de Margerie, French geologist), is another rocky point on the coast which we have named. All our observations were made too far away from this location to be able to fix its position with any accuracy.

DISCOVERY, CAPE (Cap de la Découverte), is a rocky feature of the coast charted by the French Expedition of 1840. It is a region of large and important rock exposures. In that vicinity much bird life was in evidence, indicating it to be an area of penguin and petrel rookeries. The position assigned on our map is that determined by Captain Davis on board the *Aurora* in 1914, with some modification as a result of a check on board the *Discovery* during my cruise of 1931. Our position is considerably south and east of that assigned to it by D'Urville. Though not according with D'Urville's charted position, we felt confident at the time that we were dealing with the feature which the French had thus named.

However, when now comparing our observations with D'Urville's chart, it appears quite possible that the feature which we have regarded as Cape Discovery may not appear on the French chart, and that which we have named Cape de Margerie may be D'Urville's Cape Discovery. To satisfactorily clear up these uncertainties, and to accurately map the coast between our Cape Discovery and Point Geology, a more detailed survey of the area is called for.

DUMOULIN ISLETS lie close to the mainland in the neighbourhood of Point Geology. It was upon one of these that the French Expedition landed. These islets are figured as an inset in the smaller scale map of Adélie Land accompanying the Reports of the French Expedition. They are entered upon our chart as the Dumoulin Islets to commemorate C. A. Vincendon-Dumoulin of the French expedition who conducted observations of terrestrial magnetism in that locality.

GEOLOGY, POINT (Pointe Géologie), is the name which the French Expedition applied to a point on the coast where they attempted a landing. On floating ice or upon a small islet adjacent to Point Geology, members of the scientific staff set up their instruments and determined the local value of the elements of terrestrial magnetism. The establishment of such a magnetic station required the determination of its geographic position made with all the accuracy their instruments would allow. We are in agreement with the position assigned on the French chart.

JULES, CAPE.—We have re-located what appears to be D'Urville's feature, Cape Jules. Our position, though not claimed to be accurate, on account of its distance when sighted, is plotted to the south of the position shown on the French chart.

LACROIX, MOUNT (named by us after Professor A. Lacroix, Muséum National D'Histoire Naturelle, Paris), is a conspicuous rock peak estimated (by Lieut. Oom) to be about 1,000 feet in height, standing back, but not far distant from the shore. It was sighted from the *S.Y. Discovery* in 1931, and located on the chart by Lieut. Oom. However, the ship's position on that occasion did not offer opportunity for a really accurate fix for this feature.

PEPIN, CAPE.—What we have entered as Cape Pepin appears to correspond with the feature so named by D'Urville.

PINER BAY was named by Wilkes after the Signal-Quartermaster of the *Vincennes*.

ROBERT, CAPE, is the furthest west-named feature of the coast appearing in D'Urville's chart. Our position closely accords with that on the French chart.

QUEEN MARY LAND

The first sighting of this new land was from the deck of the *Aurora* on February 13th, 1912. Royal sanction for thus naming this discovery was received by us in Antarctica through our wireless telegraphic connection in June, 1913.

Our western-base party, under the leadership of Frank Wild, spent a year in occupation of the territory, and during that time, by sledge journeys, succeeded in carrying the outline of the coast to the east and to the west. In the latter direction they joined up with Drygalski's Kaiser Wilhelm II Land. To the east they extended the known coastline a long way towards Wilkes's Knox Land. The resulting chart incorporating their survey work is submitted as a folding map in this volume. The geographical work achieved was the result of five sledge journeys.

The first of these was an autumn journey southward from the Hut (The Grottoes), established on floating shelf-ice (Shackleton Ice-Shelf) 17 miles north of the Queen Mary Land coast. On reaching the coast, they ascended on to the Ice-Cap, defining its nature and the gradient from sea-level inland.

The second was a spring reconnaissance to the eastward over the Ice-Shelf as far as the Hippo. The third was another spring reconnaissance to the west beyond the Helen Glacier.

The other two were the main efforts—one to the east led by Frank Wild, and one to the west with Jones as leader.

The mapping methods adopted on these journeys were identical with those employed by sledge parties from the Main Base in King George Land, and need not be repeated here.

Kennedy was the cartographer to the eastern party, and Dovers to the western party. The Denman Glacier, with its intensely broken ice, proved an obstacle to further advance to the east, but Kennedy returned with an excellent map of the area traversed. Their observations go far towards an explanation of the structure and stability of the Shackleton Ice-Shelf. Also a broad and general knowledge of the nature of the coastal region of the mainland Ice-Cap is provided. A large scale reproduction of portion of Kennedy's map appears in the text as Figure 24. The frequency of rock outcrops in this region is there illustrated. Figure 25 illustrates the appearance of David Island as observed from different points of view. It will be noted that it is more irregular in outline than is usual with ice-capped islands marginal to the Antarctic mainland.

Kennedy took with him on this sledge journey a dip-circle, and obtained much useful data relating to terrestrial magnetism. Watson's photographic records are a valuable series, especially in relation to glaciology. The rock collections made by Watson and Hoadley from this and other sledge journeys which have been discussed elsewhere in these volumes (Series A, Vol. IV) supplied for the first time knowledge of rocks occurring *in situ* in this region of Antarctica, other than the leucite basalt of the recently extinct volcano of Gaussberg discovered by the German Expedition.

As regards the main western sledge journey, which went as far as Gaussberg, this party also returned with a good record of the coastline and glacial features of western Queen Mary Land. The map compiled by Dovers is incorporated with Kennedy's in the folding map included in this volume.

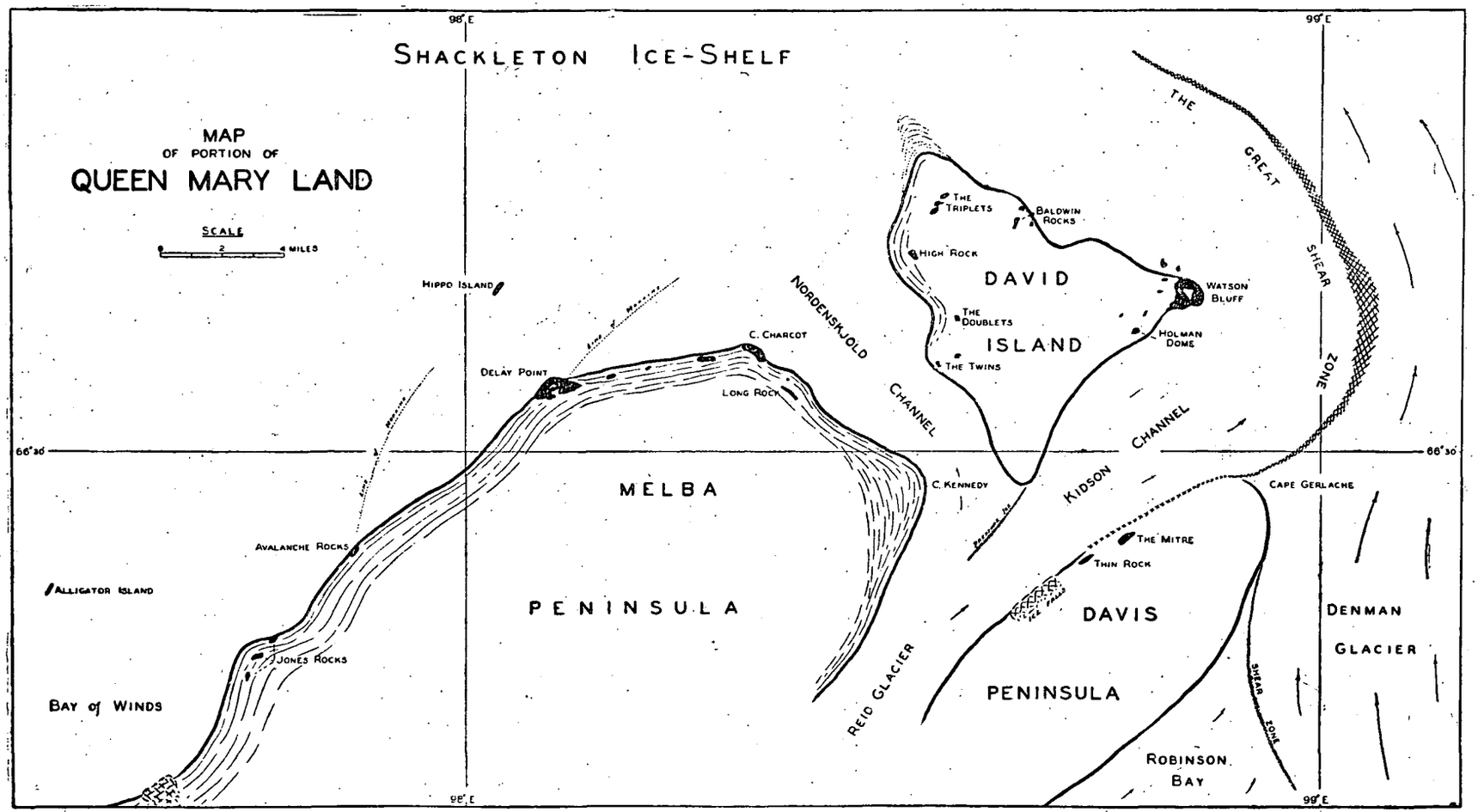


FIG 24. David Island and portion of Queen Mary Land.

One of the most interesting discoveries of this western party was the finding of a group of small islands (Rookery Islands) embedded in bay-ice and accessible from the shore. These are illustrated in the text by Figures 26 and 27. The rocks collected, and the extremely interesting observations relating to the varied and abundant bird life of those islands, were excellent reward for their efforts.

GAZETTEER OF QUEEN MARY LAND.

ADAMS ISLAND (Adams, boatswain on the *Aurora*) is a small rock peak about 9 miles distant from Haswell Island. It is embedded in thick bay-ice most of the year, but free late in summer (see Text Figure 29). Its position on our chart is that fixed from the *Aurora*.

ALLIGATOR ISLAND is the summit of a steep, rocky, peaked island, rising on its west side about 500 feet above the Shackleton Ice-Shelf. It is half a mile long by 150 to 200 yards wide at the level of the shelf-ice surface. The rock is a contorted gneiss. In their reports members of the western-base party usually referred to this as the Alligator Nunatak.

AMUNDSEN, MOUNT (Roald Amundsen, Norwegian Polar explorer), is a notable nunatak rising through the ice-cap to a height of about 4,000 feet.

AVALANCHE ROCKS form a vertical face, 400 yards long and 600 feet high, on the coast overlooking the Shackleton Ice-Shelf.

BALDWIN ROCKS (Dr. J. M. Baldwin of Melbourne Observatory, who co-operated in the transmission of wireless time signals) are several outcrops on the east side of David Island.

BARR SMITH, MOUNT (Robert Barr Smith of Adelaide, patron), is a striking rock peak 4,030 feet in height, rising several hundred feet above the surrounding surface of the ice-cap. It was visited by Wild's eastern party from the Grottoes. The latitude, carefully determined by Kennedy from a station on the summit, is 67° 10·4′.

CHARCOT, CAPE (Dr. Jean Charcot, French Antarctic explorer) is a notable rocky point at the western entrance to the Nordenskjöld Channel. Charnockite is the prevailing rock.

DAVID ISLAND (Professor Sir Tannatt Edgeworth David of Sydney, member of the Expedition Advisory Committee) rises out of the Shackleton Ice-Shelf to a maximum height of 1,000 feet. The mean diameter is about 9 miles and greatest length 12 miles. For the most part it is encased in ice, but there are many rock exposures, as indicated in the chart (Fig. 24) mapped by Kennedy. The appearance of several different aspects of the island are illustrated in the text (Fig. 25).

DAVIS PENINSULA (Captain J. K. Davis of the A.A.E.) is the long strip of ice-capped land between the Northcliffe and Reid Glaciers.

DELAY POINT is a brown rock bluff rising about 600 feet above the surface of the Shackleton Ice-Shelf. The rock area amounts to about 80 acres. Granite and biotite schist are the prevailing rocks of the locality.

DENMAN GLACIER (Lord Denman, Governor-General of the Commonwealth in 1911, patron) is a major Antarctic glacier. Its main channel is over 9 miles in breadth. The course of this ice flow has been mapped for a distance of 50 miles inland from the coast. Its last descent to sea-level is by way of a gigantic ice cascade at the base of which it reforms and presses north through the Shackleton Ice-Shelf.

THE DOUBLETS was the name given to a nunatak on the west coast of David Island.

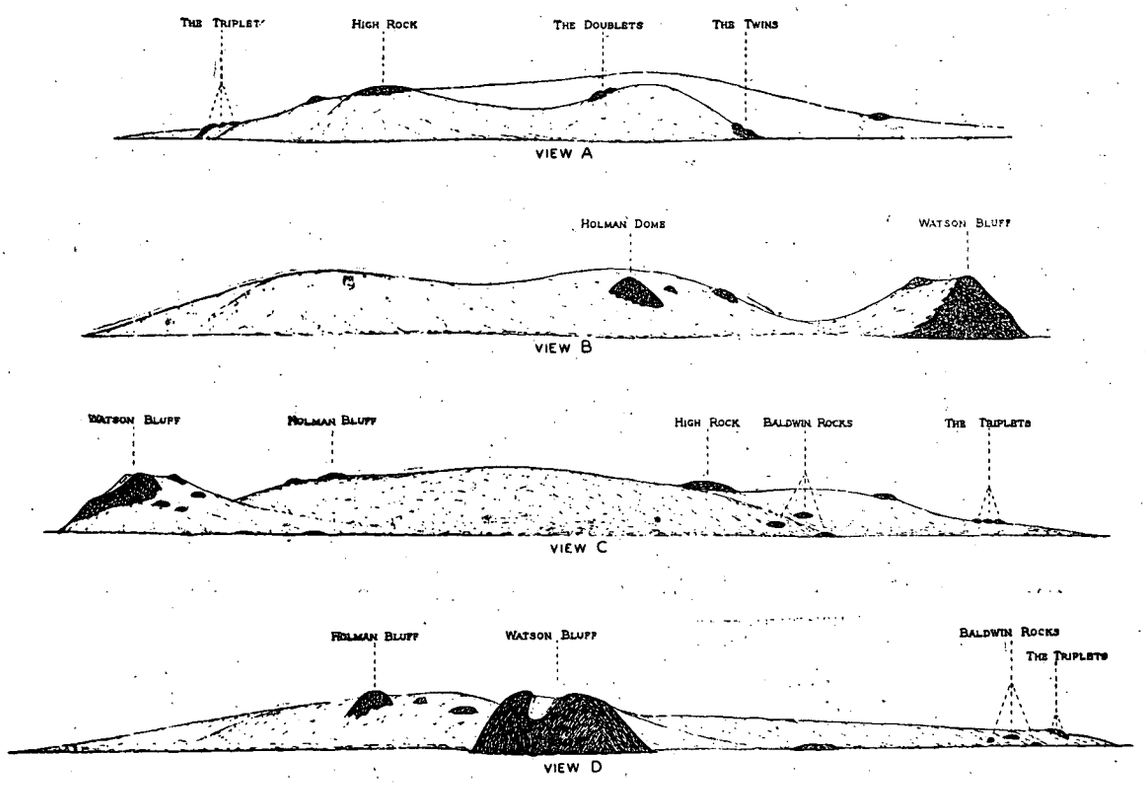


FIG. 25. David Island as viewed from various quarters.
A. Aspect from position near Hippo Island.
B. As seen from the south-east on Nov. 17th
C. View from the north-east on December 8th.
D. Outline seen from the east on Nov. 18th.

DOVERS, CAPE (G. Dovers of the A.A.E.) is a prominent point on the ice coast of the mainland due south of Henderson Island.

DRYGALSKI ISLAND (Professor Erich von Drygalski) discovered and named by the A.A.E. Observations made from the *Aurora* in January, 1914, determined its height to be 1,200 feet and diameter about 9 miles. No rock is visible. The ice-cap forms a perfect dome. Text Figure 28 illustrates its appearance as seen from the mainland.

FARR BAY (Dr. C. C. Farr of New Zealand, Expedition Advisory Committee) is an embayment on the east side of the Helen Glacier. When visited it was occupied by thick, old bay-ice in which derelict icebergs were embedded. The ice evidently breaks out only in exceptional seasons. This feature was referred to as Depot Bay in some early reports.

FULMAR ISLET is an elongated islet of the Haswell Group (Fig. 26), notable for its rookery of Southern Fulmars.

GERLACHE, CAPE (Lieut. Adrien de Gerlache, Belgian Antarctic explorer) is the ice-clad nose of the Davis Peninsula where the Denman Glacier sweeps past it.

GILLIES ISLANDS (F. Gillies of the A.A.E.) are two small rocky islets projecting through the Shackleton Ice-Shelf. The southern one rises 60 feet above the surface of the shelf-ice, and measures 300 yards long in a north-and-south direction by 80 yards. The northern one is

located 500 yards from the other, and measures about 400 yards in circumference, and rises to nearly 200 feet in height. Usually referred to by the western-base party as Gillies Nunataks.

HARRISSON ICE-RISES (C. T. Harrisson of the A.A.E.) are two swellings of the shelf-ice where the Shackleton Ice-Shelf rides over the underlying rocky ridge leading north from Cape Moyes.

HARRISSON, CAPE (C. T. Harrisson of the A.A.E.) is the point of ice-covered land at the junction of the channel of the Denman Glacier and Robinson Bay.

HASWELL ISLAND (Professor W. A. Haswell of Sydney, Expedition Advisory Committee) is the largest of the Rookery Islands. Its rock expanse, which is mainly composed of an acid charnockite, measures about three-quarters of a mile in diameter (Fig. 27 is Dover's sketch of this island). The highest portion reaches about 340 feet above sea-level. Distributed over 5 acres of the bay-ice at about 1 mile east of this island is the largest Emperor Penguin rookery known to exist. During midsummer the rocky ledges of the island are crowded with nesting petrels of many species. The position given is that fixed from the *Aurora*.

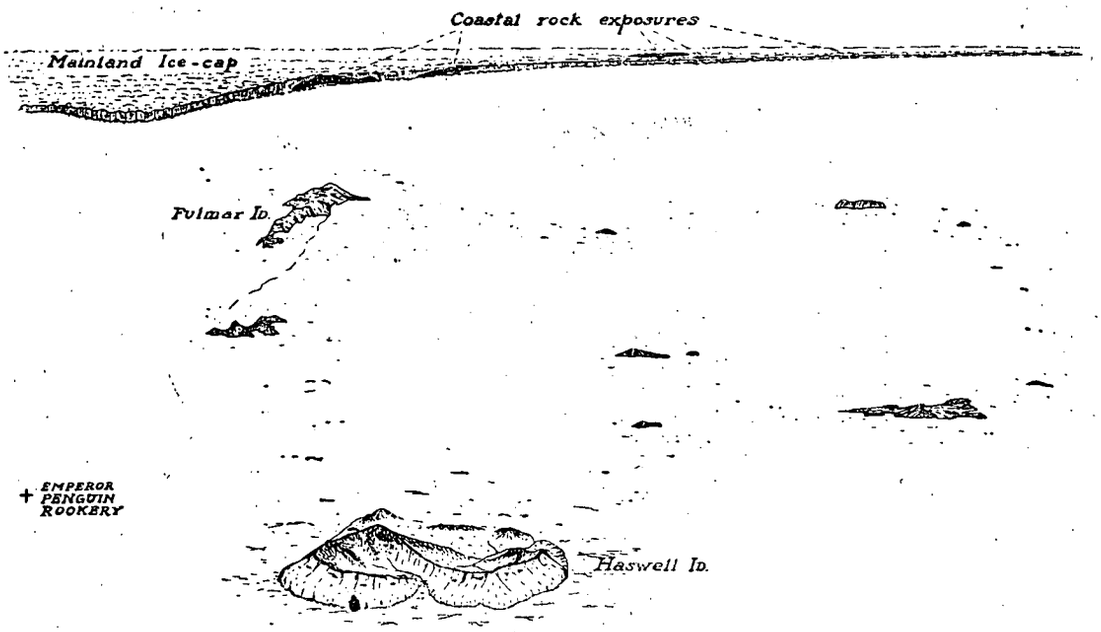


FIG. 26. Looking south across the Rookery Islands to the mainland coast.

HELEN GLACIER (Lady Helen, wife of Sir Lucas Tooth of Sydney, patron), in its upper section, is a tumbled region of serac-ice. It extends seawards as a semi-floating ice tongue.

HENDERSON ISLAND (Professor G. C. Henderson of Adelaide, Expedition Advisory Committee) is an ice-capped island about 7 miles in average diameter, which rises to 600 feet above the Shackleton Ice-Shelf.

HIGH ROCK is a high-standing nunatak on the west side of David Island.

HIPPO ISLAND is a steep, rocky island which rises through the Shackleton Ice-Shelf to a height on its south side of 405 feet. It is half a mile long and 200 yards across. The rock is mainly a dark-coloured gneiss, interspersed with bands of red granite. Snow Petrels nest there in great numbers. Lichen and moss grow on sheltered portions of the outcrop.

HOADLEY, CAPE (C. A. Hoadley of the A.A.E.), is a large rock outcrop at the eastern end of the great rock wall which forms the coastline between the Denman and the Scott Glaciers.

HOLMAN DOME (W. A. Holman, Premier of New South Wales, 1911) is a cupola-shaped nunatak on the south-east side of David Island.

HORDERN ISLAND (Sir Samuel Hordern of Sydney, patron) was observed from Watson Bluff, sighted across the impassable outflow of the lower Denman Glacier. Kennedy, in his survey, plotted only the western rock wall of this feature, but since it is the northward continuation of the rocky mainland coast, but separated from it by an ice channel, it appears to be in the nature of an island mass.

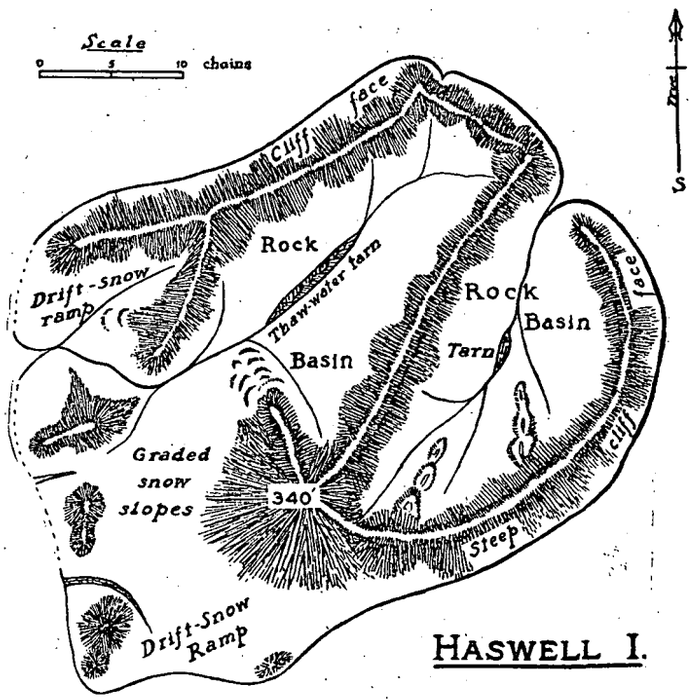


FIG. 27. View looking north across Haswell Island.

HUGHES PASSAGE (W. M. Hughes, Australian Prime Minister, 1917) separates Henderson Island from the mainland.

JONES, CAPE (S. E. Jones of the A.A.E.) is the western extremity of the rock wall which extends between the Denman and the Scott Glaciers.

JONES ROCKS (S. E. Jones of the A.A.E.) are coastal outcrops on the east side of the Bay of Winds.

JUNCTION CORNER is the junction of the land ice-cap with the Shackleton Ice-Shelf on its western side.

KENNEDY, CAPE (A. L. Kennedy of the A.A.E.) is the point of the ice coast where the Reid Glacier and the Nordenskjöld Channel meet.

KIDSON CHANNEL (Dr. Edward Kidson, Dominion Meteorologist, New Zealand), which separates David Island from Davis Peninsula, is from 4 to 7 miles wide (see Map, Fig. 24).

LONG ROCK is an elongated exposure on the mainland coast east of Cape Charcot.

MASSON ISLAND (Professor Sir David Orme Masson of Melbourne, Expedition Advisory Committee) is an ice-capped island of somewhat over 10 miles in diameter rising above the Shackleton Ice-Shelf to a height of about 1,500 feet.

MELBA PENINSULA (Dame Nellie Melba of Melbourne, patron) is the ice-capped highland trending in a north-easterly direction, located between the Shackleton Ice-Shelf and the deep channel of the Reid Glacier.

MITRE, THE, is a nunatak on the north-facing coast of Davis Peninsula.

MOYES, CAPE (M. H. Moyes of the A.A.E.), is an ill-defined sweep of the coast where the ascending ice-cap, riding over a submerged rocky ridge, presses somewhat further north into the Shackleton Ice-Shelf.

NORDENSKJÖLD CHANNEL (Dr. Otto Nordenskjöld, Swedish Antarctic explorer) is from 3 to 5 miles wide, and separates David Island from the Melba Peninsula.

NORTHCLIFFE GLACIER (Lord Northcliffe of London, patron) descends into Robinson Bay.

POSSESSION ROCKS are two small outcrops of garnetiferous gneiss, located about half a mile south of the shore line of Robinson Bay and about 200 feet above the ice level of the Northcliffe Glacier filling the bay. They were so named for the fact that the official ceremony of taking possession of the region of Queen Mary Land for the British Crown was performed by Wild on the westernmost of these outcrops on December 25th, 1912.

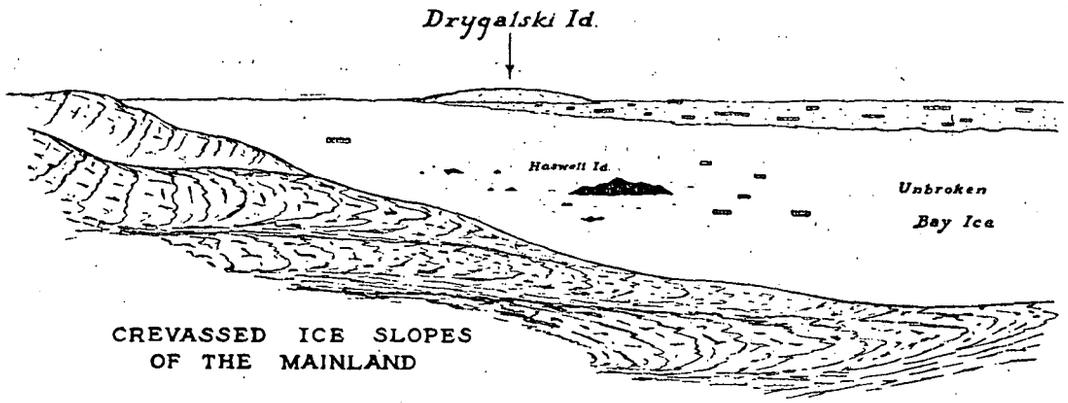


FIG. 28. View of Drygalski Island from Dover's sketch of December 4th. Crevassed ice slopes of the mainland in the foreground. Rookery Islands embedded in unbroken bay-ice in the middle distance.

REID GLACIER (Sir George Reid, Commonwealth High Commissioner in London, 1911) descends steeply to the sea by a channel about 5 miles in width.

ROBINSON BAY (Lionel Robinson, Australia, patron), some 10 miles in width where the Denman Glacier sweeps past it, is occupied by the lower Northcliffe Glacier.

ROOKERY ISLANDS comprise about 10 small rocky islands located within 5 miles of the coast. They were discovered and mapped by the western sledge party from the Grottoes. Fig. 26 is a sketch survey by Dovers illustrating their distribution.

SANDOW, MOUNT (Eugene Sandow of London, patron), is a nunatak of the ice-cap overlooking the Denman Glacier, and reaching a height of about 4,000 feet.

SCOTT GLACIER (Captain R. F. Scott, R.N., Antarctic explorer) was only imperfectly seen, viewed at a great distance across the impassable region of the lower Denman Glacier. Its limits are only vaguely sketched. There seems to be little doubt that it is of considerable size, and a width of 6 miles is suggested from the observations available.

SHACKLETON ICE-SHELF (Sir Ernest Shackleton, British Antarctic explorer) is a major shelf-ice formation, extending quite 150 miles north of the mainland coast, and at least 165 miles in a west-to-east direction. Much of its surface is at an elevation of 100 feet and more above the sea-level. Many small islands embedded in it have already been discovered, and the probability is that more will be found when further exploration is undertaken in that area. It is probable that the stability of this feature is due to the existence of islands towards the eastern side of the Ice-Shelf.

STRATHCONA, MOUNT (Lord Strathcona, High Commissioner for Canada, 1911, patron) is an outstanding nunatak of about 4,000 feet in height, rising above the inland ice-cap.

TERMINATION TONGUE was an immense tongue-shaped shelf-ice formation about 60 miles in length, and averaging 15 miles in breadth, met with on each of the three Antarctic cruises of the *Aurora*. At its northern end it was found to be floating in very deep water, but the sea-floor shelved rapidly towards its southern end. The assumption at the time of discovery was that it represented the seaward terminal of a great land glacier. During the voyages of the *Discovery* in 1931, we sailed over the location formerly occupied by this ice formation, discovering that it had disappeared in the interval since 1914. Captain Davis, when he discovered it in 1912, gave it this name because it was situated near where Wilkes had entered "Termination Land" on the map.

The THIN ROCK is a long, narrow outcrop on Davis Peninsula.

THE TRIPLETS are three small rock outcrops of porphyritic granite at the northern extremity of David Island.

THE TWINS are two small, but closely associated rock outcrops on David Island.

WATSON BLUFF (A. D. Watson of the A.A.E.) is about a mile in length and the largest of the rock exposures on David Island. Its summit reaches to about 900 feet above sea-level. Vast numbers of Snow Petrels nest in the crevices of the granite.

WESTERN BARRIER is the designation applied by the Expedition's western-base party to a large ice formation located about 13 miles west of "The Grottoes." In some of its features it resembled a glacier tongue formation, but was unconnected with the mainland ice. It came to be regarded as a stranded berg of large size. However, as the surface is irregular in places and a sounding of 112 fathoms has been got alongside it on the west side, it may be an isolated relic of a former northward extension of the mainland ice-cap.

WINDS, BAY OF, is a notable embayment in the margin of the ice-cap, so named because of the almost constant outflow therefrom of cold dense air from the Plateau.

WRIGHT BAY (Dr. C. S. Wright of Scott's *Terra Nova* Expedition) lies on the western side of the Helen Glacier. It is to be expected that it is free of bay-ice in the late summer.

KAISER WILHELM II LAND

Kaiser Wilhelm Land was discovered and named by the German South Polar Expedition of 1901–03, under the command of Professor Dr. Erich von Drygalski. The Germans first sighted the ice-capped land from the deck of the *Gauss* at about 6 a.m. on the morning of February 21st, 1902. The nearest approach of the vessel to the land was during that same morning. They were still at least several miles distant from the coastal ice cliffs. The ship's position at that time does not appear to be stated in the published records of the Expedition, except where it is shown graphically on the track chart. In Volume I of the Scientific Reports* of the Expedition (map published in 1921), the farthest south point of the track is given as about 66° 42′ S. lat. and 91° 43′ E. longt. In the folding map accompanying Drygalski's preliminary account† of the achievements of the Expedition, it is approximately 66° 39′ S. lat. and 92° 0′ E. longt. In Drygalski's popular volume‡ it is apparently 66° 34′ S. lat. and 91° 50′ E. long. There is thus in these several maps, so far as the point under discussion is concerned, a range of 8 minutes in latitude and 17 minutes in longitude. Our view is that their position at the time was perhaps not quite so far south or east as they show on the chart since, according to our chart, if they were so far they would have been over high land some four miles south of the margin of the coast.

After this brief sight of the coast the *Gauss* proceeded back on her tracks towards the north-west, and next day, February 22nd, at 4 a.m., was caught and held fast in pack-ice anchored by grounded icebergs. There, at a distance of 46 miles from the coast, she remained immovable, frozen in a field of consolidated pack-ice for about a year before release finally came.

An ascent in a captive balloon which was part of their equipment resulted in the sighting of a black rock mass (Gaussberg) to the south standing on the very edge of the icy coastline. This they subsequently visited by sledge journey across the sea-ice during the winter.

In his preliminary account† of the work of the Expedition in a paper read on April 25th, 1904, Drygalski, in addition to showing the margin of the mainland, also figures on his map a patch marked " High Land." The western margin of this is located about 65° 51′ S. lat. and 93° E. longt. The same is shown on the folding map of the popular publication. ‡ This appearance of land does not agree with the position of Drygalski Island, which we subsequently discovered and named. When viewed from any position which the *Gauss* occupied, there is no land lying in the direction of that appearance of land.

In the folding map accompanying the final geographical report ¶ of Drygalski's Expedition, the " High Land " figured in the earlier maps does not appear. However, there is a new development, namely, a patch of " High Land " said to have been sighted from the *Gauss*, located in about 66° 32′ S. lat. and 91° 52′ E. longt. and south-east thereof. This map also includes a skeleton outline of our map of Queen Mary Land as published in the Geog. Journ. of 1914, except that the mainland coast for some distance on either side of Gaussberg is the *Gauss* Expedition interpretation thereof. With regard to the " High Land " shown on that map, a note attached states : "Insel nach Mawson"; but there is some mistake about this. If in any of my correspondence with Drygalski any statement of mine has been misinterpreted to mean that an island exists in that locality, I now wish to make it clear that we never at any time found an island in that locality. Evidently what the *Gauss* did see in that direction was part of the mainland coastline in the neighbourhood of our Cape Filchner. It is difficult to understand why those on board the *Gauss* at the time of sighting this " High Land " were not able to trace the coast in a sweep to the south and around the ship's bows to the west. According to the position of the ship at the time, as indicated on their map, they were quite close to the coast and the day was fine and clear.

Comparing their ship's track with our coastline survey, it is suggested that perhaps the location of the *Gauss* at her furthest south position, where on the map in Volume II of their Reports the depth is shown as 401 metres, was uncertain. It may be that the true location was somewhat further north and west.

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* Deutsche Südpolar Expedition, 1901–03 : Berlin, 1905–21.

† Geog. Journ., Vol. XXIV, pp. 129–152.

‡ " Zum Kontinent des eisigen Südens," published in Berlin, 1904.

¶ See Vol. I, Part 2 (published in 1908) and Vol. I, Part 4 (published

Support is given to this suggestion by the fact that in Drygalski's popular account, referred to above, the farthest south position of the *Gauss* is indicated as just over the Antarctic Circle, or about 7 miles north of the location indicated in the Scientific Reports of the Expedition.

The folding map accompanying Volume II of Drygalski's Scientific Reports shows the mainland coast extending away to the west as far as the 80th degree of east longitude. All that length of coast westward of the 87th, or perhaps at best 86th, degree was, at the time of printing that impressive map, no more than pure surmise. The *Gauss* Expedition had certainly not seen the coastline further west than the limits just mentioned. They had, in fact, seen what is visible from the summit of Gaussberg and no more. It is important that this should be realised, else a false idea may be gained as to the extent of knowledge concerning that section of the coast prior to 1931. Also, when viewing the same map, it is to be borne in mind that the extent of the land towards the east from Gaussberg as a result of the *Gauss* Expedition was no further than our Cape Filchner. Their line of coast roughly indicated to the east of Gaussberg as far as the meridian of Cape Filchner does not correspond with ours; their coast is, for instance, some 16 minutes of latitude to the south of Cape Filchner.

The *Gauss* Expedition proved only that land, either an island or probably part of something much larger, did exist about the vicinity of the Antarctic Circle in the locality of Gaussberg. Also they had disproved the existence of " Termination Land " to the east. The nearest land known to exist to the west was that reported by Enderby and Kemp, which, in the state of knowledge of that time, might also have been an island. The use of the term continent at the time was certainly premature, for one of the current ideas not excluded until very recently was that the great Antarctic Ice-Cap possibly rested upon, or was held in position by, oceanic or continental islands. The continental type of rocks dredged by the *Gauss* would be thus explained, and so also the meteorological data would correspond with continental ice-cap conditions.

In some recent publications certain sections of the Antarctic coastline originally recorded as " lands " are now given the title of " coasts." So the term Kaiser Wilhelm Coast has appeared on some maps. In this publication, however, which deals with the Antarctic as at the time of our Expedition, we retain Drygalski's discovery as Kaiser Wilhelm Land. Its limits can be regarded as Cape Penck on the west and Cape Filchner on the east. The undermentioned are several established points on the coast.

FILCHNER, CAPE (Dr. Wilhelm Filchner, commanding the German Antarctic Expedition of 1911–12) was charted and named by the A.A.E. Its position was fixed by Dovers, of the western sledge

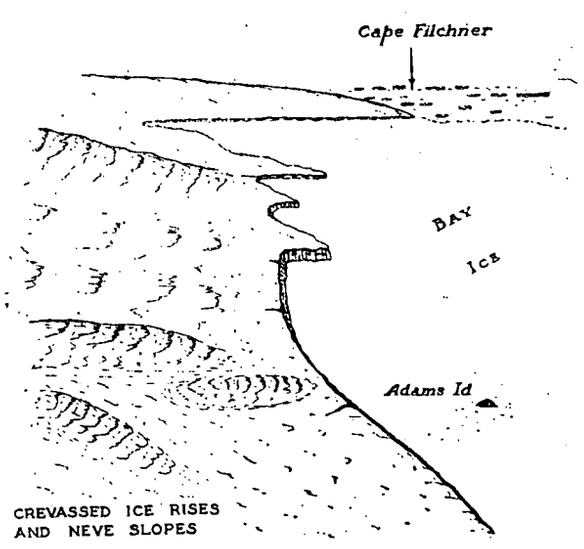

FIG. 29.—View of Cape Filchner from the coastal ice slopes on December 7th. Adams Island is seen embedded in unbroken bay-ice.

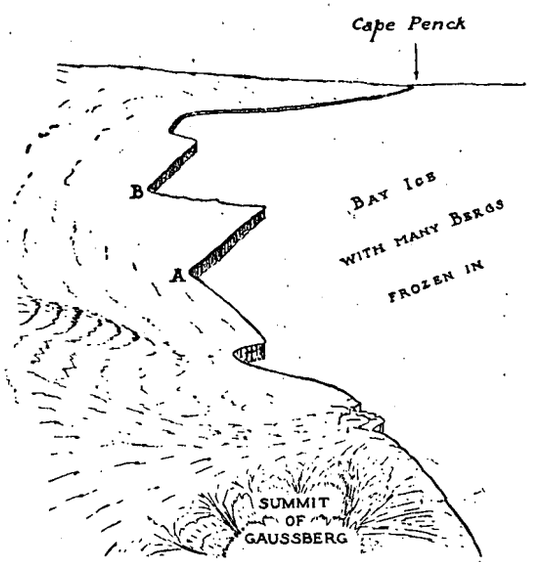

FIG. 30.—View of Cape Penck from the summit of Gaussberg. Estimated distance to the point A was 4 miles, and to B about 8 miles.

party from the Grottoes. No rock was visible from the point of observation, which was situated on the plateau to the south. The aspect of Cape Filchner viewed from the east is illustrated in Text Figure 29.

GAUSSBERG, so named by Professor Drygalski, commanding the German *Gauss* Expedition of 1901–03. It is a comparatively recent but extinct volcanic cone, 1,148 feet high, on the coastal margin of the continental ice-cap. The rock is a leucite basalt. The location of Gaussberg was determined with meticulous care by the Germans, who give it as latitude 66° 48′ S., longitude 89° 19′ E.

PENCK, CAPE (Dr. Albrecht Penck, German geographer) is the name we applied to a point on the ice coast west of Gaussberg visible from the summit of the mountain and featured on Dover's map (see Text Figure 30).

POSADOWSKY BAY is the name given by Drygalski to a wide-open embayment in the vicinity of Gaussberg.

GEOGRAPHICAL WORK OF THE SHIP'S PARTY

Throughout the three Antarctic voyages and two sub-Antarctic cruises of the *Aurora*, Captain Davis spared no pains in securing an accurate record of the vessel's track. Every suitable opportunity presented for fixing the ship's location by observation was taken. This was necessary not only for ordinary geographical reasons, but for the fact that in periods of good weather soundings were often taken on several occasions during each day and required to be accurately located. The keenness of Captain Davis and his staff in this regard resulted in an excellent record being achieved. There were several periods of up to three days' duration when, owing to overcast skies during gales or to fogs, observations for position were not possible. In plotting the ship's course at such times, the dead-reckoning position has in all cases been adjusted with consideration of local surface drift currents, on the basis of probability, to harmonise with the last observed position before such period and the first observed position following. Actually there were only two such periods in the three years' operations where difficulty has been found in harmonizing the dead-reckoning record with earlier and later observed positions. The first of these was in the period January 3rd to 6th, 1912, when the discrepancy suggests that the gigantic iceberg, in the lee of which the *Aurora* was sheltering at the time, thought to be co-extensive with the land or aground, had actually drifted. The second occasion was when, between February 8th and 11th, 1912, the *Aurora* was attempting to make a passage south through icebergs and pack-ice to the west of Termination Tongue. However, in neither interval would a more accurate knowledge of the ship's position during the interval be of critical value beyond its bearing upon the several soundings taken and the question of movement, if any, of the iceberg. Where such adjustments have been found necessary, when critically examining the ship's record in preparation of the final track chart as reproduced in this volume, we have not altered, in the text herewith presented, the figures for position given in the ship's records (the ship's log and Captain Davis's own log), but have plotted the track in accordance with our final interpretation.

The *Aurora* was not fitted with wireless for reception of time signals, so that all positions depended upon ship's chronometer time. In the case of the 1913–14 voyage, this was able to be re-checked on arrival at Cape Denison by comparison with the meridian of Cape Denison which, by that time, had been fixed with a high degree of accuracy by wireless time signals from Melbourne.

The courses followed on the three Antarctic voyages are recorded in the text as Fig. 2. The more critical portions of the voyages, namely, along Antarctic coasts, are reproduced on a larger scale in the folding maps and in Map Plates II and III.

The region south of Australia and New Zealand, where the sub-Antarctic cruises were directed, is dealt with in Text Figure 6. In this map is included, in addition to the tracks of the *Aurora*, that of the *Nimrod* when, in 1909, commanded by J. K. Davis, she traversed the same region in search of the fabled Royal Company's Islands. It will be seen that the distribution of these tracks adds further proof of the non-existence of islands to the south of Tasmania. In his search in that locality, Captain Davis located and charted an important rise in the ocean floor lying to the south of Tasmania to which the name, Mill Rise, was given to commemorate the service that H. R. Mill, of London, has given to the history of Antarctic exploration. The location and extent of the Mill Rise is obvious from the soundings shown on the chart. As it has a plateau-like surface, it is deduced that it is a submerged continental horst block and not a volcanic oceanic outburst.

The extensive oceanographic programme conducted from the *Aurora* is dealt with elsewhere in these volumes (Series A, Vol. II). The large programme of soundings, most of which are from an area almost without soundings up to that date, was conducted by means of the old, laborious wire-probing method before the days of echo sounding. The information thus obtained cleared up in large measure the broader features of uncertainty which existed before that date regarding the configuration of the ocean floor between Australia and Antarctica. Also the many soundings taken systematically in Antarctic waters in conjunction with our land discoveries clearly demonstrated the existence in that region of the Antarctic of a very large land area where, up to that date, all had been speculation without any proof of the existence of continuous continental land.

In Antarctic waters, observations from the *Aurora* advanced geographical knowledge very greatly by confirming the existence of Adelie Land, sighted by D'Urville and Wilkes in 1840, and by the discovery of land (King George Land) to the eastward of Adelie Land and to the westward thereof (Wilkes Coast); also by the discovery of land (Queen Mary Land and Drygalski Island) to the east of the Kaiser Wilhelm Land of Drygalski. The outline of the western face and northern extremity of the Mertz Glacier Tongue and of the Shackleton Ice-Shelf, the outline of Drygalski Island and the Western Barrier, also the re-charting of the coastline of Adelie Land, were the result of operations from the deck of the *Aurora*. Elsewhere the rough original outline of some of the coast executed from the ship was subsequently completed by surveys of the land parties.

During the second Antarctic voyage, J. Waterschoot van der Gracht, a Dutch marine artist who accompanied the vessel, made a series of crayon drawings reproducing faithfully the detail of the ice-cliffs in the neighbourhood of Commonwealth Bay. This useful record is housed at the University in Sydney.

The ship's operations also contributed to knowledge by eliminating the possibility of the existence of land over considerable areas. In this manner good work was done in the region between the Wilkes Coast and the Shackleton Ice-Shelf.

Observations from the ship taken in conjunction with work on the land has eliminated all possibility of the existence of land, other than perhaps very small islands, anywhere north of the King George Land coast. Consequently the land as charted by Wilkes at Point Hudson, Point Emmons, and Point Case does not exist. It is assumed that Wilkes mistook for ice-encased land massive shelf-ice formations or grounded, tilted icebergs. It is interesting to note that there still exists a feature corresponding to Wilkes's Disappointment Bay, namely, the gap between the northern extremity of the Ninnis Glacier Tongue and that of the Mertz Glacier Tongue. It seems most probable that his Point Case was the northern tip of the Mertz Glacier Tongue and Point Emmons the extremity of the Ninnis Glacier Tongue.

Wilkes's "High Land covered with snow," shown extending north to Cape Carr from the Adelie Land coast is the same ice jam that exists to-day. It is probably held together by large icebergs aground; or it may be stiffened by the existence of some small islands; or finally it may, in its core region, be another glacier tongue from the land. From our observations there appears to be no probability of the main land in that region extending further north than the 66th degree of latitude.

Further discussion bearing on the question of Wilkes's landfalls in the Australasian region in relation to our observations is the subject of an earlier publication.* Professor W. H. Hobbs has also written much on this question.

Arising out of the ship's operations, but not already dealt with, are other named features of our maps as registered below.

Bruce Rise (W. S. Bruce, Scottish Antarctic explorer) is an elevated section of the ocean floor located from the *Aurora* on January 14th, 1914. It lies in about 63° 21′ S. lat., 101° 42′ E. longt.

Davis Bay (Captain J. K. Davis of the A.A.E.) is a recession in the Wilkes Coast.

Davis Sea (Captain Davis of the A.A.E.) is an area of the sea off the coast of Queen Mary Land, south of the pack-ice belt, where open water is to be found during the summer months. This freedom from pack-ice is due to the existence of the Shackleton Ice-Shelf.

The pack-ice drifting westward around the Antarctic coast is deflected to the north by the Ice-Shelf. It then passes western Queen Mary Land as a stream moving west from the northern extremity of the Shackleton Ice-Shelf. The prevailing wind is in the quarter south to east, and this also helps to keep the Davis Sea free of loose floating ice.

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*Wilkes's Antarctic Landfalls; Proc. Roy. Geographical Society of Australia, South Australian Branch, Vol. XXXIV (1932), pp. 70–113.

D'URVILLE SEA (Admiral Dumont D'Urville) is the name by which we have distinguished the navigable off-shore waters which exist along the coast of King George Land and of Adelie Land between the Mertz Glacier Tongue on the east and the ice jam at Cape Robert on the west. Even in summer months the D'Urville sea is usually defined from the Southern Ocean by streams of westward-moving pack-ice. Even in winter some open water may be found along this coast, owing to the prevalence of off-shore gales.

KELTIE, CAPE (Dr. Scott Keltie, Secretary, Royal Geographical Society, 1911), is the most northerly part of the Wilkes Coast.

MILL RISE, an important rise in the ocean floor centred about 230 nautical miles south of Tasmania.

WILKES COAST (Lieut. Wilkes, United States Antarctic explorer). This is defined as the coast to the west of Adelie Land discovered and charted by Captain J. K. Davis in January, 1912 (see Text Figure 5). In some of our earlier publications it has been referred to as Wilkes Land, but in view of such designation being confused with the earlier and wider application of the same name by American geographers, we now adopt the present title in agreement with the publishers of the Commonwealth Government's map (1939) of Antarctica. It is ice-capped land, rising steeply from the sea coast to the high ice plateau of the interior. Solid, unbroken bay-ice prevented the ship in late January from making a close approach to the land. Observations were made from the ship at too great a distance from the land to observe minor features of the coast. No rock outcrops are recorded.

DESCRIPTION OF PHOTOGRAPHIC RECORDS

PLATE I.

Fig. 1. John King Davis, second in command of the Expedition and Captain of the *Aurora*.

2. The *Aurora* in dry dock showing the under-water stern fixings.
Negative P. 271 (Davis).

PLATE II.

Fig. 1. S.Y. *Aurora* in tropical waters on voyage to Australia, 1911.
Negative C. 76 (Mertz).

2. The fore end view of the *Aurora* in dry dock.

3. The steel-plated, cut-away bow of the *Aurora*.

PLATE III.

Fig. 1. The crowd on the wharf at Queen's Pier at 4 p.m. on December 2nd, 1911. On the wharf, just below the bridge of the *Aurora*, can be seen Wild in a white jersey and Captain Davis just behind him. His Excellency Sir Harry Barron is facing the camera just on the far side of Wild. Dr. Mawson (with cap) is immediately on the right of Sir Harry Barron. Gray (Second Officer) is on duty on the bridge.

Negative C. 26 (Mertz).

2. Friends on board the *Egeria* and the *Marama* accompanied the *Aurora* down the Derwent as far as Crayfish Point.

Negative C. 24 (Mertz).

PLATE IV.

Fig. 1. A boat party going ashore to investigate the possibilities of Caroline Cove as a base for a land station.

Negative Q. 246 (Gray).

2. Landing on the beach at Caroline Cove. Bands of penguins come to greet us.

Negative H. 404 (Hurley).

PLATE V.

Fig. 1. The *Aurora* at anchor in Hasselborough Bay. View from "Wireless" Cove where all the equipment for the "Wireless" Station was landed.

Negative H. 95 (Mawson).

2. On arrival of the *Aurora* at North-East Bay, a sealing vessel, the *Clyde*, was found to have been recently cast ashore as a complete wreck.

Negative H. 420 (Hurley).

Plate VI.

Fig. 1. The S.S. *Toroa*, Hollyman Steamship Coy., was commissioned to transport to Macquarie Island stores and some members of the land parties. The figures on the bridge are, from left to right: Bage, the Captain of the *Toroa*, Sawyer, Blake, Hunter, Hoadley, Eitel (Secretary) and the First Officer of the *Toroa*.

Negative C. 130 (Mertz).

2. Very rough weather was encountered after leaving Capetown when running the easting down. From left to right the figures are Dr. X. Mertz, Corner (Second Engineer), P. Gray (Second Officer), Lieut. B. E. S. Ninnis. Ninnis and Mertz were the only two members of the land parties who travelled out from Europe to Australia on the ship. They joined the ship with the special object of looking after the sledge dogs.

Negative Q. 72 (Gillies).

3. The camp on Macquarie Island at the lower end of the "flying fox." Wild and Blake are the two right-hand figures.

Negative Q. 319 (Gillies).

4. Photograph taken from the head of Wireless Cove where the wireless equipment was landed. The white tent of Wild's landing party is seen in the foreground. To the left of that is a large rock mass which formed the lower anchor of the "flying fox" which extended to the upper anchorage seen on the sky line at the top of the hill.

Negative P. 99 (Mawson).

Plate VII.

Fig. 1. Erecting the wireless masts on the summit of Wireless Hill. The operating-huts in course of erection near the right-hand side of the picture.

Negative C. 196 (Mertz).

2. On arrival at Macquarie Island, sledge dogs were taken ashore and tethered at intervals on an anchored line. As seal meat was plentiful and the shore life agreeable after the hardships of the voyage, their condition rapidly improved. The figure is Ninnis.

Negative P. 121 (Mawson).

Plate VIII.

Fig. 1. After leaving Macquarie Island favourable weather was encountered.

Negative Q. 832 (Gillies).

2. Frank Wild.

Negative S.H. 88 (Hurley).

Plate IX.

Fig. 1. The *Aurora* rolling lazily on the voyage to the pack-ice.

Negative Q. 831 (Gillies).

2. Icebergs were encountered north of the pack-ice.

Negative C. 111 (Mertz).

PLATE X.

Fig. 1. Loose drift-ice on the margin of the pack.

Negative C. 74 (Gray).

2. Some sections of heavy drift-ice were encountered north-west of the Balleny Islands.

Negative Q. 828 (Gillies).

3. Just outside the margin of the pack-ice. To the south just above the horizon is a well marked ice-blink which signals the main pack-ice, actually below the horizon. The darker, higher sky is a "water sky." An Emperor Penguin can be seen standing on the edge of a piece of the drift-ice.

Negative C. 187 (Gillies).

4. Such scattered pack, or better styled drift-ice, is easily navigable. The ice mass in the foreground on the right is seen to be rapidly disintegrating under the warmer summer conditions.

Negative W. 81 (Hurley).

PLATE XI.

Fig. 1. Traversing the looser pack-ice in search of land west of the Balleny Islands. This pack is seen to be greatly weather-worn and incorporates much brash-ice.

Negative S.H. 21 (Hurley).

2. Steaming along the margin of what appeared to be a great shelf-ice formation on the morning of January 3rd. Twelve months later this was proved to be an enormous iceberg quite 40 miles in length.

Negative S.H. 19 (Hurley).

PLATE XII.

Fig. 1. Landing of the boat party from the *Aurora* on the afternoon of January 8th, 1911. This was the first time that a landing had been made on the mainland of Antarctica between Cape Adare and Gaussberg. The French had, however, in 1840 landed upon a small islet immediately off the coast at Point Geology. The figure on the left without a hat is Bage; that on the right with a pick is Mawson.

Negative H. 622 (Hurley).

2. From the anchorage in Commonwealth Bay the motor-launch, towing a string of boats, ran backwards and forwards transferring the equipment of the Main Base Party to the shore. The prominent point of the ice cliff coastline (just to the left of the stern of the vessel) was known as Bearing Bluff.

Negative H. 546 (Hurley).

PLATE XIII.

Fig. 1. With the aid of rope and tackle suspended from sheer legs erected at the head of the Boat Harbour, the unloading of the boats was greatly facilitated.

Negative H. 484 (Hurley).

2. After landing equipment on the ice quay at the head of the Boat Harbour, the material was sledged to stacks conveniently arranged around the site selected for the erection of a hut. The peaked tents are erected alongside the hut site. A sledge in the foreground is seen to be loaded with coal briquettes each weighing 25 lbs.

Negative H. 638 (Hurley).

* 82908—Y

PLATE XIV.

Fig. 1. After landing the Main Base Party and their equipment at Cape Denison, Captain Davis made every effort to land Wild's party at a subsidiary base which it was hoped to establish at not less than 400 miles to the west of the Main Base. The ship was headed through the pack wherever it was navigable, but no opportunity for landing was met with until very late in the season.

Negative H. 497 (Hurley).

2. A photograph taken by Hurley from a staging rigged beneath the bowsprit where a good view could be obtained of the ship's bows pressing through the pack-ice.

PLATE XV.

Fig. 1. With the *Aurora* anchored to a floe in the pack-ice, large quantities of snow and fresh-water ice could be quickly hoisted on deck to replenish the vessel's fresh-water supply.

Negative H. 126 (Hurley).

2. Having hoisted fresh-water ice on deck, it is then packed into the melting tanks where a steam coil from the engine-room thaws it. The fresh-water then runs down into the ship's storage tanks.

Negative Q. 148 (Gray).

PLATE XVI.

Fig. 1. Navigating the ship through thick pack-ice north of Queen Mary Land.

Negative C. 104 (Gray).

2. The unbroken sea-ice met with on February 13th, 1912. At what was estimated to be about 30 miles to the south, the rising slopes of new Antarctic land (subsequently known as Queen Mary Land) were visible, but cannot be seen in the photograph. The shadow of the ship's mast and flag can be seen in the foreground. In the distance is the figure of a man on the left and a seal on the right.

Negative P. 150 (Davis).

PLATE XVII.

Fig. 1. A party of eight men under the leadership of Frank Wild landed from the *Aurora*, and established a base on the Shackleton Ice-shelf, the Expedition's Western Base. From left to right: Harrisson, Dr. Jones, Watson, Moyes, Dovers, Hoadley, Wild, Kennedy.

Negative H. 715 (Hurley).

2. The *Aurora* anchored to the bay-ice adjacent to the Shackleton Ice-shelf formation when landing the Western Base Party. This spot was just 17 miles to the north of the mainland of Queen Mary Land. In the foreground is an interested band of Emperor Penguins; on the cliff face can be seen the sheer-legs and tackle for hoisting the equipment from the bay-ice to the top of the shelf-ice where the Hut was erected.

Negative Q. 334 (Gillies).

PLATE XVIII.

Fig. 1. The ship's party skinning a seal on the bay-ice off Queen Mary Land.

Negative Q. 486 (Gray).

2. The sheer-legs and tackle for hoisting the equipment of the Western Base Party from the low bay-ice to the top of the 100 ft. high Shackleton Ice-shelf.

Negative Q. 379.

PLATE XIX.

Fig. 1. Walking away with the hauling line when hoisting equipment to the top of the Shackleton Shelf. On the left are hut timbers; to the right of the sheer-legs is a dump of boxes of stores.

Negative P. 104 (Watson).

2. A case of stores arriving at the top of the shelf-ice; on the bay-ice below three men can be seen taking an empty sledge back to the ship.

Negative P. 105 (Watson).

PLATE XX.

Fig. 1. The *Aurora* commencing the return voyage to Hobart. She is seen drawing away from the bay-ice alongside the Shackleton Ice-shelf just after having farewelled the Western Base Party.

Negative P. 49 (Watson).

2. Photograph from the *Aurora* steaming north along the face of the Shackleton Ice-shelf.

Negative P. 117 (Mawson).

PLATE XXI.

Fig. 1. A seascape in the "fifties," where big seas are running all the year round. In the foreground a petrel is seen flying along the trough of the sea.

Negative H. 120 (Hurley).

2. The *Aurora* at the anchorage in Hasselborough Bay. Photographed from Aerial Cove.

Negative W. 179 (Hurley).

PLATE XXII.

Fig. 1. The Monegasque trawl hoisted on deck. Second Officer Gray standing by.

Negative P. 265 (Davis).

2. First Officer Fletcher holding the driver loaded with sinkers ready to hoist overboard. The Lucas sounding machine on the right.

Negative P. 274 (Davis).

PLATE XXIII.

Fig. 1. The *Aurora* at anchor in Carnley Harbour, Auckland Islands.

Negative Q. 833 (Gillies).

2. Chief Engineer Gillies and the provision depot for castaways established at Carnley Harbour by the New Zealand Government.

Negative Q. 45 (Primmer).

3. The launch kellicked by the shore after Waite's party had been landed at Carnley Harbour.

Negative Q. 312 (Gillies).

4. The brick pedestal for magnetic observations erected by the Sir James Clark Ross Antarctic Expedition of 1840. This is at Port Ross and was rediscovered by Captain Davis after a search through the dense scrubby undergrowth.

Negative Q. 314 (Primmer).

Plate XXIV.

Fig. 1. The *Aurora* under full sail headed south for the relief of the Antarctic bases; early January, 1913.

Negative Q. 830 (Gillies).

2. Making rapid progress in a favourable breeze on the relief expedition of 1912–13. Of the two figures pacing the deck, that on the left is Captain J. K. Davis; that on the right James Davis, a retired whaling captain of Hobart who accompanied the vessel on the cruise for the purpose of identifying the types of whales sighted.

Negative S.H. 22 (Hurley).

Plate XXV.

Fig. 1. The hull of the *Aurora* became encased in ice while standing off Commonwealth Bay awaiting the return of the missing sledge party during a severe blizzard of the first week in February, 1913.

Negative Q. 67 (Gillies).

2. During the blizzard of early February, 1913, the seas broke over the ship's deck, encasing the rigging and machinery in ice.

Negative Q. 65 (Gillies).

Plate XXVI.

Fig. 1. A Sea-leopard basking on the drift-ice just outside the edge of the main pack-ice.

Negative Q. 327 (Gillies).

2. Members of the main Antarctic land base who returned in the *Aurora* to Australia in February, 1913. From left to right: Standing—Whetter, Hurley, Webb, Hannam, Laseron, Close; sitting—Stillwell, Hunter, Correll, Murphy.

Negative C. 54 (Gillies).

Plate XXVII.

Fig. 1. Tabular icebergs of this kind are distributed in great numbers in the off-shore waters around the Antarctic Continent.

Negative H. 504 (Hurley).

2. The *Aurora* arrives off the West Base Station to relieve Wild's party, who are seen cheering on the bay-ice.

Negative C. 142 (Gillies).

Plate XXVIII.

Fig. 1. S.Y. *Aurora* heading south through the "Roaring Forties."

Negative C. 79.

2. The *Aurora* advances south through slack pack-ice.

Negative Q. 790 (Hurley).

PLATE LXIX.

Fig. 1. The East Coast Sledge Party. Madigan takes a sun observation for latitude.
Negative Q. 638 (McLean).

2. The East Coast Sledge Party. The drift around the tent after a blizzard.
Negative Q. 637 (McLean).

3. East Coast Sledge Party breaking camp.
Negative Q. 646 (McLean).

4. The King George Land coast near Penguin Point.
Negative Q. 652 (McLean).

PLATE LXX.

Fig. 1. Penguin Point, King George Land.
Negative Q. 702 (McLean).

2. The coastline on the west side of Murphy Bay, King George Land.
Negative Q. 714 (McLean).

PLATE LXXI.

Fig. 1. The East Coast Sledge Party sledging across the sea-ice 30 miles from the coastline of King George Land.
Negative Q. 668 (McLean).

2. The East Coast Party working the sledge through hummocky pressure-ice east of the Ninnis Glacier Tongue.
Negative Q. 722 (McLean).

PLATE LXXII.

Fig. 1. A pressure pinnacle in the sea-ice north of King George Land. Madigan's Party in the foreground.
Negative Q. 705 (McLean).

2. Madigan's East Coast Sledge Party on the sea-ice north of King George Land.
Negative Q. 80 (McLean).

PLATE LXXIII.

Fig. 1. The East Coast Sledge Party established a depot on the Ninnis Glacier Tongue. Figures from left are Correll, Madigan.
Negative Q. 704 (McLean).

2. A recently frozen lane in the sea-ice north of Horn Bluff. The coast at Horn Bluff appears in the distance on the left.
Negative Q. 708 (McLean).

Plate XXXV.

Fig. 1. At this stage the framework of the main living-room of the Hut at Cape Denison has been erected and a commencement made on the walling.

Negative H. 562 (Hurley).

2. The external walling is now almost completed. The only windows were four skylights in the roof. On the completion of this main section of the building, a smaller room, to serve the purpose of a workshop, was built on to the near face of the building as seen in the photograph. The door here shown then led into the workshop, so that the exit from the main living-room was by way of the workshop.

Negative H. 555 (Hurley).

Plate XXXVI.

Fig. 1. The occasion of the completion of the construction of the Hut was celebrated with some ceremony; the flag was run up to the top of the flag-pole on the peak of the roof, and in a short speech possession was taken of the neighbouring lands for Great Britain coupled with the Commonwealth of Australia. This was in March, 1912.

Negative H. 687 (Hurley).

2. The Hut in early autumn viewed from near the north-west corner. Just to the left of the nearest figure is to be seen, still open, the upper part of the doorway into the verandah of the workshop. The figure on the right is standing upon the roof of the improvised hangar, at this stage already buried under the snow.

Negative W. 89 (Hurley).

Plate XXXVII.

Fig. 1. In the late summer the thick ice formations along the shore line, forming the ice-foot, waste away, leaving little more than bare rocks at the water's edge.

Negative W. 157 (Hurley).

2. Standing on the eastern extremity of the Cape Denison rock area, this view is presented when looking east. Here the ice-cap is still resting on rock, and a small rocky off-lying islet can be seen just below the brink of the ice cliffs.

Negative W. 167 (Hurley).

Plate XXXVIII.

Fig. 1. Skiing exercises in the autumn on a snow slope on the south side of Round Lake.

Negative C. 128 (Mertz).

2. View looking north-west from near the eastern side of the Cape Denison rock area. Photograph taken in late autumn when only these odd penguins remained.

Negative C. 213 (Mertz).

Plate XXXIX.

Fig. 1. The ice cliffs at Land's End. Note the well-developed snow cornice. The figure is Dr. Mertz.

Negative C. 121 (Mertz).

2. The margin of the ice-capped land eastward of Cape Denison. Hurley is seen photographing on the brink of the cliff. The frozen surface of the sea is seen extending northward from the foot of the ice cliff.

Negative S.H. 56 (Hurley).

PLATE XL.

Fig. 1. The Hut in summer, viewed from the north. Weddell Seals in the foreground.

Negative P. 253 (Hunter).

2. A view in late autumn on the west side of the Boat Harbour, looking north. The shore-ice formations have nearly vanished. Great numbers of Weddell Seals come ashore at this time of the year.

Negative C. 261 (Mawson).

PLATE XLI.

Fig. 1. During autumn the dogs were tethered over the rocky area in front of the Hut.

Negative C. 96 (Mertz).

2. The dogs were frequently used during the winter, sledging stores to Aladdin's Cave. The figures, from left to right, are Mertz, Ninnis and Murphy.

Negative H. 681 (Hurley).

PLATE XLII.

Fig. 1. View taken from the inside of the living-room looking towards the workshop, a portion of which is seen through the doorway, where two men are at work. Supported on a frame near the ceiling can be seen the main cistern of the acetylene gas plant. The near figures, from left to right, are Close, who was messman for the day, Whetter, cook for the day, and Murphy, who is just getting out of bunk having been on watch the previous night.

Negative W. 72 (Hurley).

2. The workshop, a busy place during the long period of confinement of the first twelve months. The figures, from left to right, are Hodgeman, Hunter, Laseron, Correll, Hannam. Hannam is seen attending to the petrol engine and generator in the wireless plant.

Negative W. 124 (Hurley).

PLATE XLIII.

Fig. 1. During a portion of the year entrance and exit to the Hut could be made only from a trap-door in the roof of the verandah of the workshop. Dr. Mertz is here seen emerging.

Negative H. 479 (Hurley).

2. During the winter months the only access to the Hut was by way of a system of underground passages extending through the accumulated snow drifts. A certain amount of shovelling was required each day to keep these clear. Ninnis, who was shovelling at the time, is seen standing by.

Negative W. 143 (Hurley).

PLATE XLIV.

Fig. 1. The bright light above is daylight entering through the opening leading down through the drift-snow overlying the Hut. When entering by this hole, one arrived in the enclosed verandah on the west side of the Living Hut, from where this view was taken. The dark area in the lower part of the picture is the entrance to a tunnel through the drifts which in turn led to a doorway into the verandah of the workshop. One then proceeded by way of the workshop into the living-room.

Negative C. 239 (Mawson).

2. Hodgeman is here seen rising through the last vertical section of the passage (illustrated in fig. 1 above) leading out from the Hut. The figure on the left is Webb.

Negative Q. 737 (McLean).

PLATE XLV.

Fig. 1. Man-haul sledging up the ice slopes to Aladdin's Cave.

Negative S.H. 12 (Hurley).

2. A halt for a few minutes on the tedious haul to Aladdin's Cave.

Negative C. 207 (Mertz).

3. Man-hauling over the ice slopes to Aladdin's Cave.

Negative Q. 791 (Hurley).

4. An early reconnaissance camp on the ice slopes 4 miles south of Cape Denison.

Negative Q. 794 (Hurley).

PLATE XLVI.

The Hut was usually festooned with damp clothes hung up to dry. Bage is seen mending his reindeer sleeping bag.

Negative W. 48 (Hurley).

PLATE XLVII.

Fig. 1. The meteorologists, visiting the Meteorological Screen, find it hard work pushing their way against a gale of wind.

Negative H. 135 (Hurley).

2. The meteorologists experienced great difficulty in attending to the instruments in the face of the extremely violent winds prevailing at Cape Denison. Madigan and Hodgeman are here seen working their way up in the lee of the rocks to the wind-direction recorder.

(Cinematograph film.)

3. Madigan is seen struggling with the Snow-Gauge in a high wind. The snow has been got safely into the bag which Hodgeman is holding, the problem now being to replace the bucket.

(Cinematograph film.)

4. Madigan and Hodgeman leaving the Screen in a high wind on the return journey to the Hut. Note the angle at which Madigan is leaning out on the wind to preserve equilibrium.

(Cinematograph film.)

PLATE XLVIII.

Fig. 1. Looking north past the Hut to the ice-capped Mackellar Islets. On the partly frozen Boat Harbour can be seen the Tide-Gauge. To the left of the Hut is the flat roof of the hangar.

Negative W. 32 (Hurley).

2. Winter Quarters as seen from the north. On the sky-line on the left is the Meteorological Screen containing the wind-direction recorder. Somewhat to the right of it is to be seen a square structure which is Bage's Transit House. Just beyond and to the right of the figure is the general meteorological screen housing thermometers and hygrographs. A single wireless mast is standing; sections of the other, recently blown down, are seen in the foreground.

Negative F.P. 8 (Hurley).

PLATE XLIX.

Fig. 1. A considerable quantity of ice was required for the Hut to provide sufficient water for the daily domestic requirements. This was quarried from the adjacent glacier. In this photograph the quarryman is seen struggling to reach his pick.

(Cinematograph film.)

2. Picking ice in the face of a high wind. The figure at work is seen leaning on the wind in balanced equilibrium.

Negative (Cinematograph film).

3. Two men are here seen trying to communicate with each other. In the face of this high wind, with heads muffled up in helmets, it was found necessary, even when alongside each other, to shout as loudly as possible.

(Cinematograph film.)

4. In the blizzards at Cape Denison ice quickly formed round the face. When the drift was dense it took but a few moments to form a complete mask over the face.

Negative H. 4 (Hurley).

PLATE L.

Though cooped up so much in the Hut owing to the adverse weather, a steady programme of scientific work continued. The figures, from left to right, are Mertz, McLean, Madigan, Hunter, Hodgeman.

Negative W. 152 (Hurley).

PLATE LI.

Fig. 1. Every lull in the almost ceaseless blizzard was made full use of, in advancing the erection of the wireless masts.

Negative W. 184 (Hurley).

2. The wireless transmitting and receiving equipment installed during 1912 in a corner of the workshop. Hannam is seen listening in.

Negative H. 249 (Hurley).

PLATE LII.

Fig. 1. Evening recreation in the Hut. The figures are: Around the table, from left to right—Stillwell, Close, McLean, Hunter, Hannam, Hodgeman, Laseron, Bickerton, Mertz, Bage. Standing, from left to right—Mawson, Madigan, Murphy, Ninnis, Correll.

Negative W. 74 (Hurley).

2. As the whiskers grew apace there was much clipping to be done. The figures, from left to right—Bage, Stillwell, McLean, Madigan, Hodgeman, Hunter and Hurley.

PLATE LIII.

Fig. 1. The Hut and wireless masts as erected in the spring of 1912. Large grounded icebergs are in view to the north.

Negative S.H. 2 (Hurley).

2. View looking west from Cape Denison.

Negative S.H. 65 (Hurley).

PLATE LIV.

Fig. 1. The sledge, cached in March, 1912, on the ice slopes 1,500 feet above sea-level south of Winter Quarters, as found on August 10th following. Note how the ice is undercut beneath the runners on the windward side and the mound of hard névé accumulated on the lee side of the sledge.

Negative H. 592 (Mawson).

2. Bage is seen cooking the hoosh in Aladdin's Cave. Hurley is reclining in the sleeping bag on the right.

Negative C. 12 (Mertz).

PLATE LV.

Fig. 1. The air-tractor, a converted aeroplane. Bickerton is standing by it.

Negative H. 475 (Hurley).

2. At work in the hangar repairing the air-tractor which was seriously damaged on the voyage from Hobart. The figures, from left to right, are Bage, Ninnis, Bickerton.

Negative W. 49 (Hurley).

PLATE LVI.

Fig. 1. The first stage in erecting a tent in a high wind is to quarry plenty of heavy ice blocks, which are subsequently to be stacked on the flounce of the tent.

(Cinematograph film.)

2. The second stage is to transfer heavy bags of food from the sledge to a point immediately to windward of the tent. These also are to be used to weight the tent flounce.

(Cinematograph film.)

3. The third stage. All is now in preparation for erecting the tent. The ice blocks and the food bags are stacked to windward of the tent site. Holes have been cut in the ice in the proper places to receive the five tent legs. The head of the tent is pointed to windward. One man is inside the tent and with the aid of straps firmly grasps the centre windward leg. The other two men grasp the tent from without. At the given signal, all three men work in unison, lifting the peak, the man inside devoting his whole energies to holding the centre windward leg in its niche in the ice. Without releasing hold on the tent, the men outside contrive in a flash to transfer the food bags on to the tent's flounce. They then quickly follow up with blocks of ice. Not until the windward side of the tent is thus firmly secured, do the men outside pay attention to the leeward side of the tent. When this has been done, and not until then, the man inside the tent continues to devote his whole energy to holding the windward leg firm.

(Cinematograph film.)

4. The men outside the tent are here hurriedly piling further blocks of ice around the flounce of the tent.

(Cinematograph film.)

PLATE LVII.

Fig. 1. Antarctic Penguins, both Adelie and Emperor, knowing no enemies on the land, appear to regard man as another form of penguin, for, like themselves, he stands upright on two legs. They are here seen squawking loudly, trying to communicate with Hunter.

Negative H. 607 (Hurley).

2. Snow Petrels nest in tunnels beneath and between the rocks. This one was photographed when just emerging from its shelter.

Negative H. 59 (Hurley).

PLATE LVIII.

Fig. 1. Aladdin's Cave was excavated in the ice below this spot, where a mound of debris has accumulated.
Negative H. 2 (Hurley).

2. Dr. Mertz emerging from Aladdin's Cave. The canvas cover of the entrance is hinged back behind him. There also are to be seen two canvas bags, each containing a fortnight's food for three men.
Negative H. 552 (Hurley).

PLATE LIX.

A summer view looking towards the Hut from the fractured and heaved-up, frozen surface of the Boat Harbour at Cape Denison. The rising slopes of the inland ice sheet are seen in the background. A dark line across the lower part of the slopes indicates the upward limit of morainic matter. The wireless masts are as re-erected in the summer of 1913.
(Hurley.)

PLATE LX.

Fig. 1. Sledging on the higher plateau near Aurora Peak. The figures are, from left—Hodgeman, Madigan.
Negative Q. 254 (Mawson).

2. Ninnis and the dogs sledging a heavy load of stores to Aladdin's Cave.
Negative.

PLATE LXI.

Fig. 1. Adelie Penguins mated on their nests about November 1st.
Negative S.H. 26 (Hurley).

2. Here is an Adelie Penguin which has been buried during a summer blizzard, and on emergence, still has cakes of ice and snow frozen on it.

PLATE LXII.

Fig. 1. On their first arrival at the rookeries after long absence during the winter, Adelie Penguins come ashore sleek and fat. They are here shown arrived at Cape Denison in the middle of October.
Negative S.H. 23 (Hurley).

2. One of the Adelie Penguin rookeries at Cape Denison. Photograph taken early in the season.
Negative P. 262 (Hunter).

PLATE LXIII.

View from the west side of the Boat Harbour looking west across Commonwealth Bay. The *Aurora* at anchor, and Bearing Bluff, a prominent point of the ice cliffs, is seen near the left-hand side of the picture.
Negative W. 151 (Hurley).

PLATE LXIV.

Fig. 1. Occasionally during the autumn the heavy swell from the north reaches Cape Denison; then seas breaking over the coast throw up along the shore a good deal of kelp which grows in abundance in the shallower off-shore waters.
Negative C. 324 (Mertz).

2. Weddell Seals of the Antarctic are particularly tame creatures.
Negative Q. 394 (Watson).

3. Weddell Seals basking on the shore near Cape Denison.
Negative Q. 633 (McLean).

4. Weddell Seals on the Mackellar Islets.
Negative H. 512 (Hurley).

PLATE LXV.

Fig. 1. Pancake-ice below the coastal cliffs at Commonwealth Bay.
Negative W. 68 (Hurley).

2. The gneissic rocks of Memorial Hill viewed from the east. On the summit is the cross erected in memory of Dr. Mertz and Lieutenant Ninnis.
Negative C.H. 60 (Correll).

PLATE LXVI.

Fig. 1. The dogs tethered during a halt on the Far-East sledge journey.
Negative Q. 252 (Mawson).

2. The East Coast Party, the Far-East Party and Stillwell's Supporting Party breaking camp on the Plateau, November, 1912.
Negative Q. 636 (McLean).

PLATE LXVII.

Fig. 1. The East Coast and the Far-East Parties camped on the Plateau, November 16th, 1912.
Negative Q. 664 (McLean).

2. The Far-East Party sledging across the Plateau; photographed immediately after parting with the East Coast Party.
Negative Q. 719 (McLean).

PLATE LXVIII.

Fig. 1. Aurora Peak. Madigan's Party in the foreground.
Negative Q. 656 (McLean).

2. Aurora Peak. In the foreground Madigan and Correll.
Negative Q. 655 (McLean).

3. Madigan's Party ascending Aurora Peak.
Negative Q. 659 (McLean).

4. Arrived at the summit of Aurora Peak. The figures, from left, are Correll and Madigan.
Negative Q. 642 (McLean).

PLATE LXIX.

Fig. 1. The East Coast Sledge Party. Madigan takes a sun observation for latitude.
Negative Q. 638 (McLean).

2. The East Coast Sledge Party. The drift around the tent after a blizzard.
Negative Q. 637 (McLean).

3. East Coast Sledge Party breaking camp.
Negative Q. 646 (McLean).

4. The King George Land coast near Penguin Point.
Negative Q. 652 (McLean).

PLATE LXX.

Fig. 1. Penguin Point, King George Land.
Negative Q. 702 (McLean).

2. The coastline on the west side of Murphy Bay, King George Land.
Negative Q. 714 (McLean).

PLATE LXXI.

Fig. 1. The East Coast Sledge Party sledging across the sea-ice 30 miles from the coastline of King George Land.
Negative Q. 668 (McLean).

2. The East Coast Party working the sledge through hummocky pressure-ice east of the Ninnis Glacier Tongue.
Negative Q. 722 (McLean).

PLATE LXXII.

Fig. 1. A pressure pinnacle in the sea-ice north of King George Land. Madigan's Party in the foreground.
Negative Q. 705 (McLean).

2. Madigan's East Coast Sledge Party on the sea-ice north of King George Land.
Negative Q. 80 (McLean).

PLATE LXXIII.

Fig. 1. The East Coast Sledge Party established a depot on the Ninnis Glacier Tongue. Figures from left are Correll, Madigan.
Negative Q. 704 (McLean).

2. A recently frozen lane in the sea-ice north of Horn Bluff. The coast at Horn Bluff appears in the distance on the left.
Negative Q. 708 (McLean).

Plate LXXIV.

Fig. 1. The East Coast Party sledging south across the sea-ice towards Horn Bluff, which is seen in the distance.

Negative Q. 717 (McLean).

2. The columnar dolerite cliffs at Horn Bluff. The scree slope below covers a coal-bearing sedimentary formation.

Negative Q. 841 (McLean).

Plate LXXV.

Fig. 1. View from below looking up at the thousand-feet high cliffs at Horn Bluff. Below is the scree slope with projecting beacons of sandstone of the coal-bearing series. Above is the dolerite in columnar structure.

Negative Q. 695 (McLean).

2. The East Coast Party's camp on the sea-ice below Horn Bluff. Beacons of sandstone can be seen outcropping from the scree slope. Above are the 650-feet high columns of dolerite.

Negative Q. 842 (McLean).

Plate LXXVI.

Fig. 1. View near Penguin Point showing the actual junction with the sea. Here very young sea-ice is seen covering a recent pool on the sea-front.

Negative Q. 700 (McLean).

2. The actual rock outcrop named Penguin Point. The figures, from left to right—Correll, Madigan.

Negative Q. 718 (McLean).

Plate LXXVII.

Fig. 1. The Southern Party and the Southern Supporting Party camped on the Plateau.

Negative H. 616 (Hurley).

2. The Southern Supporting Party. From left to right—Hunter, Murphy, Laseron.

Negative Q. 788 (Hurley).

Plate LXXVIII.

At 6^7 miles from Cape Denison, the Southern Party deposited a considerable amount of food as a depot. This was marked by a high and rather elaborate beacon, seen on the right of the picture.

Negative H. 527 (Hurley).

2. At the Nodules. The otherwise smooth surface of the Plateau is here shown heaved-up and broken. The Southern Party roped up to examine this unusual feature.

Negative Q. 680 (Hurley).

PLATE LXXIX.

Fig. 1. The Southern Party's 301-mile camp on the high Plateau. Figures from left to right are Webb and Bage.

Negative Q. 671 (Hurley).

2. The wind-weathered surface of the Plateau at 278 miles out from Cape Denison. The Southern Party are here seen returning to Winter Quarters. They were then travelling with the wind and found the sail of great help. The figures are Webb and Bage.

Negative Q. 682 (Hurley).

PLATE LXXX.

Fig. 1. An incident in Stillwell's coastal survey journey east of Winter Quarters; on the coastal ice slopes looking north over Cape Gray.

Negative Q. 508 (Laseron).

2. A lunch camp looking east over Watt Bay; Stillwell's near-east survey journey.

Negative Q. 519 (Laseron).

3. Madigan Nunatak from the west. The névé ramps rise higher on the west side than on the east.

Negative Q. 515 (Laseron).

4. The Near-East Party camped on the eastern side of Madigan Nunatak.

Negative Q. 34 (Laseron).

PLATE LXXXI.

Fig. 1. The first sight obtained by the Near-East Party of the islands and drift-ice off the coast, near Cape Gray.

Negative Q. 516 (Laseron).

2. A large island immediately under the ice cliff between Garnet Point and Cape Pigeon Rocks.

Negative Q. 511 (Laseron).

3. Outcrop at Cape Pigeon Rocks.

Negative Q. 523 (Laseron).

4. Ice cliff coastline and off-lying islets north-west of Mount Hunt.

Negative Q. 525 (Laseron).

PLATE LXXXII.

Fig. 1. Garnetiferous gneiss at Garnet Point. The figure is Stillwell.

Negative Q. 524 (Laseron).

2. View looking east from Cape Gray.

Negative Q. 536 (Laseron).

PLATE LXXXIII.

Fig. 1. View from Garnet Point, looking towards the land-ice.

Negative Q. 533 (Laseron).

2. View from Cape Pigeon Rocks looking south.

Negative Q. 539 (Laseron).

3. A Cape Pigeon nesting at Cape Pigeon Point.

Negative Q. 14 (Laseron).

4. View at Cape Gray; on the east side.

Negative Q. 522 (Laseron).

PLATE LXXXIV.

Aurora Peak, seen in the middle distance, is here viewed from near the summit of Mt. Murchison. The figures, left to right—Madigan, Hodgeman.

Negative Q. 799 (Mawson).

PLATE LXXXV.

Fig. 1. The Western Base Hut was erected on the Shackleton Ice-shelf about 600 yards back from the cliff edge. The framework was secured to wooden stumps let down into the ice surface.

Negative P. 111 (Watson).

2. The Western Base Hut begins to take form.

Negative P. 112 (Watson).

3. The Western Base Hut immediately after completion, as viewed from the south. Already drift snow is piling high against the walls.

Negative P. 110 (Watson).

PLATE LXXXVI.

Fig. 1. Departure from the Western Base Hut on the autumn depot-laying journey. The Hut is already seen to be deeply buried in snow. At this time two wireless masts were erected.

Negative P. 186 (Watson).

2. Digging out the sledge camp after heavy drift.

PLATE LXXXVII.

Fig. 1. Already in early autumn the Western Base Hut was deeply buried in drift snow.

Negative Q. 363 (Wild).

2. The Hut and surroundings later in the autumn. The Magnetic Igloo is seen in the distance on the left. One of the wireless masts is blown away; the other is maintained as a lookout and sledging beacon. The men are seen hauling up sledge loads of snow from "The Grottoes" below the level of the glacier surface.

Negative P. 195 (Watson).

PLATE LXXXVIII.

Fig. 1. On fine clear days a ramp entrance to the underground grottoes was opened up as an exit for sledging out accumulations of snow and rubbish from below. The figures, from left to right are Kennedy, Watson.

Negative H. 412 (Hoadley).

2. This protective snow house was built over a vertical shaft which the geologists sank down into the shelf-ice with the object of studying this structure.

Negative H. 252 (Hoadley).

3. Ice was quarried from the glacier at some little distance from the Hut. Stocks of this clean ice were stacked at the Hut for melting down for the domestic water supply.

Negative H. 251 (Hoadley).

4. Members of the Western Base Party obtained much recreation and amusement during winter skiing down the ice ramps which led from the shelf-ice to the floe.

Negative H. 177 (Hoadley).

PLATE LXXXIX.

Fig. 1. Showing equipment stored in a portion of the enclosed ambulatory surrounding the Hut. Very soon after the erection of the Hut, this was, of course, buried deeply under the snow.

Negative S.P. 3 (Watson).

2. Looking from the enclosed verandah along the snow tunnel which led to the exit. To gain exit one climbed out by the ladder.

Negative S.P. 1 (Watson).

PLATE XC.

Fig. 1. The wind-weathered face of the Shackleton Shelf as seen in the autumn from the sea-ice.

Negative H. 182 (Hoadley).

2. View of the unbroken sheet of sea-ice below the Shackleton Shelf. Three men sledging across the sea-ice can be seen in the middle distance.

Negative Q. 106 (Watson).

PLATE XCI.

Fig. 1. Sledging on the unbroken sea-ice west of the Shackleton Shelf.

Negative P. 264 (Watson).

2. Dinner on Mid-Winter Day at the Grottoes. From left to right, back row, Hoadley, Dovers, Watson, Harrisson; front row, Jones, Moyes, Kennedy; at the end of the table, Wild.

Negative P. 21 (Watson).

PLATE XCII.

Fig. 1. The Western Base Hut in mid-winter. A lantern illuminates the snow tunnel below; above it the lid of the vertical exit is seen to be raised. At the summit is a mound of ice formed around the chimney illuminated in one spot by a fleck of light from the fire below.

Negative H. 550 (Hoadley).

2. A corner of the Hut. The personal belongings of the occupant adorned the walls above each of the bunks.

Negative H. 409 (Hoadley).

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PLATE XCIII.

Fig. 1. Avalanche Rocks on the coast of Queen Mary Land. The land ice-cap is continually riding over the top of this rock outcrop and plunging below as periodic avalanches.

Negative Q. 368 (Wild).

2. Kennedy, the magnetician, is here seen standing at the Hut end of the long life-line extending out to the Magnetic Igloo just visible in the distance.

Negative Q. 269 (Wild).

PLATE XCIV.

Fig. 1. Sledging on the sea-ice below the brink of the Shackleton Shelf in early autumn.

Negative S.P. 13 (Watson).

2. In summer time tide-cracks may be found at certain points along the margin of the Shackleton Shelf. Seals and penguins are here seen in the distance.

Negative Q. 104 (Watson).

PLATE XCV.

Fig. 1. Young Emperor Penguins on the sea-ice adjacent to the Shackleton Shelf.

Negative Q. 259 (Moyes).

2. Young Adelie Penguins, mostly white-throats, on the sea-ice below the Shackleton Shelf.

Negative Q. 384.

PLATE XCVI.

Fig. 1. Wild's Eastern Sledge Party. From left to right, Kennedy, Harrisson, Wild, Watson.

Negative P. 33 (Watson).

2. Wild's Eastern Party sledging over the Shackleton Shelf ice. From left to right, Kennedy, Harrisson, Wild.

Negative P. 214 (Watson).

PLATE XCVII.

Fig. 1. The Eastern Sledge Party at Depot A. In the distance on the left is Delay Point; on the right is Hippo Island.

Negative P. 80 (Watson).

2. Camp on the Shackleton Shelf ice near Delay Point. The rock outcropping in the distance is Delay Point. Note the dogs are sitting with their backs to the cold wind off the land.

Negative P. 205 (Watson).

3. This large boulder of gneiss is part of a moraine which trails away from Avalanche Rocks, which are to be seen in the distance showing dimly through the mist.

Negative P. 160 (Watson).

PLATE XCVIII.

Fig. 1. The northernmost of Gillies Islands. The great moat seen on the left of the picture is on the east side of the rock mass. The ramp trails away on the west to north-western side. View taken from a position nearly north of the rock.

Negative P. 79 (Watson).

2. Alligator Island, as viewed from a point about north to north-east of it. There is a moat on the east to south-east side.

Negative P. 113 (Watson).

PLATE XCIX.

Fig. 1. Camped on the shelf ice north of Watson Bluff, David Island. Lat. 26° 20′ S., Long. 98° 50′ E. In the distance can be seen the shattered ice of the lower Denman Glacier.

Negative P. 216 (Watson).

2. Hippo Island from the north. Delay Point, on the coast of the mainland, is seen in the distance on the left.

Negative P. 188 (Watson).

PLATE C.

Fig. 1. In the shatter zone of the lower Denman Glacier. The figures from left to right—Harrisson, Kennedy, Wild.

Negative P. 83 (Watson).

2. Traversing the serac-ice of the lower Denman Glacier.

Negative P. 171 (Watson).

PLATE CI.

Fig. 1. Hauling sledges through the fracture zone of the lower Denman Glacier.

Negative P. 62 (Watson).

2. Traversing the rough ice of the lower Denman Glacier.

Negative P. 103 (Watson).

PLATE CII.

Fig. 1. The end of the trail into the broken zone of the lower Denman Glacier. The tent is seen in the distance.

Negative P. 88 (Watson).

2. In the bergschrund zone near Cape Gerlache.

Negative P. 85 (Watson).

PLATE CIII.

Fig. 1. Whilst camped on Possession Rocks, Wild raised the Union Jack and formally took possession of the great new land, Queen Mary Land.

Negative P. 87 (Watson).

2. This camp near Mt. Barr Smith was the furthest point reached by Wild's Eastern Sledge Party. In the foreground are seen their sledge tracks through the deep soft snow. Mt. Barr Smith is seen in the distance.

Negative P. 65 (Watson).

PLATE CIV.

Fig. 1. The Western Sledge Party from the Grottoes. The figures from left to right—Hoadley, Jones, Dovers.

Negative H. 86 (Moyes).

2. View along the margin of the mainland near the Rookery Islands. In the foreground is exposed a rocky moraine.

Negative H. 241 (Hoadley).

PLATE CV.

Fig. 1. Looking south from Haswell Island. In the foreground is a large erratic. Other islets are seen in the distance and the rising slopes of the ice-cap of the mainland form the distant horizon.

Negative H. 240 (Hoadley).

2. The ice-eroded surface of Haswell Island. Large icebergs are seen in the distance, firmly held in the unbroken sea-ice.

Negative H. 234 (Hoadley).

PLATE CVI.

Fig. 1. Emperor Penguins on the sea-ice.

Negative Q. 398.

2. Dr. Jones arrives at the summit of Gaussberg.

Negative H. 244 (Hoadley).

3. A corner of the Emperor Penguin rookery on the sea-ice adjacent to Haswell Island.

Negative C. 472 (Hoadley).

4. Cape Pigeons mating amongst the rocks on Haswell Island.

Negative H. 88 (Hoadley).

PLATE CVII.

Fig. 1. View of the shattered land-ice margin from the summit of Gaussberg.

Negative H. 188 (Hoadley).

2. View eastward from the top of Gaussberg. Two Skua Gulls are seen standing on the lava in the foreground.

Negative H. 245 (Hoadley).

PLATE CVIII.

View from the slopes of Wireless Hill looking south over the North End Spit towards the main part of Macquarie Island. In the foreground is the Expedition Hut. The meteorological screen is seen to the right on the Spit in the middle distance. In the distance on the left are other structures erected by sealers. The higher portions of the Island are enveloped in cloud.

Negative (Henderson).

PLATE CIX.

Fig. 1. View from the extremity of the main portion of Macquarie Island looking north across the Isthmus to Wireless Hill. On the lee side of the ridge in the foreground are two sealers' huts. The structure at the near end of the Spit is the sealers' boiling-down works. The white patch at the far end of the Spit below the hill is the Expedition Hut.

Negative Q. 320 (Sandell).

2. The Expedition Hut, which was of simple design, was built at the north end of the Spit in the lee of a protecting rock which broke the force of the fierce westerly gales.

Negative Q. 318 (Sandell).

PLATE CX.

Fig. 1. The wireless masts and aerial erected on the summit of Wireless Hill, 350 feet above sea-level. The distant summit of the Island, seen to the south, is lightly coated with snow.

Negative C. 325 (Sandell).

2. The Expedition Party stationed at Macquarie Island, during years 1912 and 1913. From left to right—Sandell, Ainsworth (leader), Sawyer, Hamilton, Blake.

Negative H. 159 (Blake).

PLATE CXI.

Fig. 1. A winter view of the wireless station on the summit of Wireless Hill. The masts and aerial on the left. On the right can be seen the two huts, the nearer one being the engine-room, the further the operating-house.

2. Sawyer's sending and receiving instruments in the operating-house.

Negative C. 326 (Sawyer).

3. The Wireless Huts; the engine-room nearer, the operating-house further away.

Negative C. 279 (Sandell).

4. The front of Sandell's engine-house. This was erected some distance from the operating-hut, so that the sound of the engine should not interfere with listening in.

Negative C. 278 (Sandell).

PLATE CXII.

Fig. 1. Portion of the wreck of the *Clyde* on the beach at Buckles Bay.

Negative C.Q. 9 (Correll).

2. The summit of Macquarie Island. View looking along the dissected plateau summit of Macquarie Island. Several small lakes are just showing. The line of condensation cloud over the background of the island is characteristic.

Negative Q. 81 (Correll).

3. The luxuriant tussock-grass is a striking feature above the beach line at Macquarie Island.

Negative C.Q. 18 (Correll).

4. Much water cascades down to the sea from the upland lakes.

Negative H. 386 (Blake).

PLATE CXIII.

Fig. 1. G. F. Ainsworth, leader of the Expedition Base at Macquarie Island during 1912–1913, standing at the door of the Hut.

Negative C.Q. 11 (Correll).

2. Members of the Macquarie Island Party on their way down from the Wireless House to the Living Hut. From left to right, Sawyer, Sandell, Hamilton. Sawyer and Sandell have been camped all night on Wireless Hill.

Negative Q. 77 (Correll).

3. L. R. Blake, who was geologist and cartographer of the Expedition Party at Macquarie Island.

Negative H. 128 (Hurley).

4. Blake standing in the snow by the small field tent which he used during his detailed survey of the island.

Negative H. 312 (Blake).

PLATE CXIV.

Fig. 1. The rocky shores of Macquarie Island are encumbered with a gigantic form of kelp, quantities of which get thrown up on the beach during storms. Sandell is seen standing upon a 21-ton gabbro erratic which has been carried by ice across the Island from the West Coast to this spot north of the Nuggets.

Negative H. 364 (Blake).

2. The tussock-grass slopes above the beach are plentifully inhabited by bird and seal life.

Negative C. 90 (Mawson).

PLATE CXV.

Royal Penguins assembled on the Nuggets Beach. A remnant of the wreck of the *Gratitude* cast ashore.

Negative H. 283 (Hurley).

PLATE CXVI.

Fig. 1. The highlands of Macquarie Island as viewed from a point 3 miles N.N.W. of the Hut at Lusitania Bay. In the distance is a glacial lake. In the foreground is a former shallow lakelet now filled in with a peaty plant growth.

Negative H. 355 (Blake).

2. A snowy winter landscape on the highlands of Macquarie Island; in the foreground is to be seen a small glacially-eroded Lake (Island Lake).

Negative H. 359 (Blake).

PLATE CXVII.

Fig. 1. Westerly seas breaking on the beach at Hasselborough Bay, Macquarie Island.

Negative H. 353 (Hamilton).

2. A rookery of Sea-elephants on the west coast of Macquarie Island.

Negative H. 288 (Hamilton).

PLATE CXVIII.

Fig. 1. Raised beach terrace on the west coast, Macquarie Island, near Eagle Point. Notice the arrangement of vegetation (*Stilbocarpa polaris*) in wind rows.
Negative H. 254 (Hamilton).

2. King Penguin rookery on the beach at Lusitania Bay.
Negative.

PLATE CXIX.

Fig. 1. The old sealers' hut at Lusitania Bay. From left to right the figures are Blake and Hamilton.
Negative H. 419 (Blake).

2. The sealers' hut at Sandy Bay. The figure is Blake.
Negative H. 421 (Hamilton).

PLATE CXX.

Fig. 1. Rockhopper Penguin at the nest. The crest is most strikingly developed in this species.

2. Macquarie Island Cormorants and young on the nest.
Negative H. 28 (Hamilton).

3. Gentoo Penguins on the beach at Macquarie Island.
Negative H. 281 (Hamilton).

4. Subantarctic Skua Gulls feeding on the carcass of a Sea-elephant, Macquarie Island.
Negative H. 42 (Blake).

PLATE CXXI.

Fig. 1. Rockhopper Penguins nest in colonies on the steep rocky slopes near the beach, Macquarie Island. Negative H. 260 (Blake).

2. A Cormorant rookery on one of the rocky reefs near Aerial Cove, Macquarie Island.
Negative H. 31 (Hamilton).

PLATE CXXII.

Fig. 1. Royal Penguins on Nuggets Beach. The peaked rocky masses in the distance are known as the Nuggets. In the distance is the *Aurora*.
Negative H. 275 (Hurley).

2. A bull Sea-elephant and some cows on the beach on the west coast of Macquarie Island. Note the raised coastal terrace and the steep face of the Island beyond, formerly the coastal cliffs.
Negative C. 287 (Sandell).

PLATE CXXIII.

Fig. 1. An Albino Royal Penguin and a Sclater Penguin.

Negative H. 575 (Hamilton).

2. During the breeding season bull Sea-elephants spend much of their time fighting. Scene on the beach at Hasselborough Bay.

Negative C. 288 (Sandell).

3. A bull Sea-elephant roaring. These creatures reach immense proportions.

Negative (Henderson).

4. A Sea-leopard on the beach, Macquarie Island. As they are ferocious creatures, Sandell is seen holding a rifle in readiness lest it should give trouble whilst the photographer is operating.

Negative H. 291 (Hamilton).

PLATE CXXIV.

Fig. 1. View over the Boat Harbour at the Main Base Station looking north-west. In the centre foreground is the Transit House and in the left foreground the Living Hut. Point Alden is the distant point of the ice coastline.

Negative R. 192 (Hunter).

2. Robert Bage, the "astronomer," inseparable from his pipe.

Negative H. 92 (Hurley).

3. The framework of the Transit House seen in course of erection. It is to be observed that provision is made for a slot in a meridional direction through the structure. Through this the passage of stars across the meridian was observed. The massive pillar frozen firmly into the ground in the centre of the structure served as the transit stand.

Negative C. 102 (Mawson).

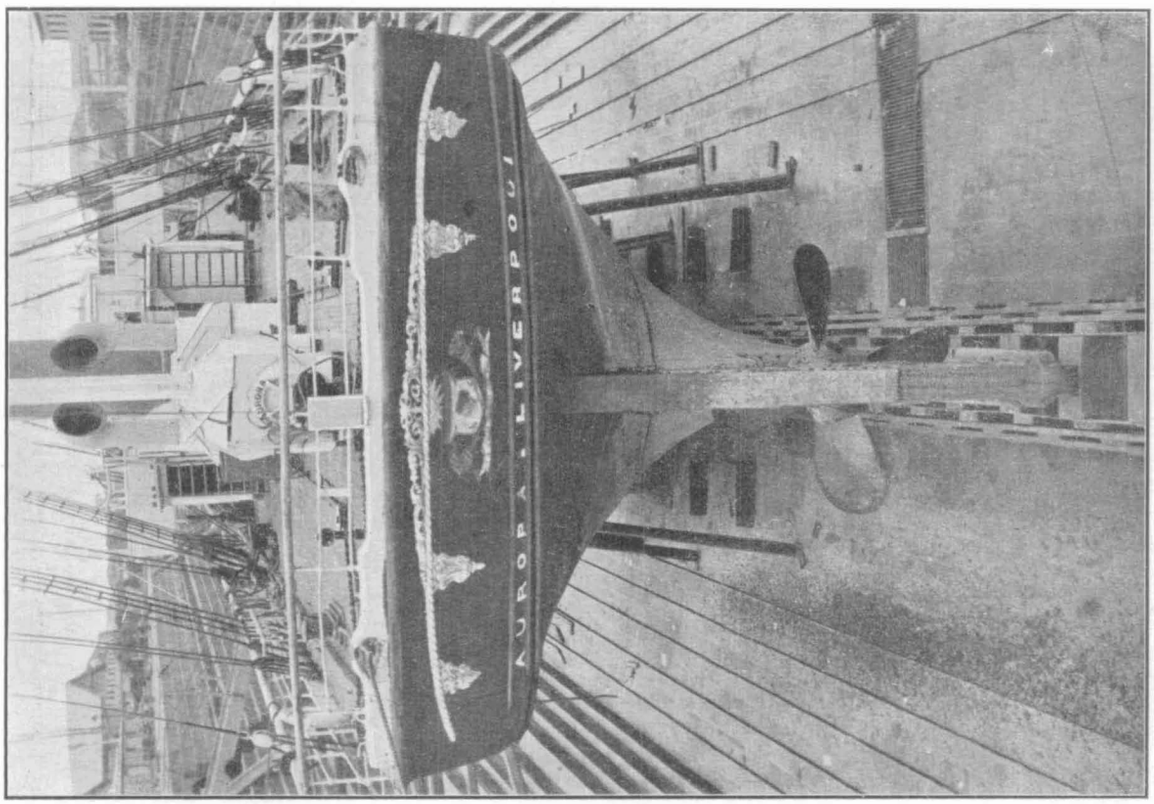

FIG. 2. Showing the stern post and propeller of the *Aurora*.

FIG. 1. Captain John King Davis.

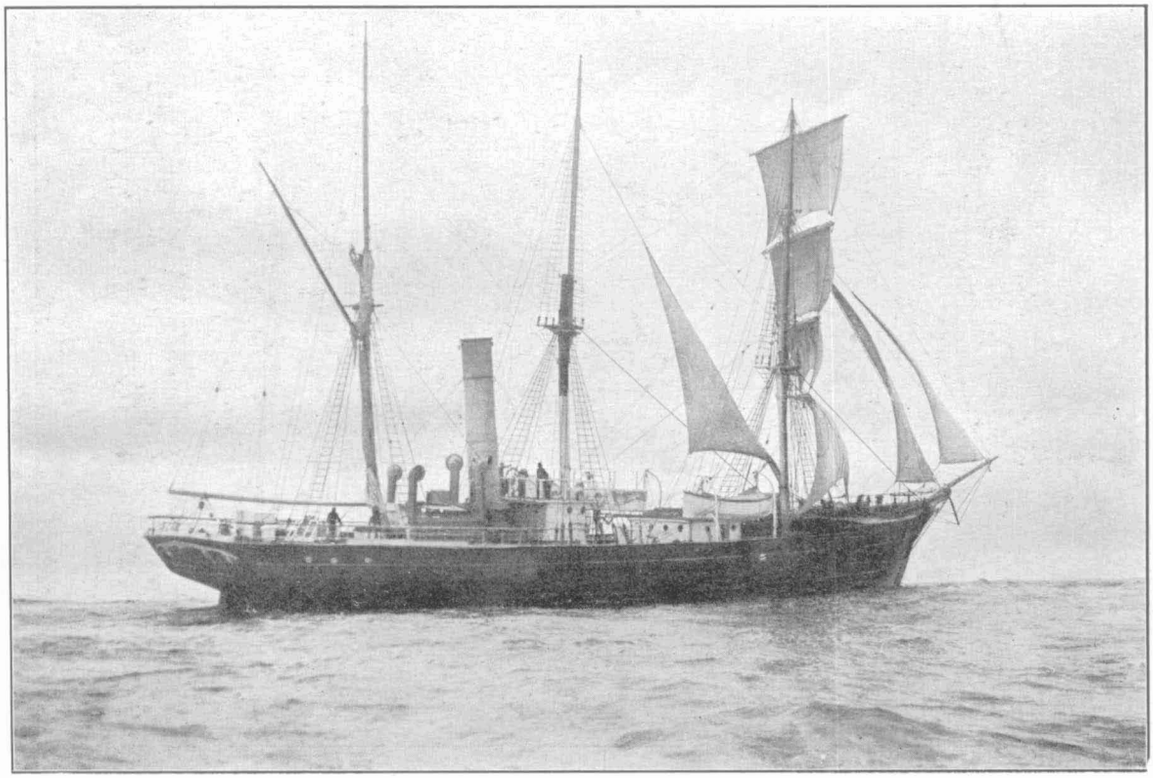

FIG. 1. The *s.y. Aurora.*

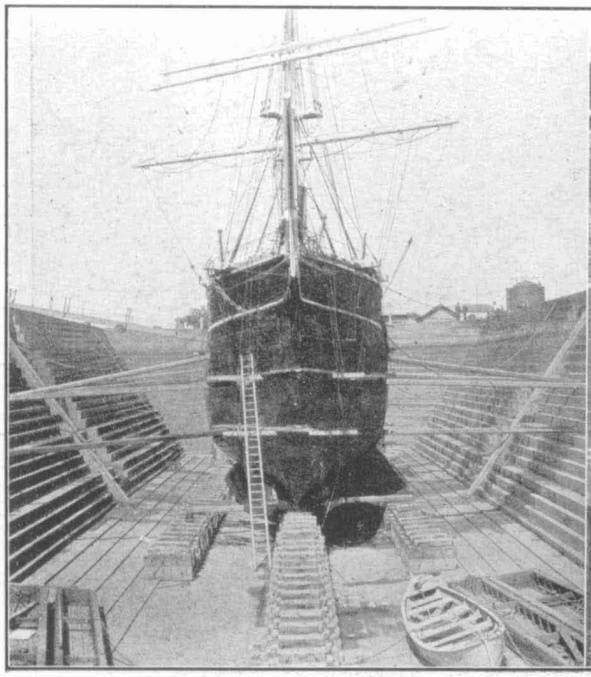

FIG. 2. In dry dock.

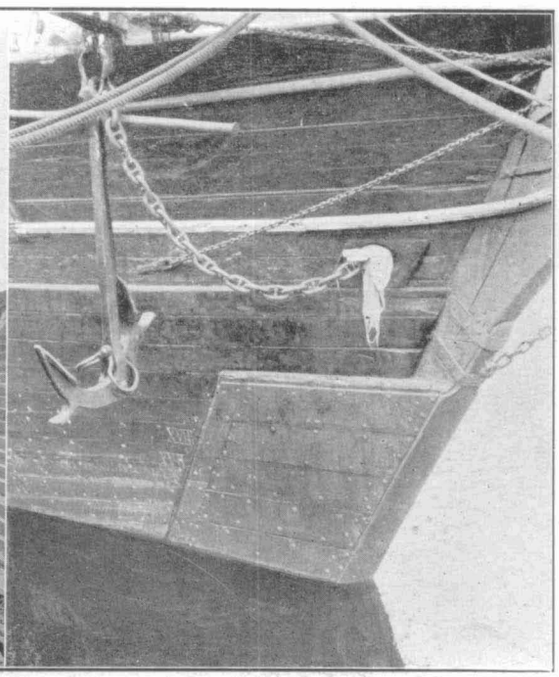

FIG. 3. The armoured bow.

FIG. 1. The moment of departure from Hobart.

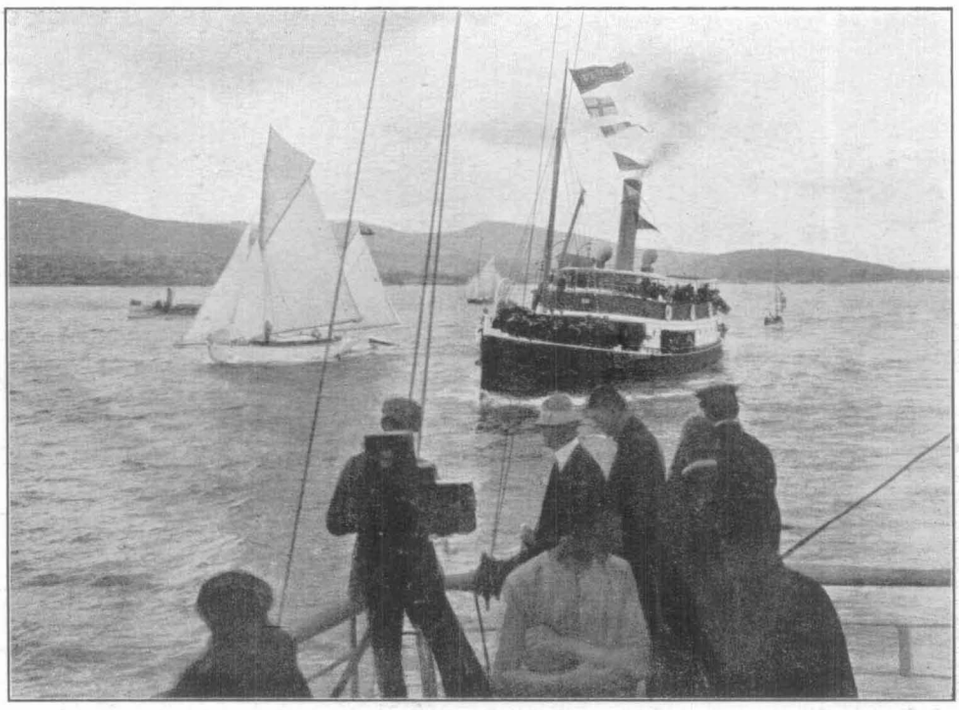

FIG. 2. Friends follow down the Derwent as the *Aurora* heads for the open sea.

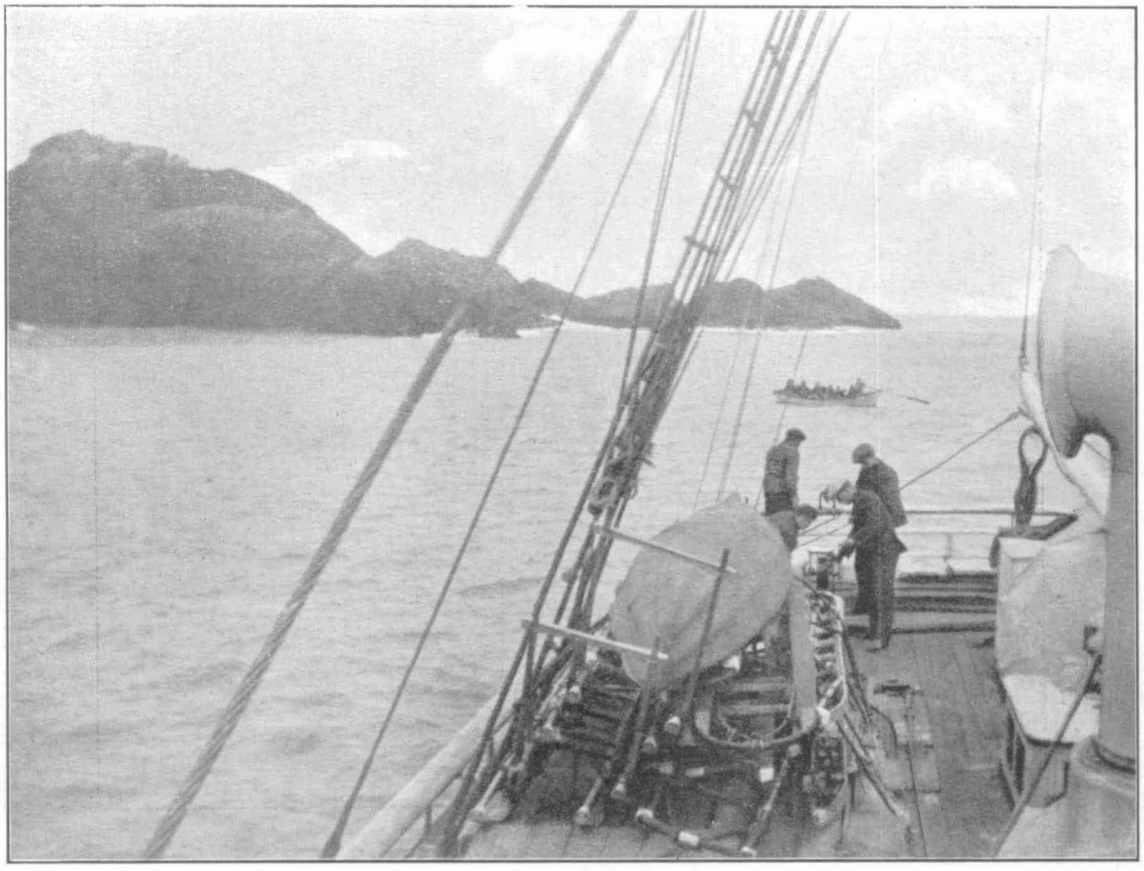

FIG. 1. Off Caroline Cove. We go ashore to reconnoitre.

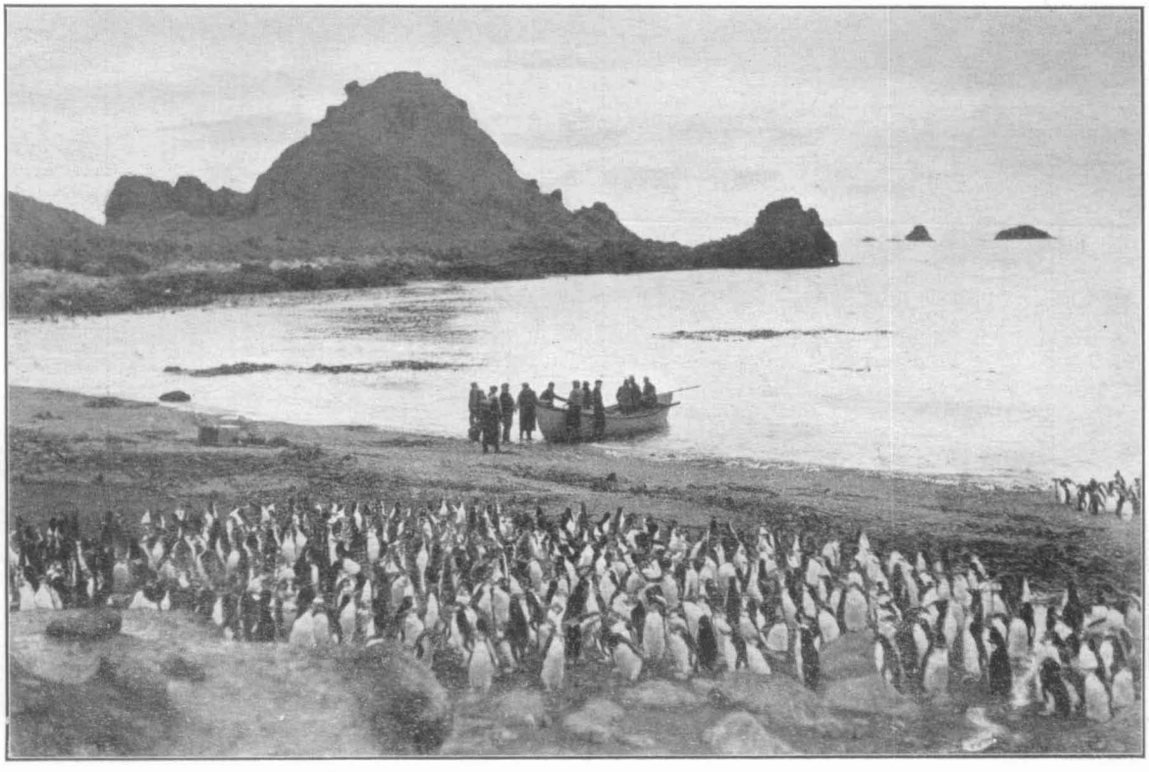

FIG. 2. Landing on the beach at Caroline Cove.

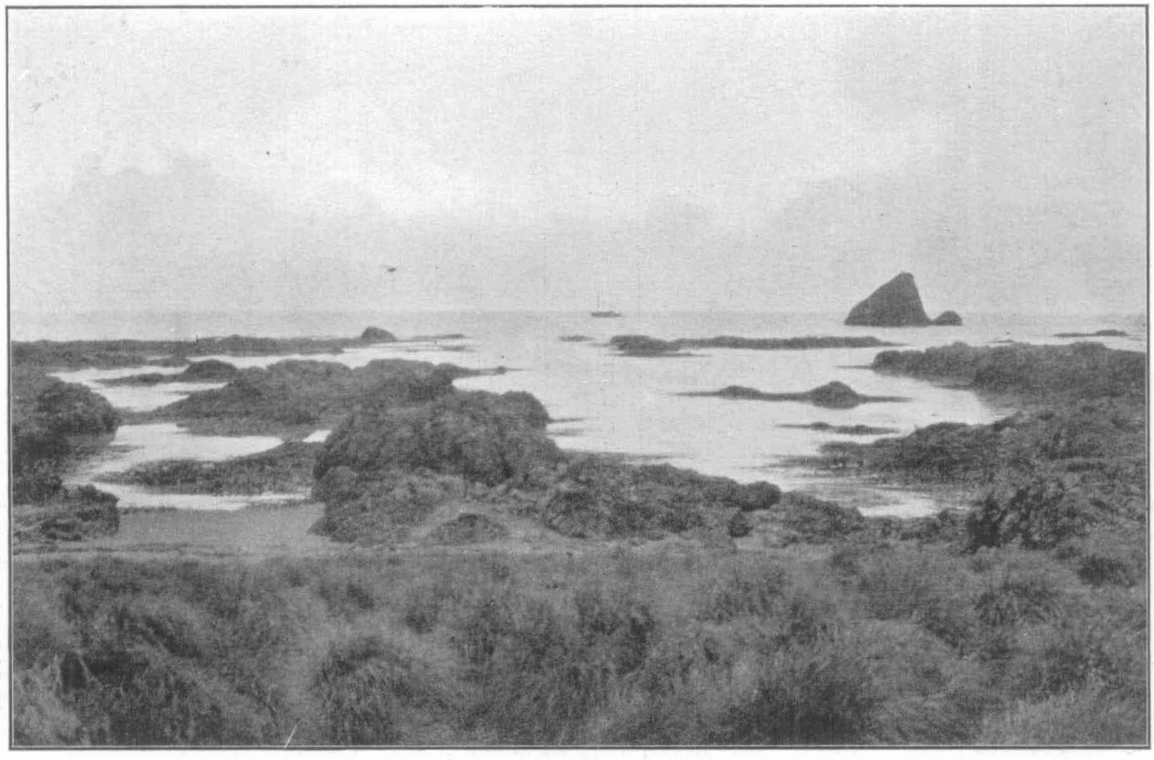

FIG. 1. The *Aurora* at anchor off Aerial Cove.

FIG. 2. The wreck of the *Clyde*.

FIG. 1. The *s.s. Toroa* voyaging to Macquarie Island.

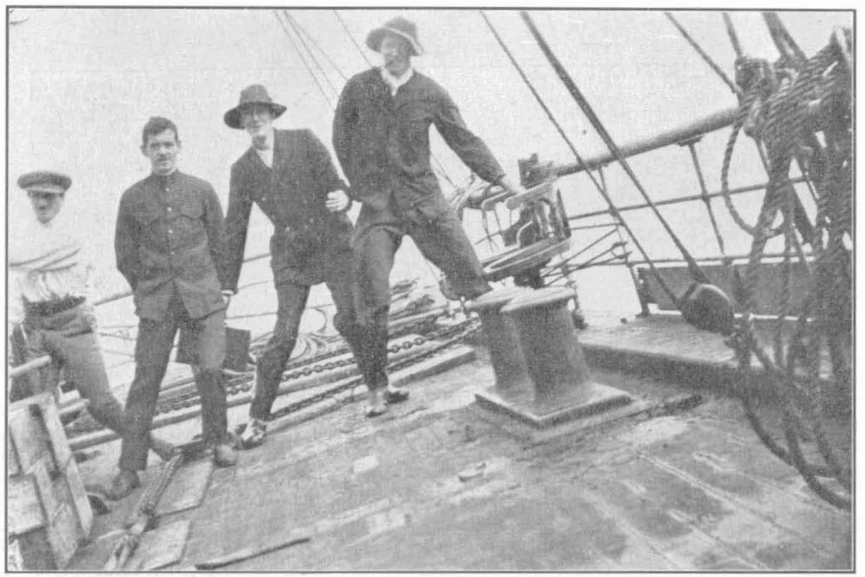

FIG. 2. Rolling through the southern seas.

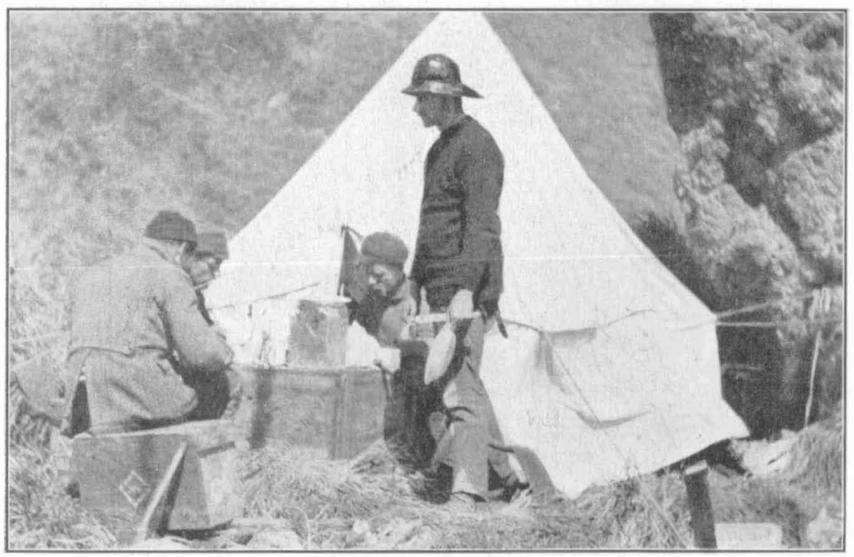

FIG. 3. Camp at the lower end of the "flying fox."

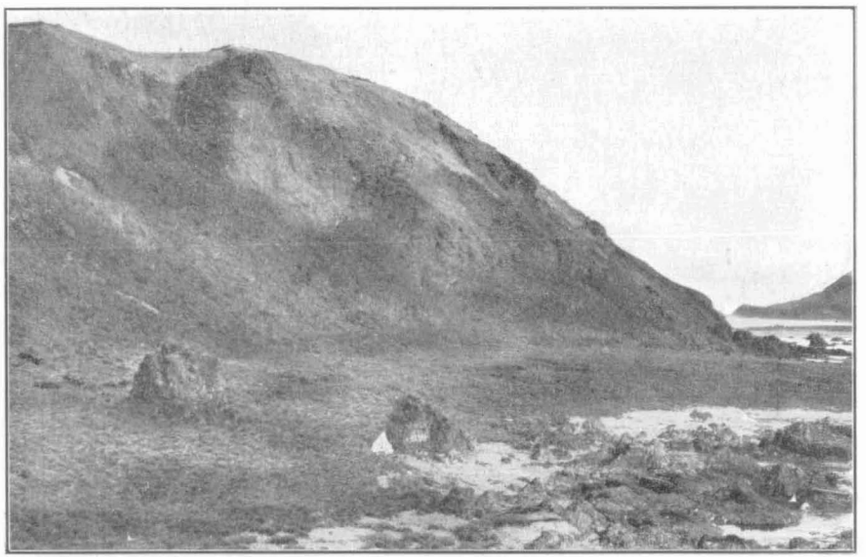

FIG. 4. The "flying fox" hoist to Wireless Hill.

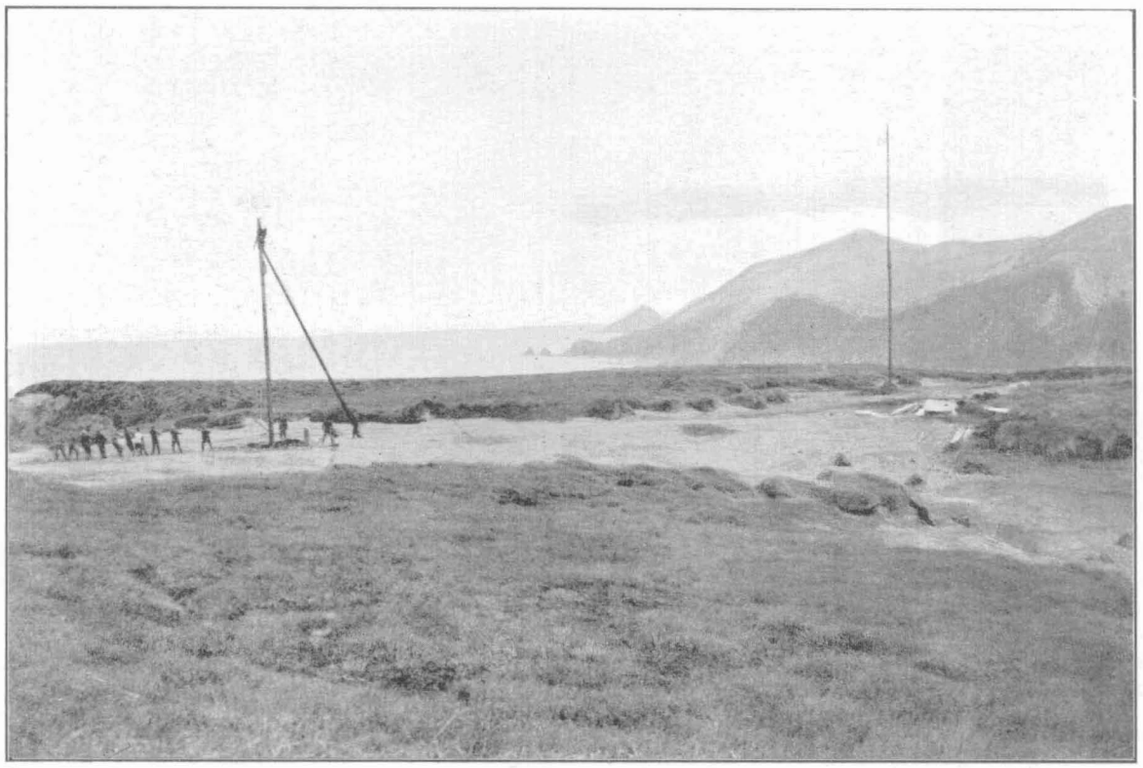

FIG. 1. Erecting the wireless masts.

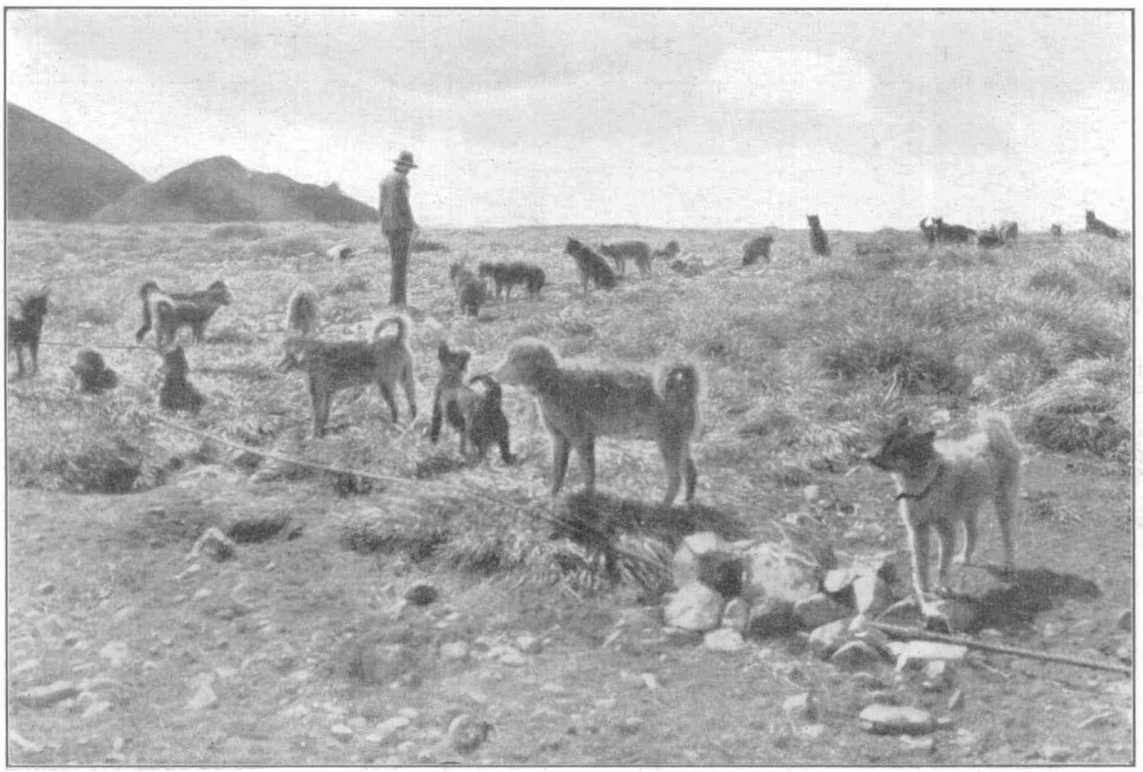

FIG. 2. Sledge dogs ashore at Macquarie Island.

FIG. 2. Frank Wild.

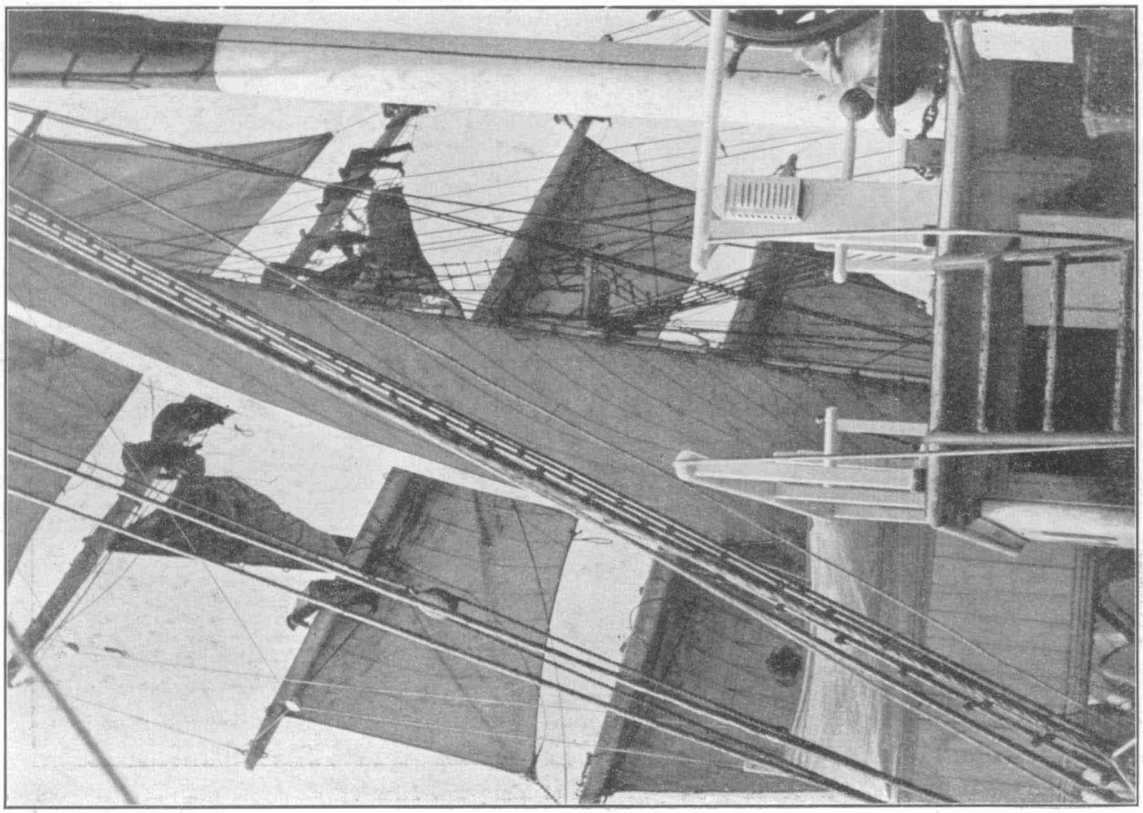

FIG. 1. Setting sail in favourable weather.

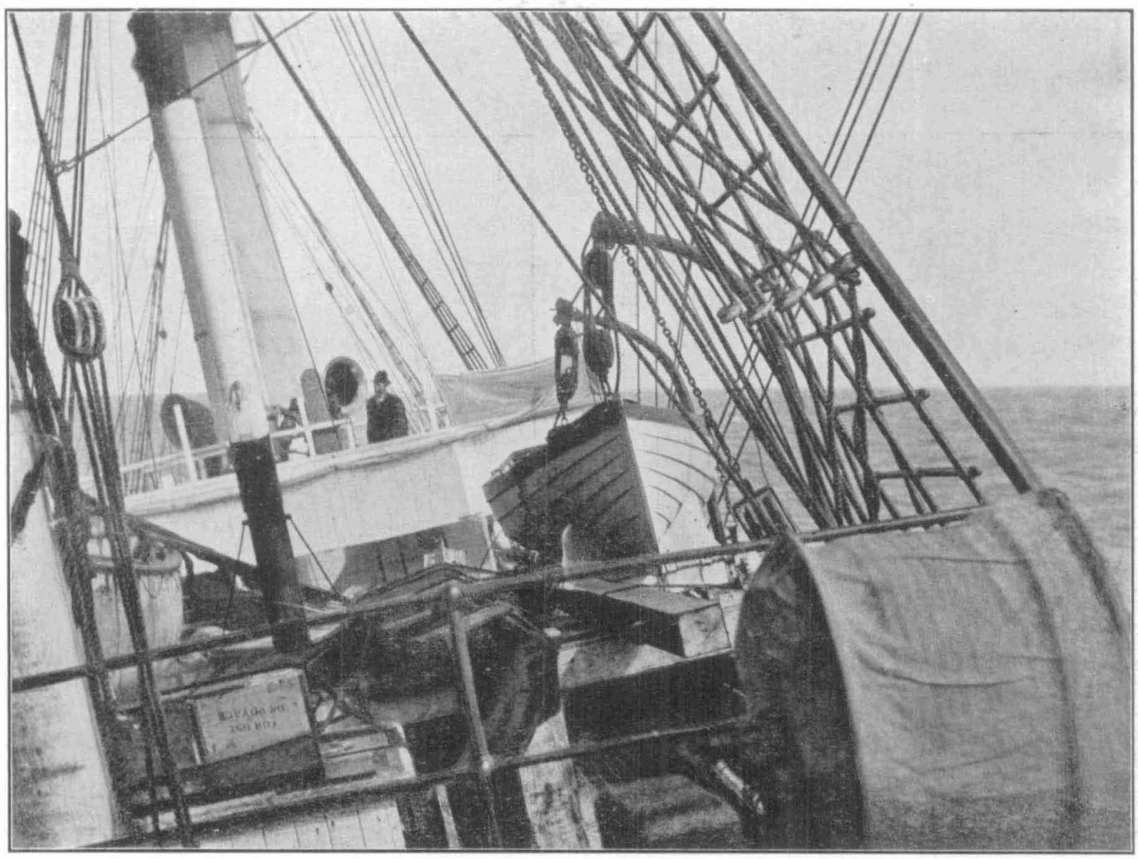

FIG. 1. The *Aurora* rolling lazily on the voyage to the pack-ice.

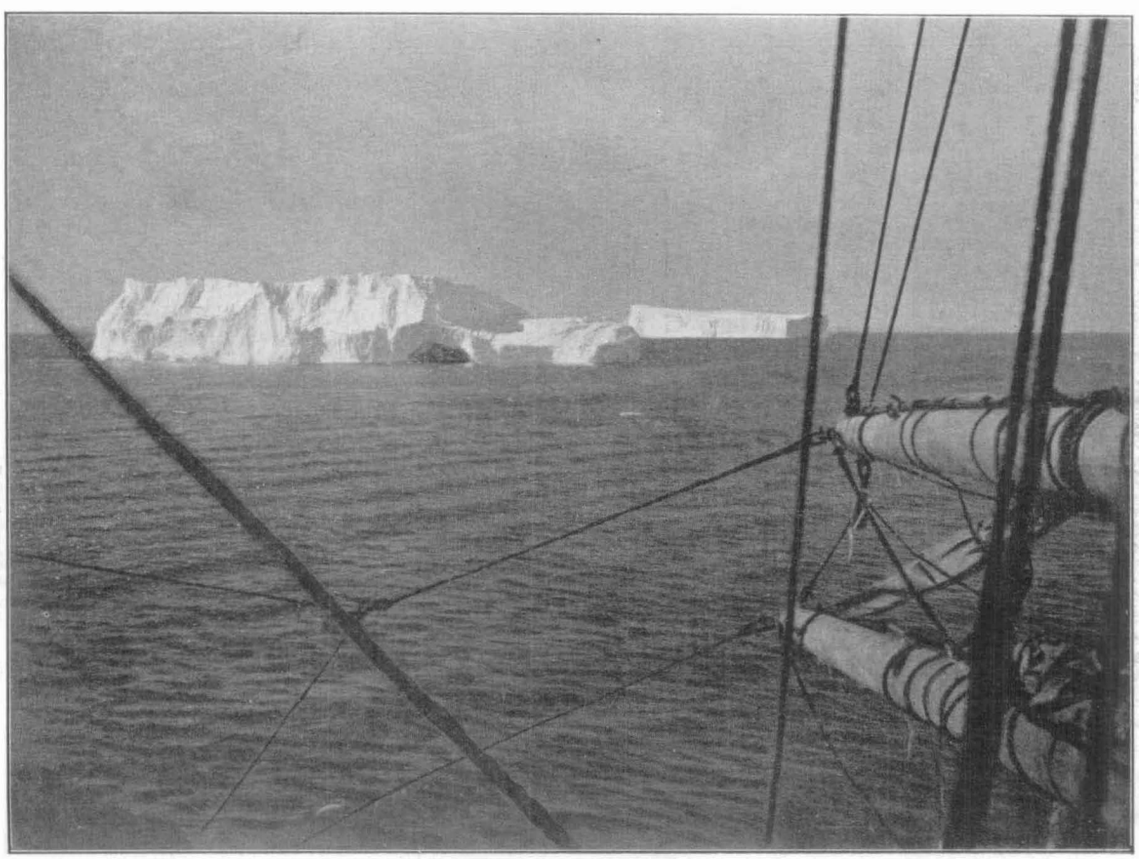

FIG. 2. Icebergs were encountered north of the pack-ice.

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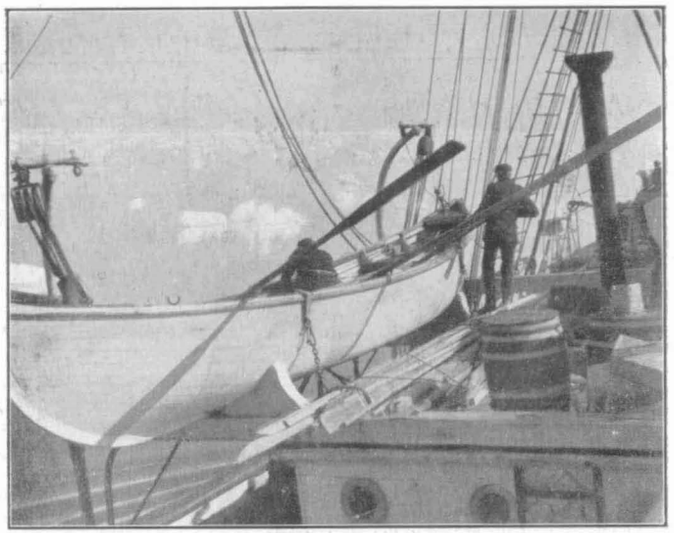

FIG. 1. Loose drift-ice.

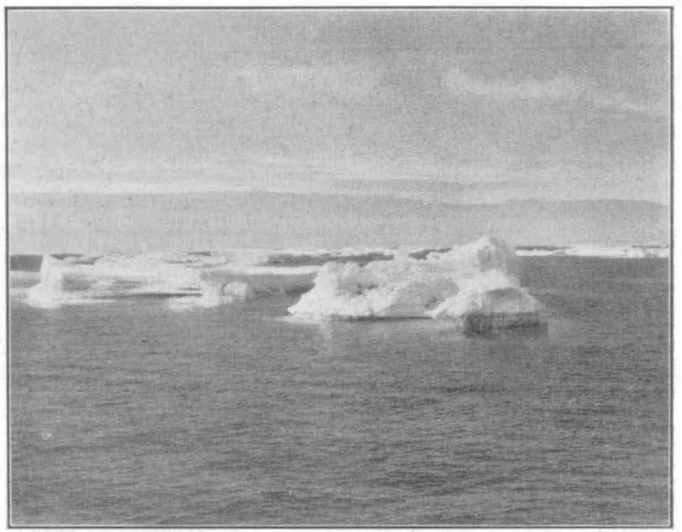

FIG. 2. Heavier elements of the drift-ice.

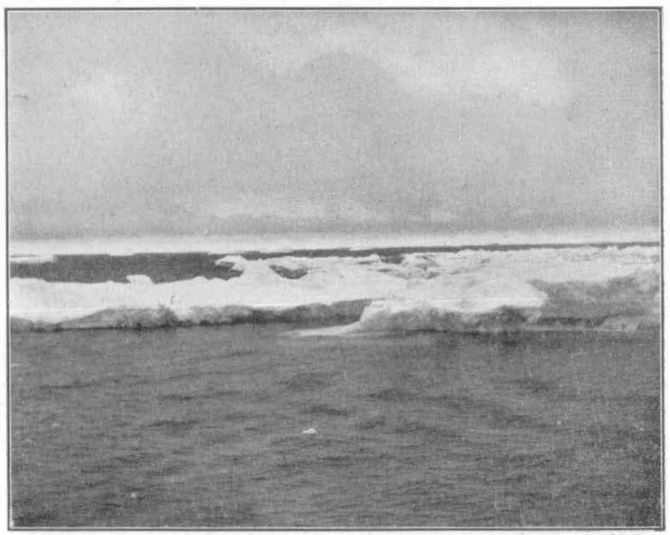

FIG. 3. Ice blink over the pack-ice.

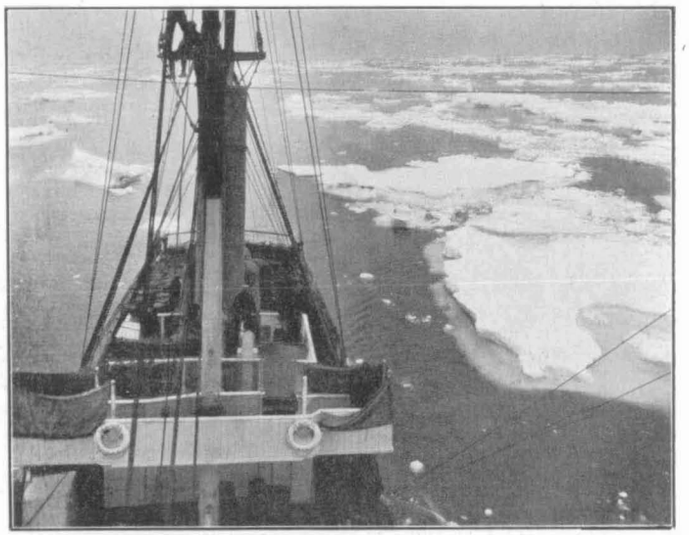

FIG. 4. Drift-ice on the margin of the pack

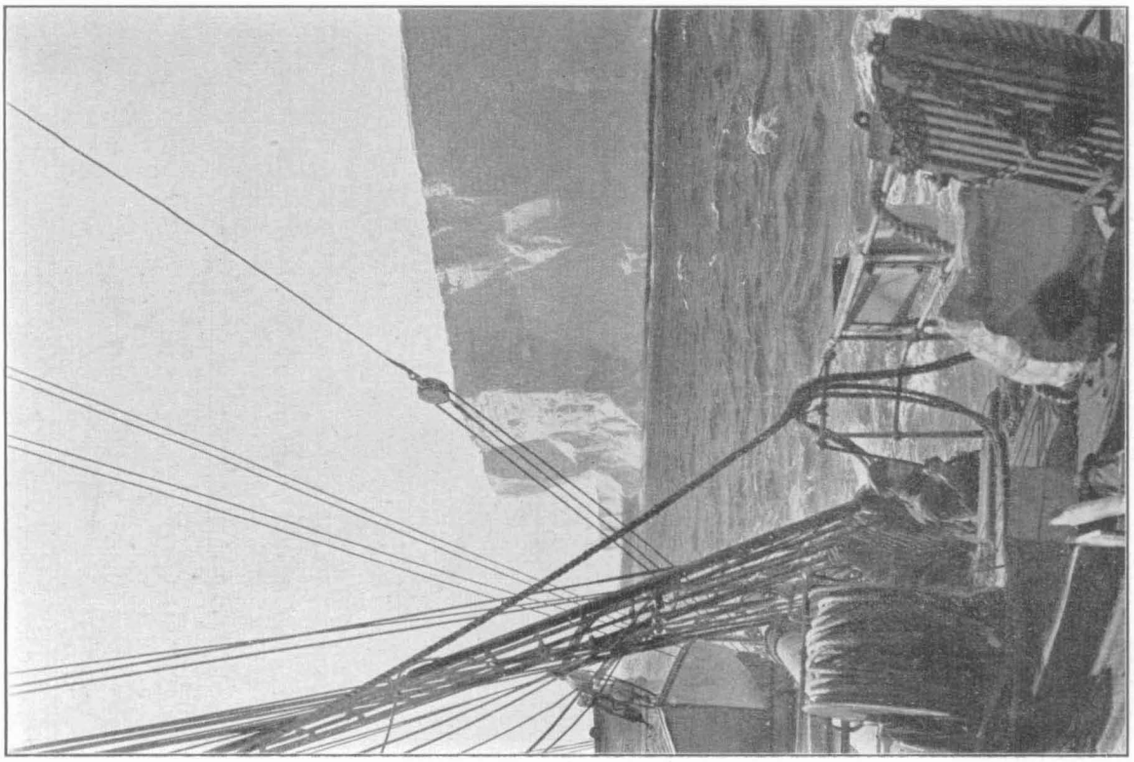

FIG. 2. The face of a 40-mile long iceberg.

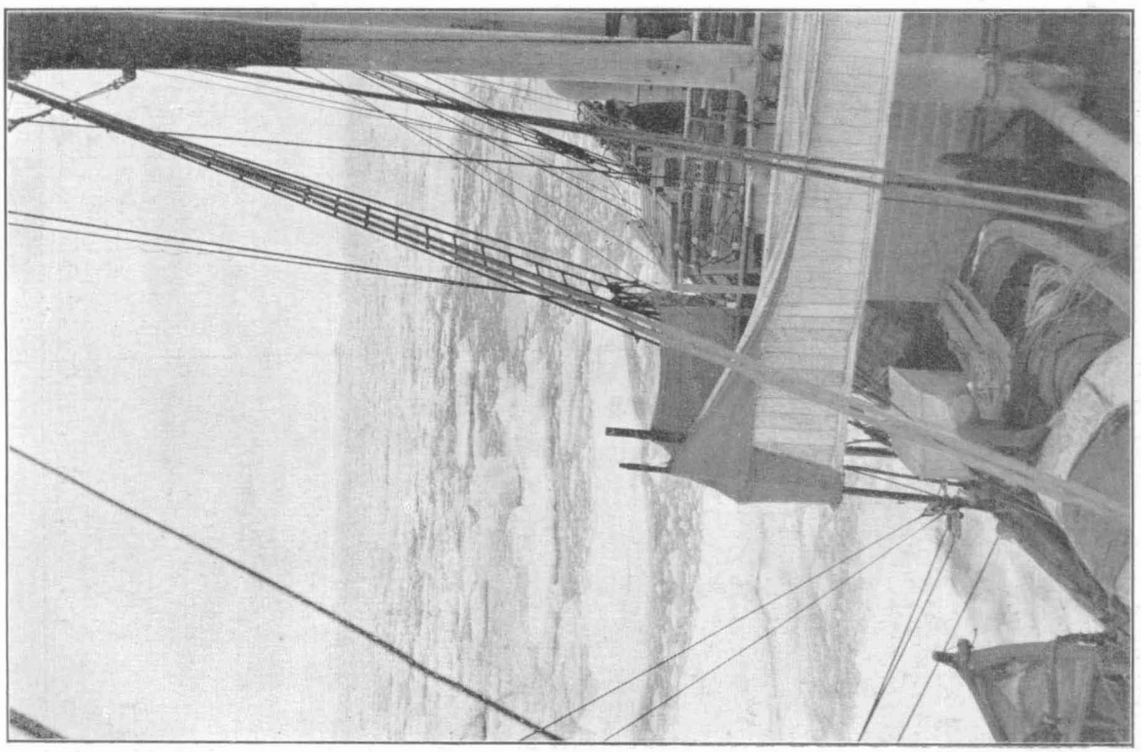

FIG. 1. Traversing slack pack-ice.

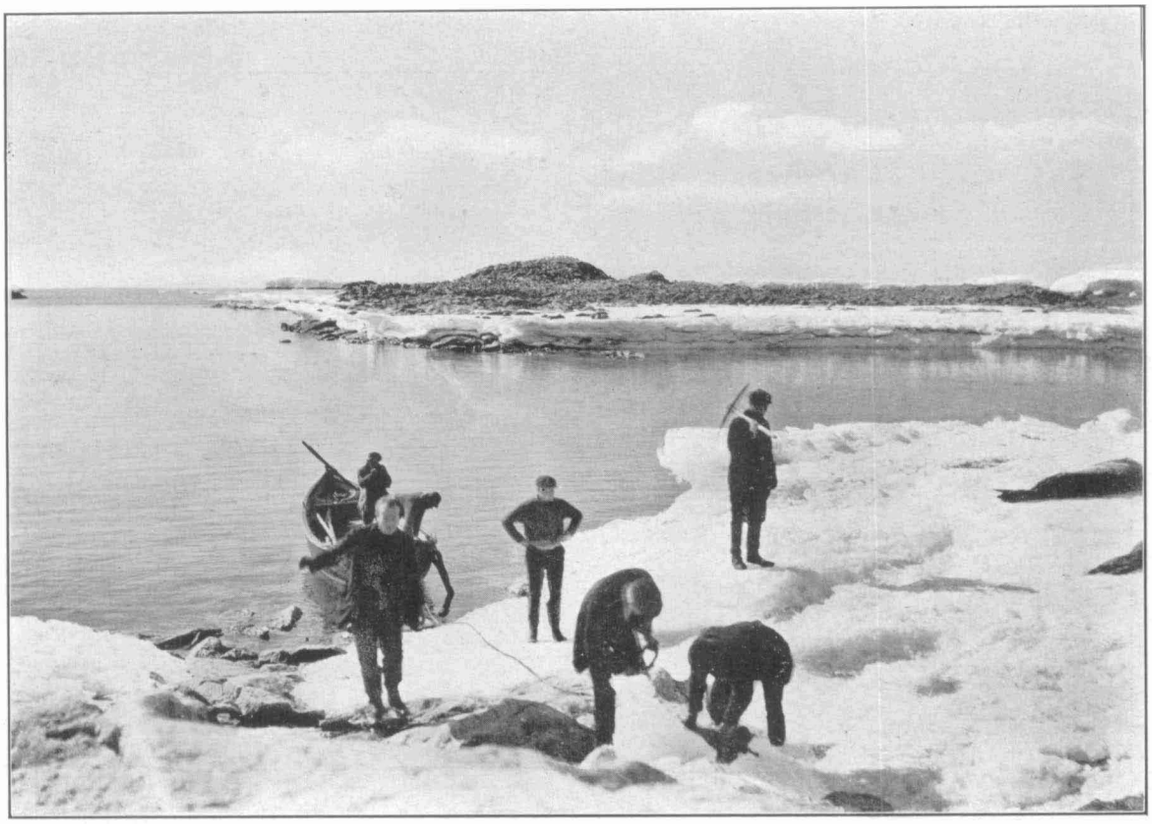

FIG. 1. Our first Antarctic landing: Cape Denison.

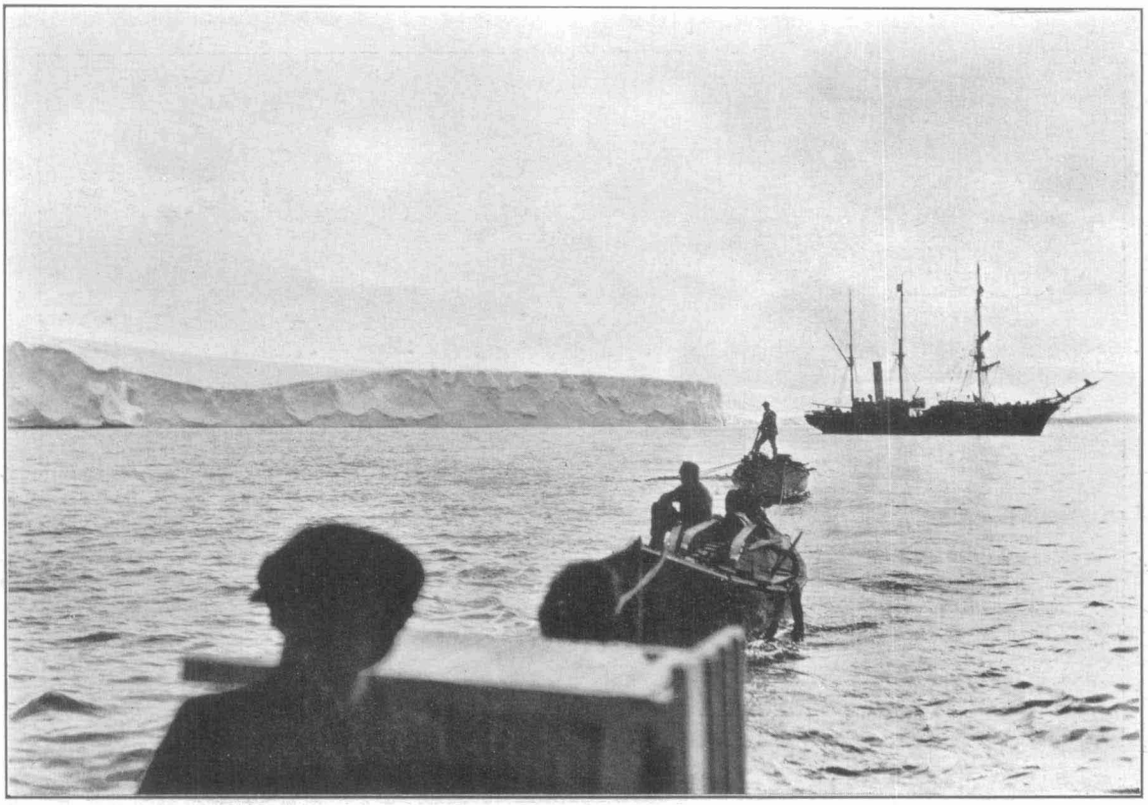

FIG. 2. Unloading operations. The *Aurora* at anchor: Commonwealth Bay.

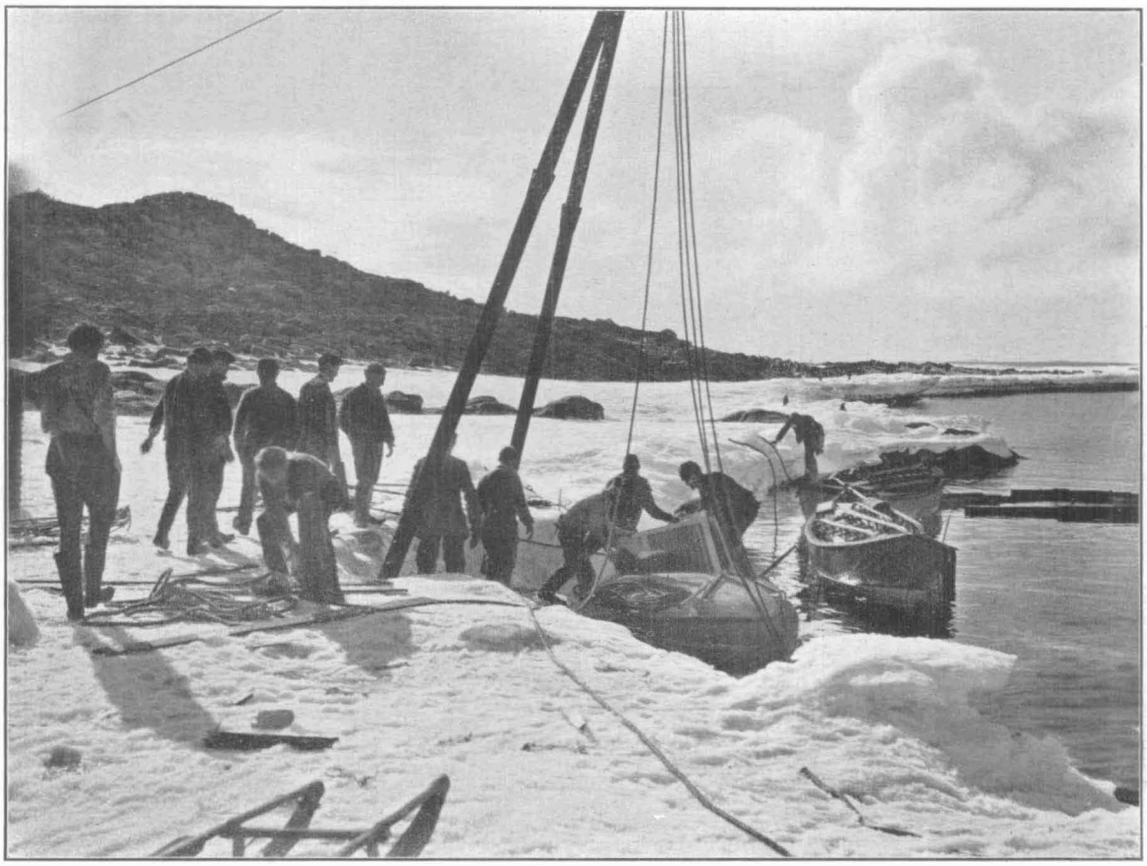

FIG. 1. Landing equipment at the head of the Boat Harbour.

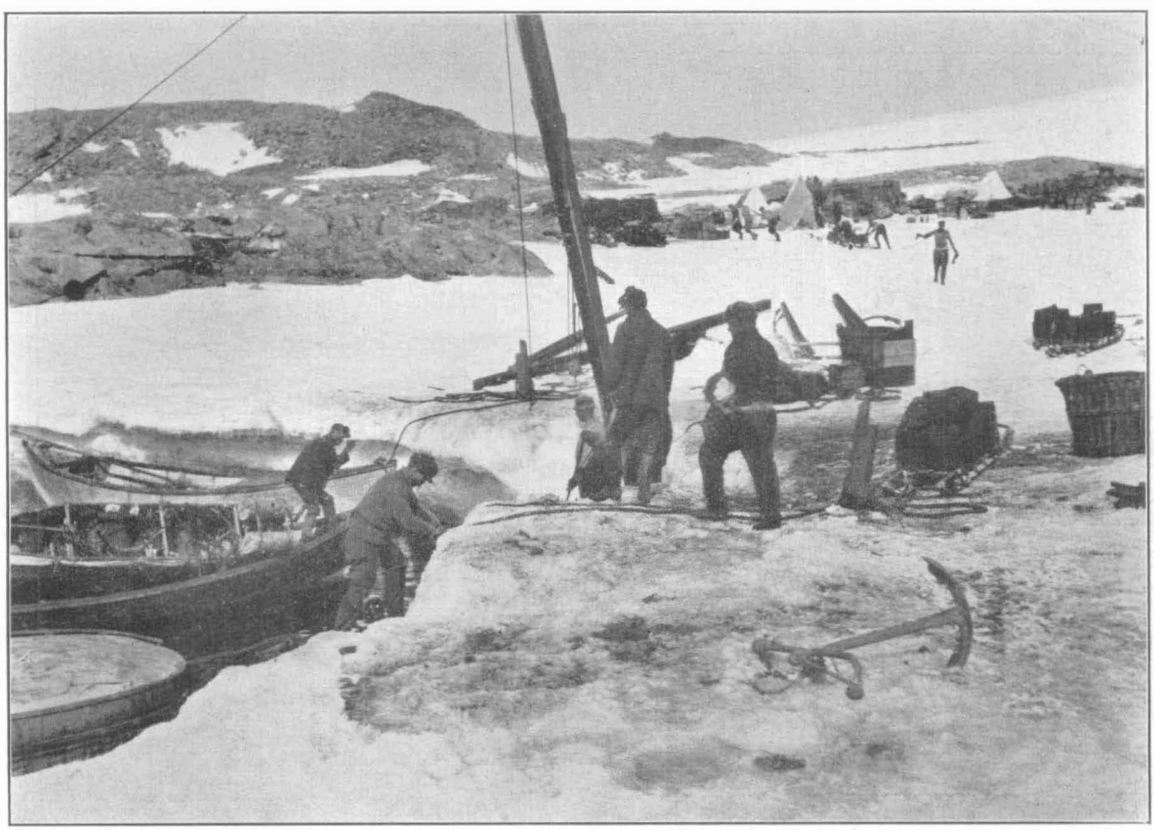

FIG. 2. Sledging equipment from the water-front to the hut site.

FIG. 1. Traversing pack-ice in search of land.

FIG. 2. The ship's bows pressing through the pack-ice.

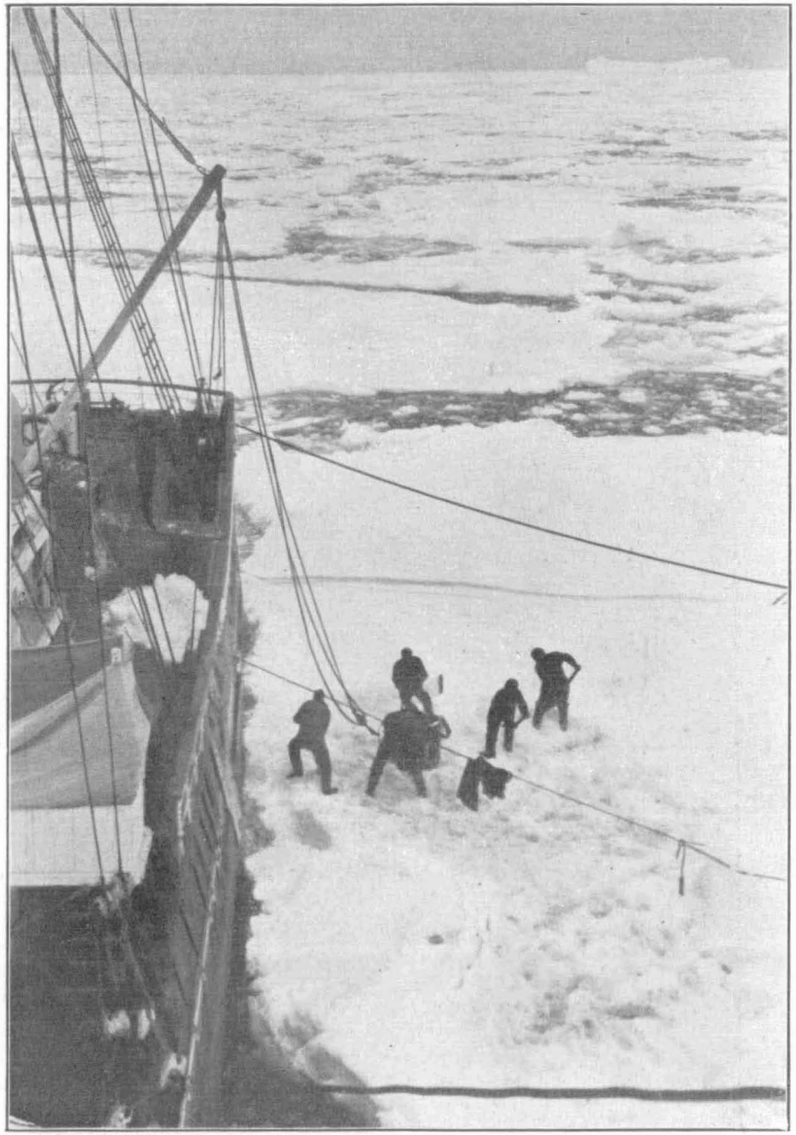

FIG. 1. Icing ship in the pack-ice.

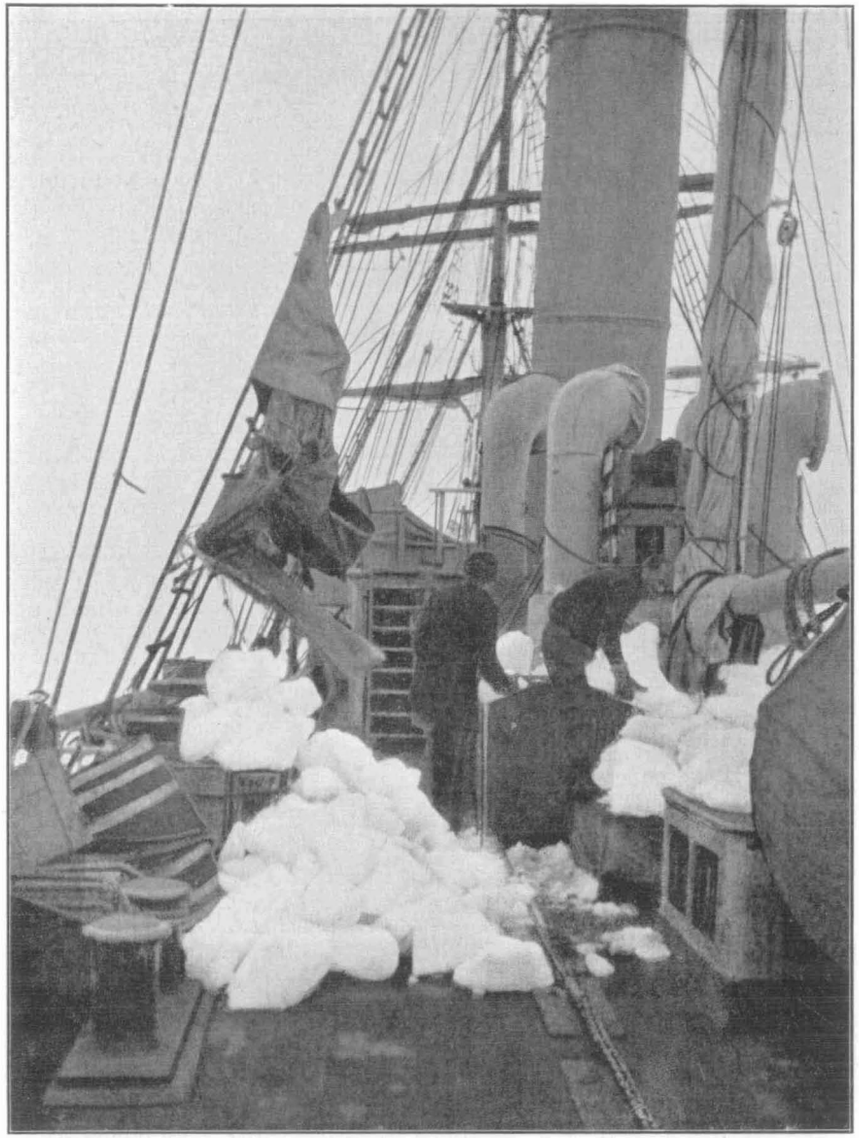

FIG. 2. Feeding ice into the melting tanks.

FIG. 1. Navigating the ship through thick pack-ice.

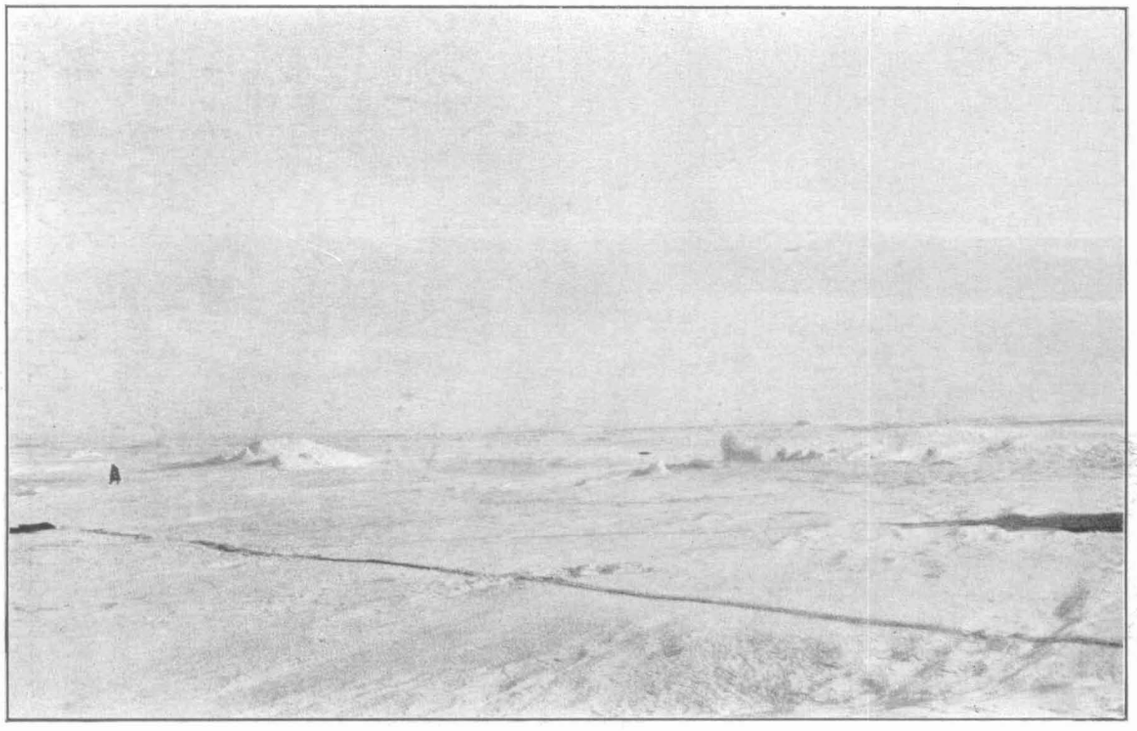

FIG. 2. The unbroken bay-ice north of Queen Mary Land.

FIG. 1. The Western Base Party.

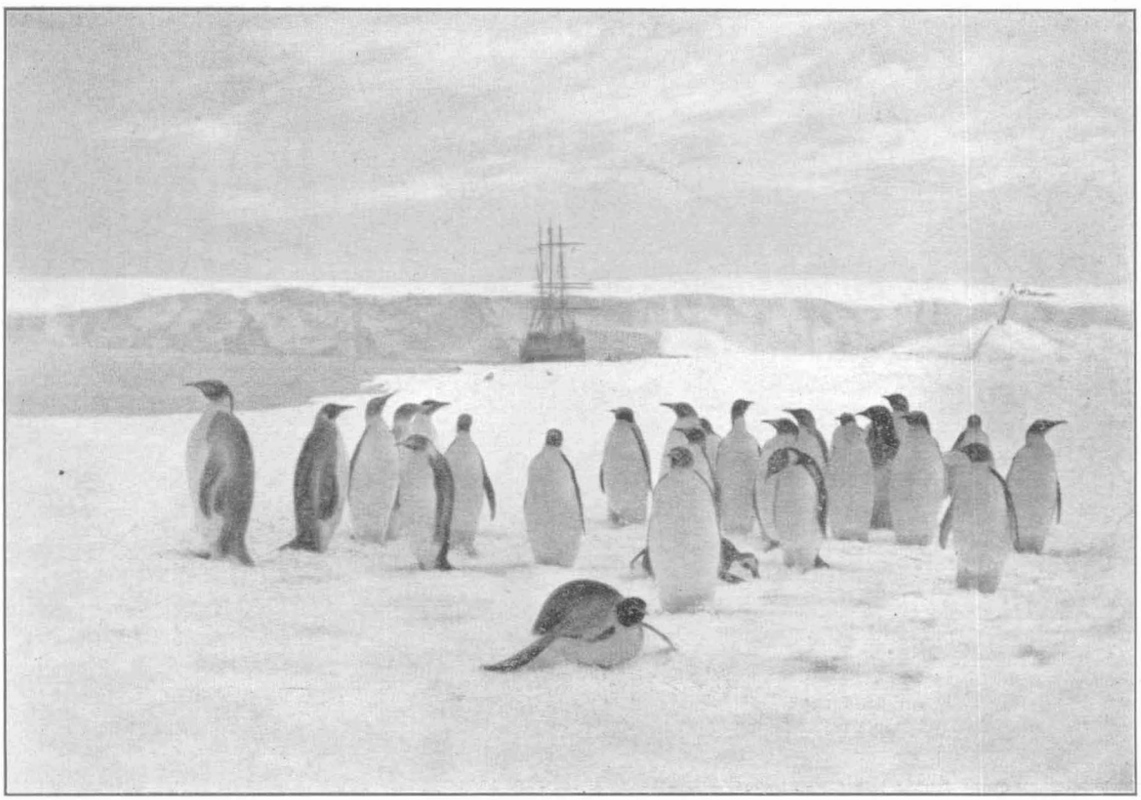

FIG. 2. Landing the Western Base Party on the Shackleton Ice-Shelf.

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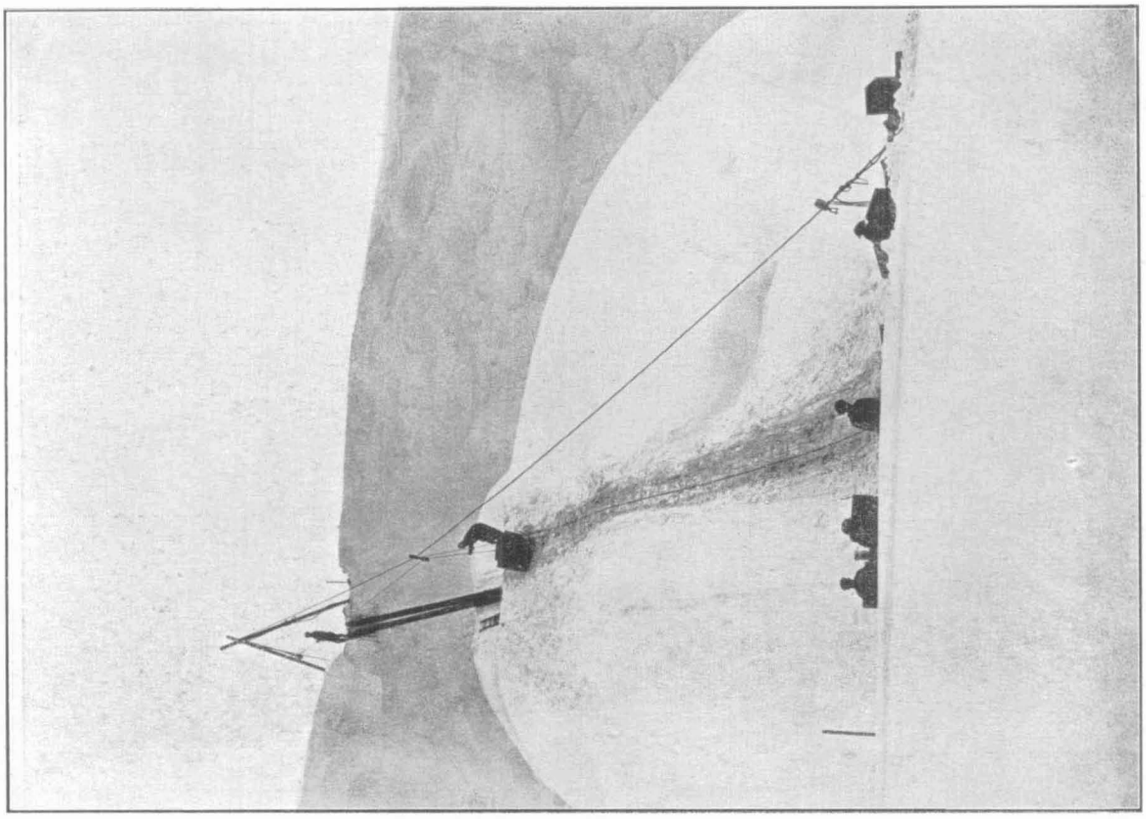


FIG. 2. Hoisting equipment on to the Shackleton Ice-Shelf.

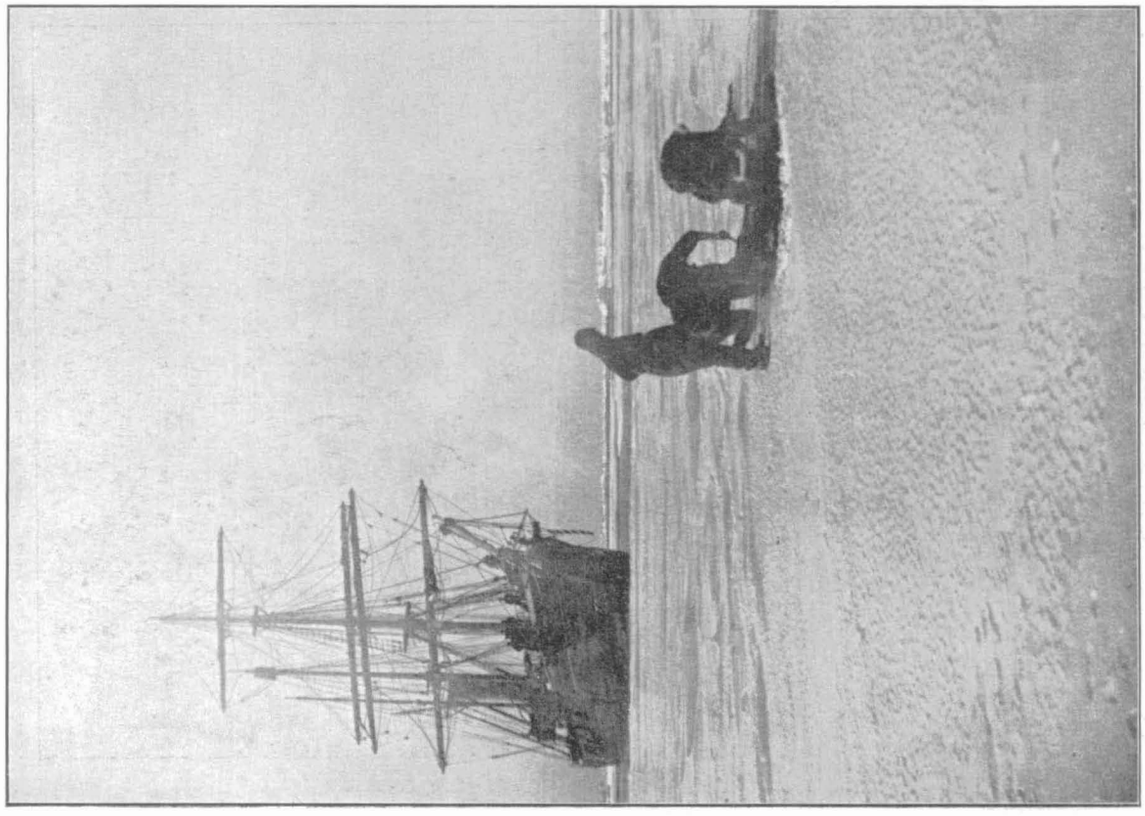


FIG. 1. Skinning a seal on the bay-ice.

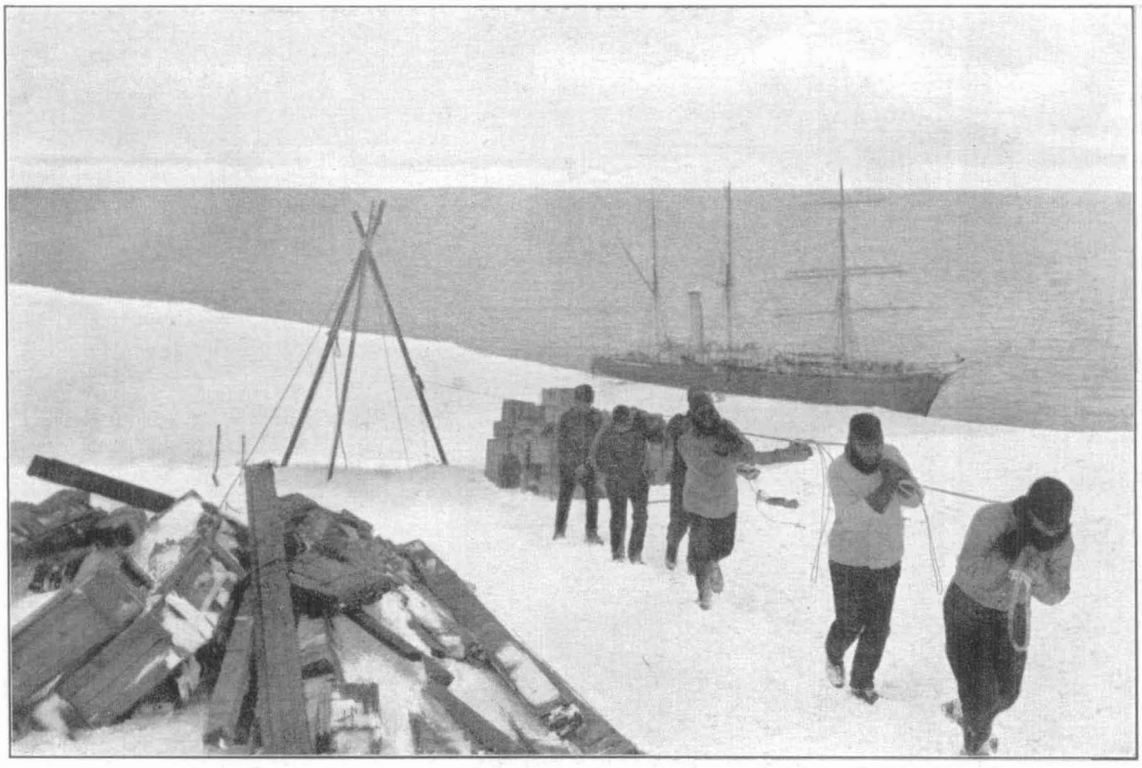


FIG. 1. On the Ice-Shelf operating the hoist.

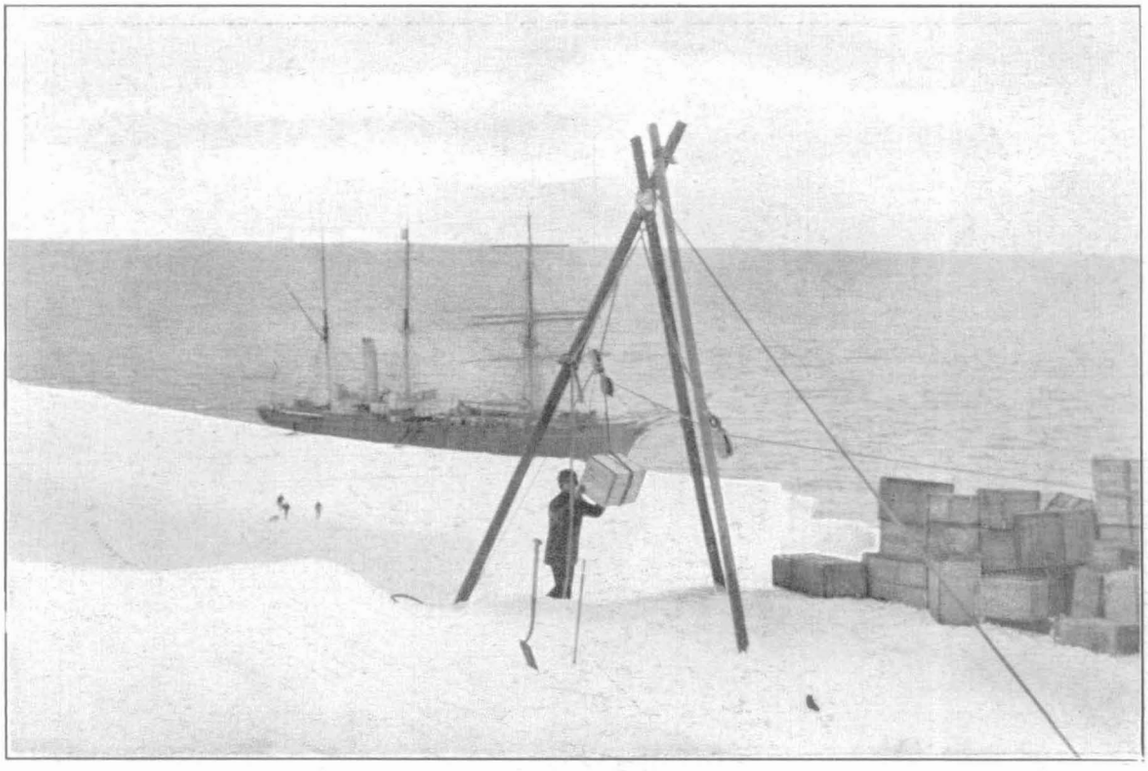


FIG. 2. A case of stores arrives at the top of the Ice-Shelf.

FIG. 1. The *Aurora* departing for Hobart after landing the Western Base Party.

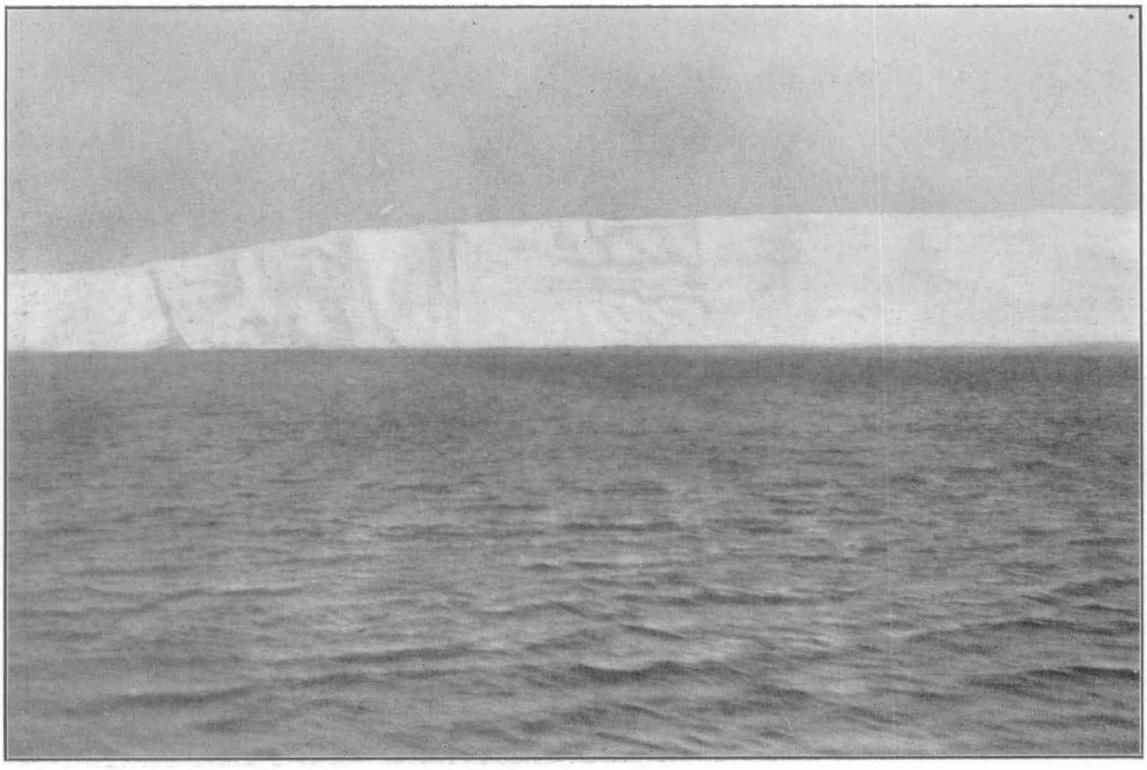


FIG. 2. The face of the Shackleton Ice-Shelf.

FIG. 1. The big rolling seas of the "fifties".

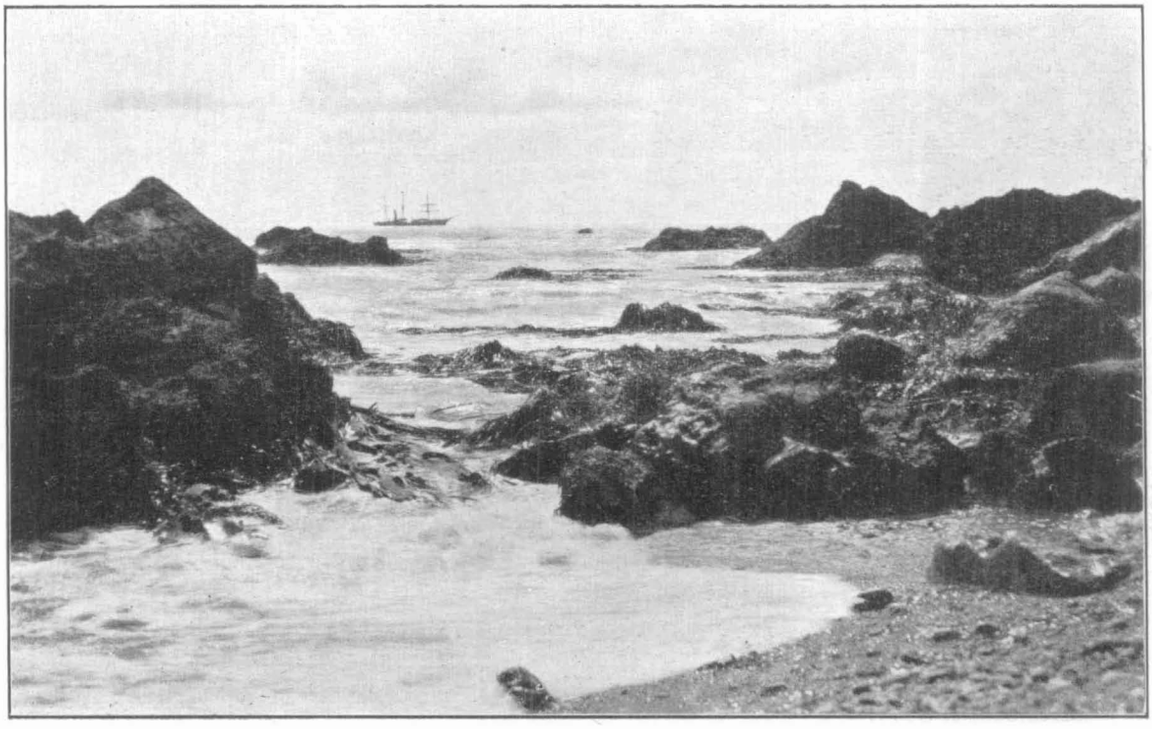


FIG. 2. The *Aurora* at anchor in Hassleborough Bay.

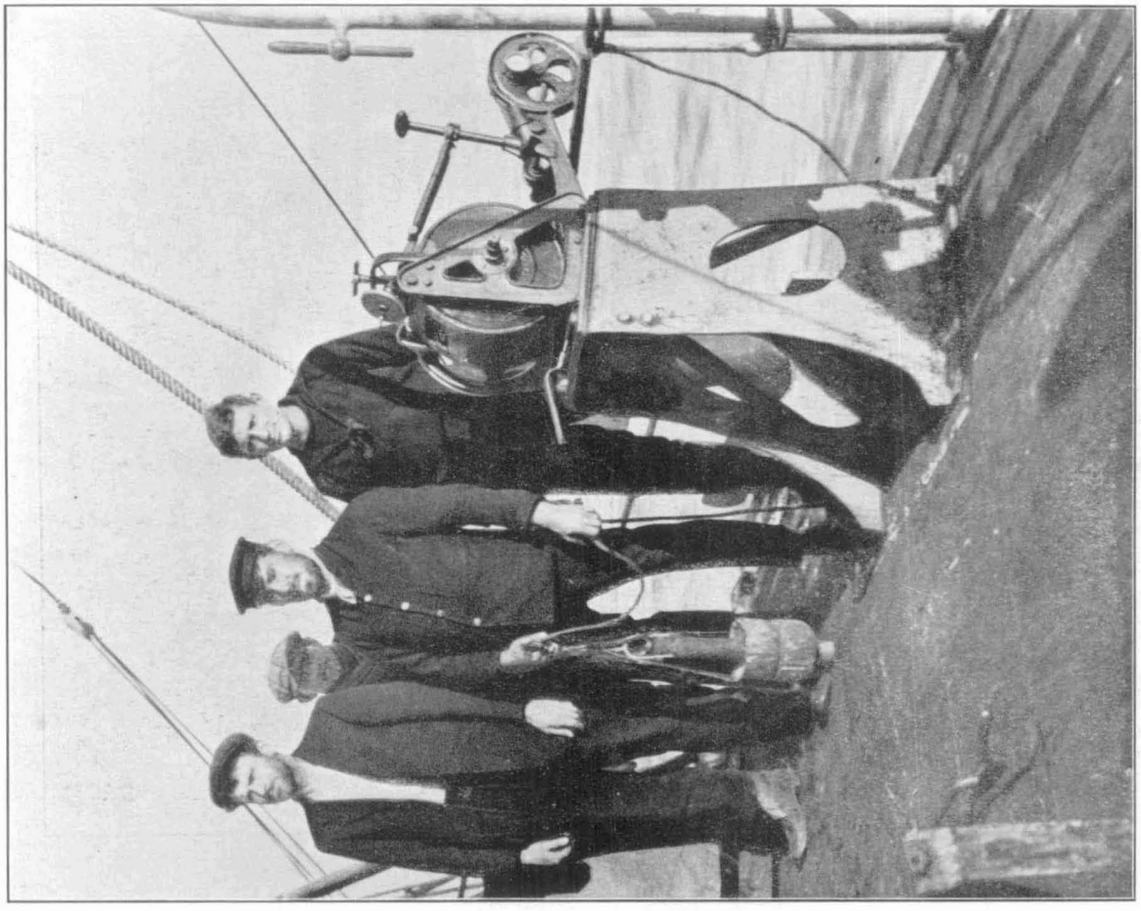


Fig. 2. First-Officer Fletcher and sounding crew.

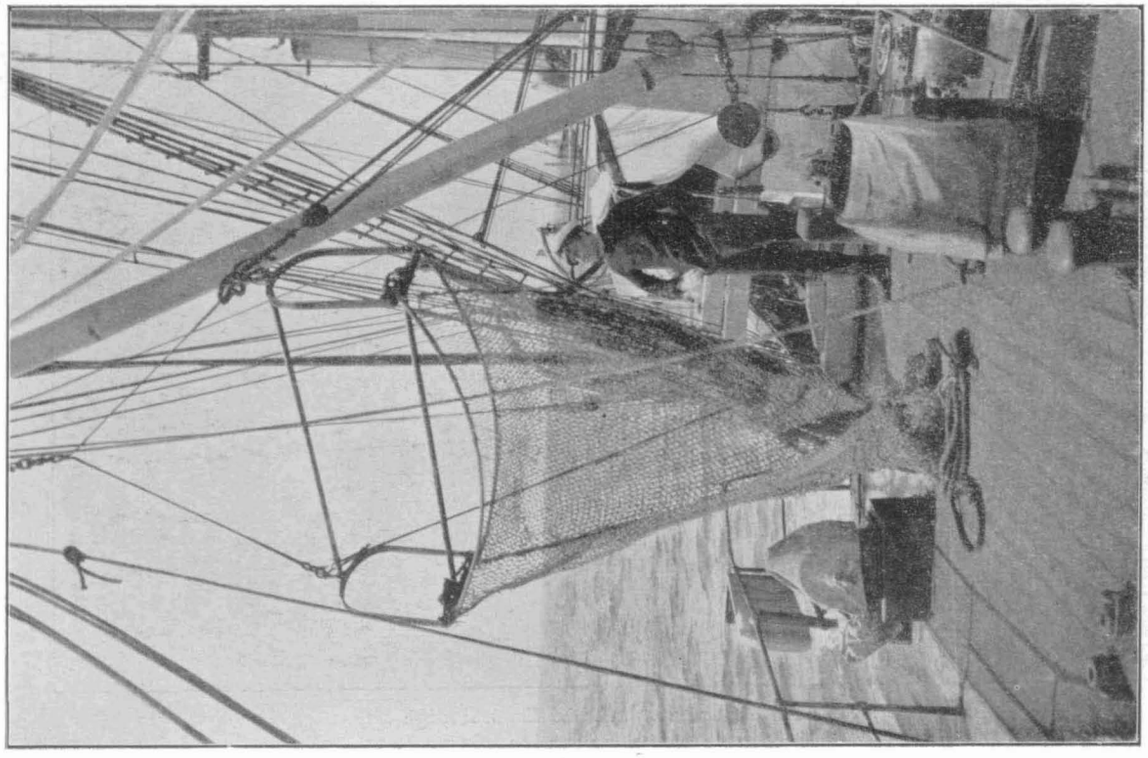


Fig. 1. Second-Officer Gray and the Monegasque trawl.

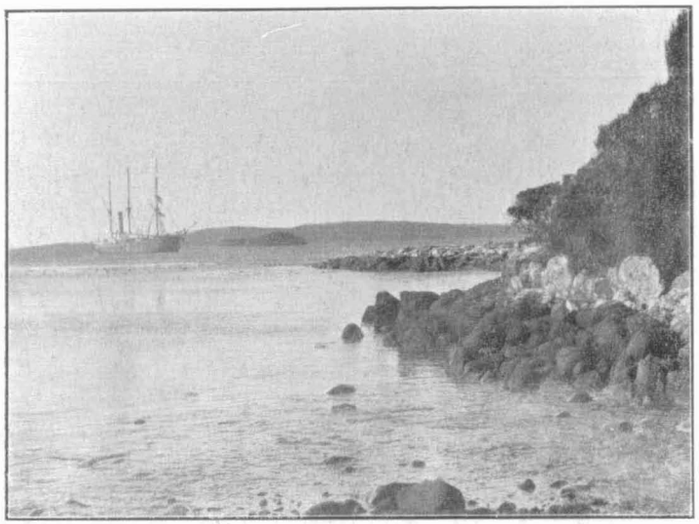


FIG. 1. Anchored in Carnley Harbour.

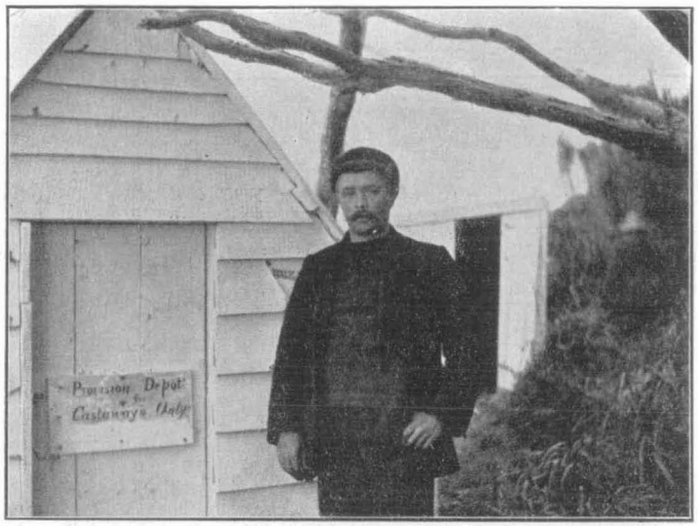


FIG. 2. Chief Engineer Gillies at provision depot.

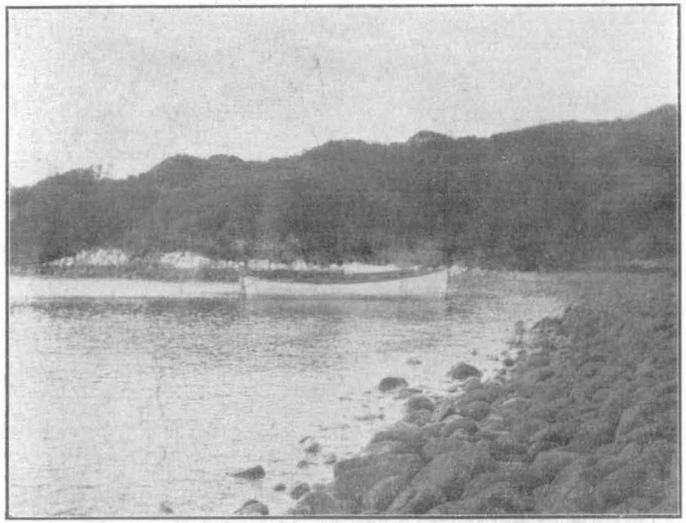


FIG. 3. Rata scrub above the shoreline, Auckland Ids.

FIG. 4. Memorial of the Ross Expedition (1840).

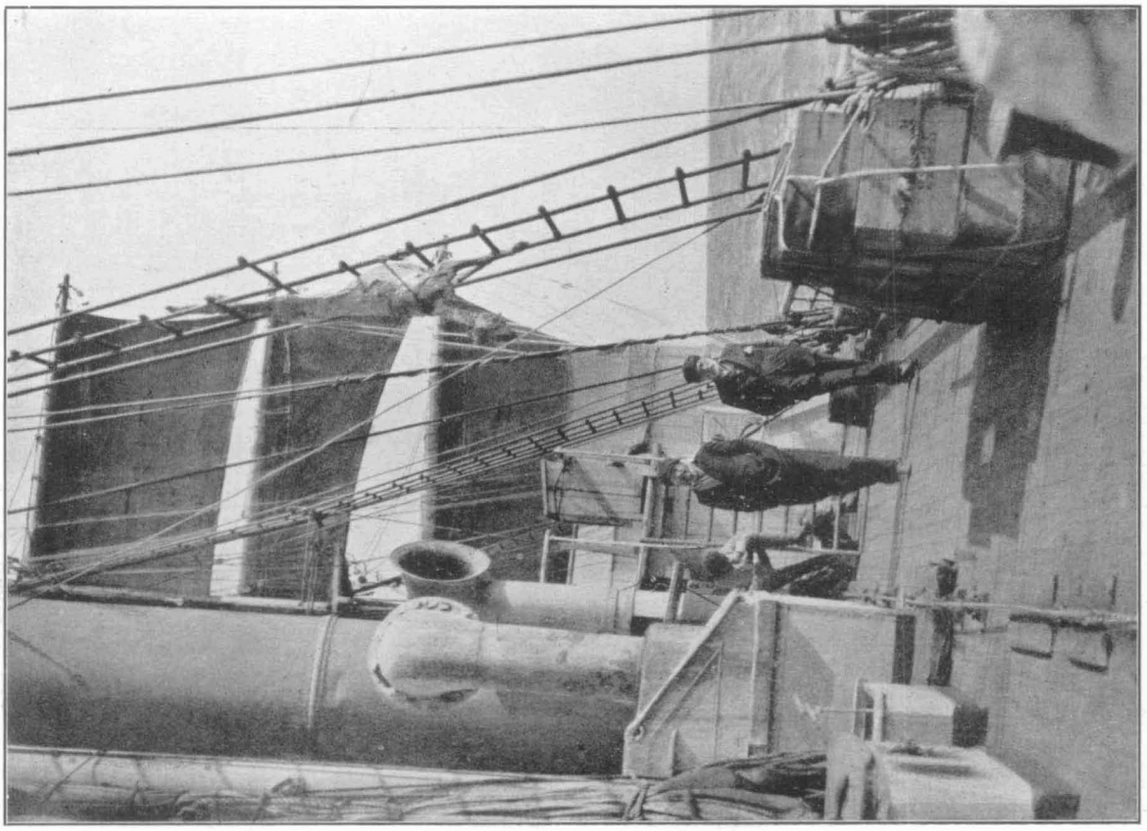


FIG. 2. A fair breeze in the "sixties"

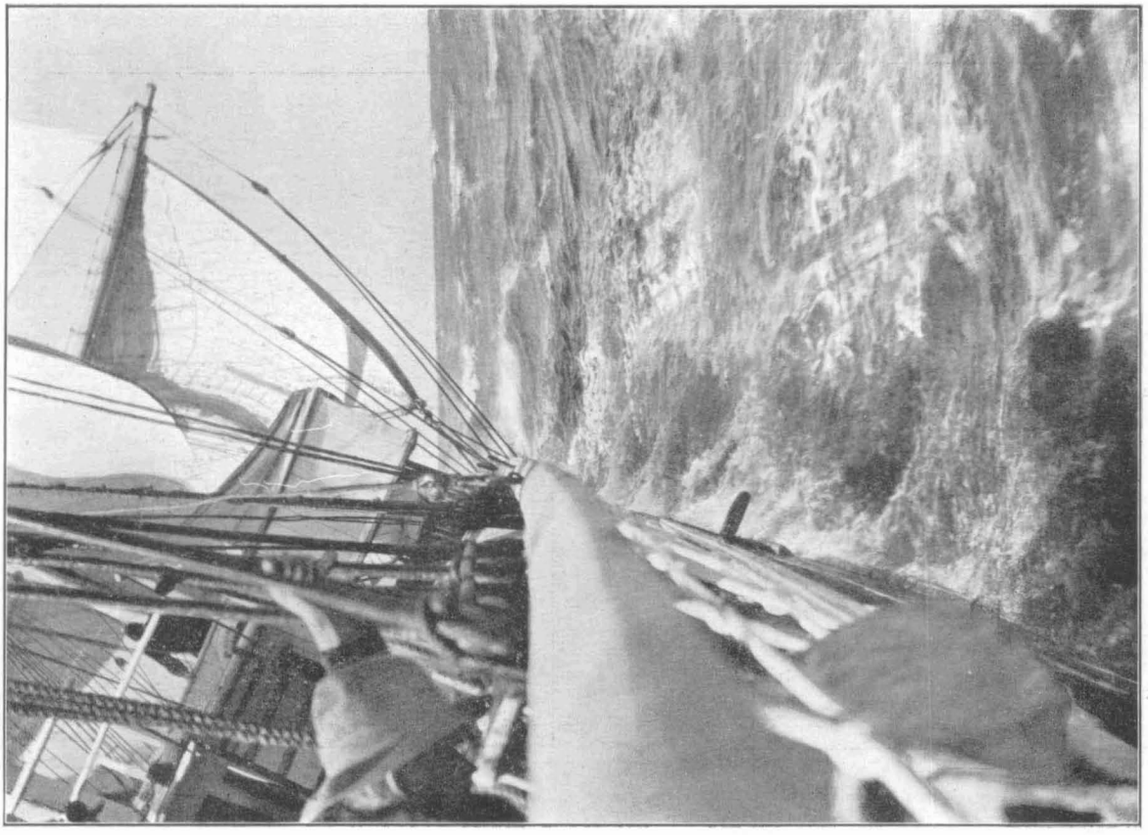


FIG. 1. Southward bound; January, 1913.

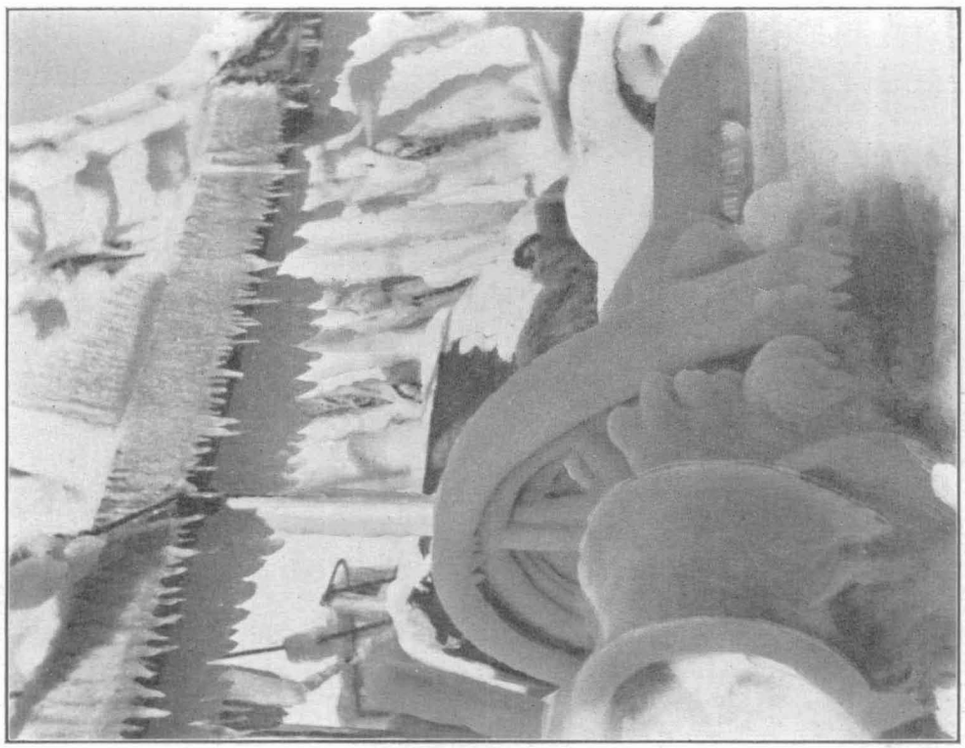


FIG. 2. Seas froze as they broke over the deck.

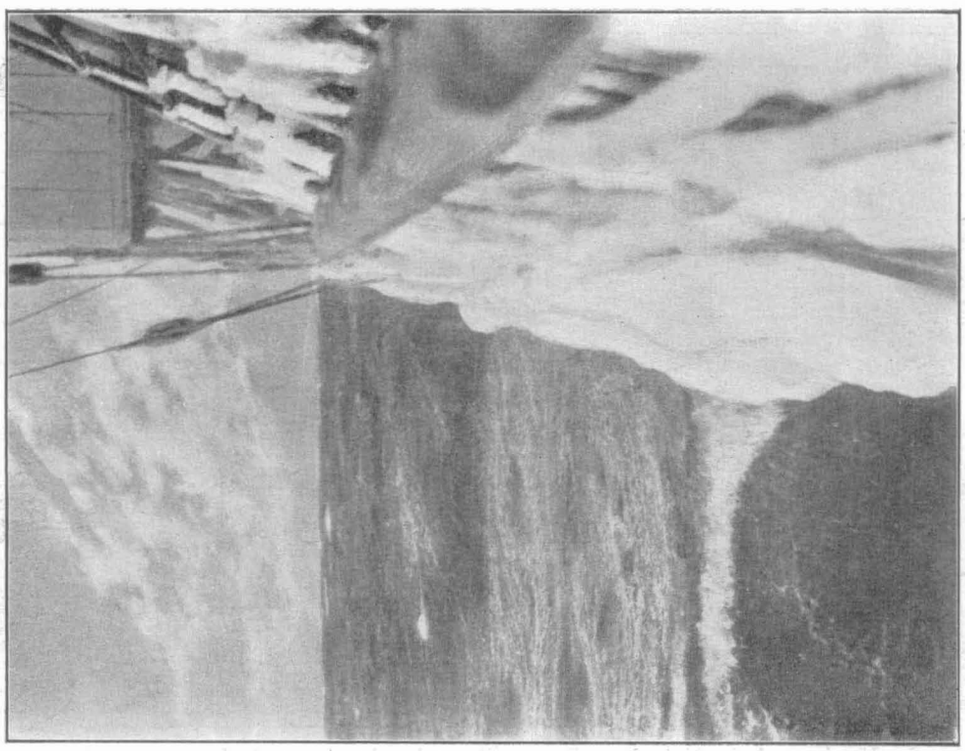


FIG. 1. The *Aurora's* ice-encased hull.

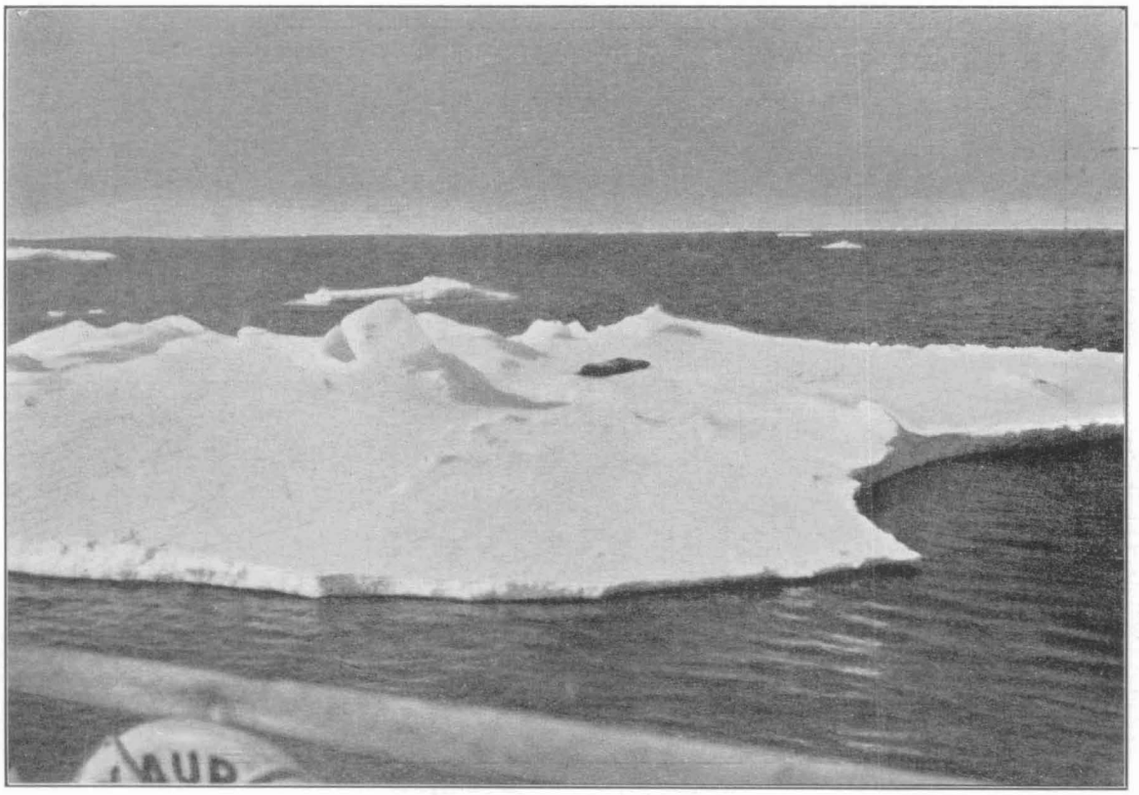


FIG. 1. A seal basking on drift-ice.

FIG. 2. Members of the Main Base Party relieved by the *Aurora* in February, 1913.

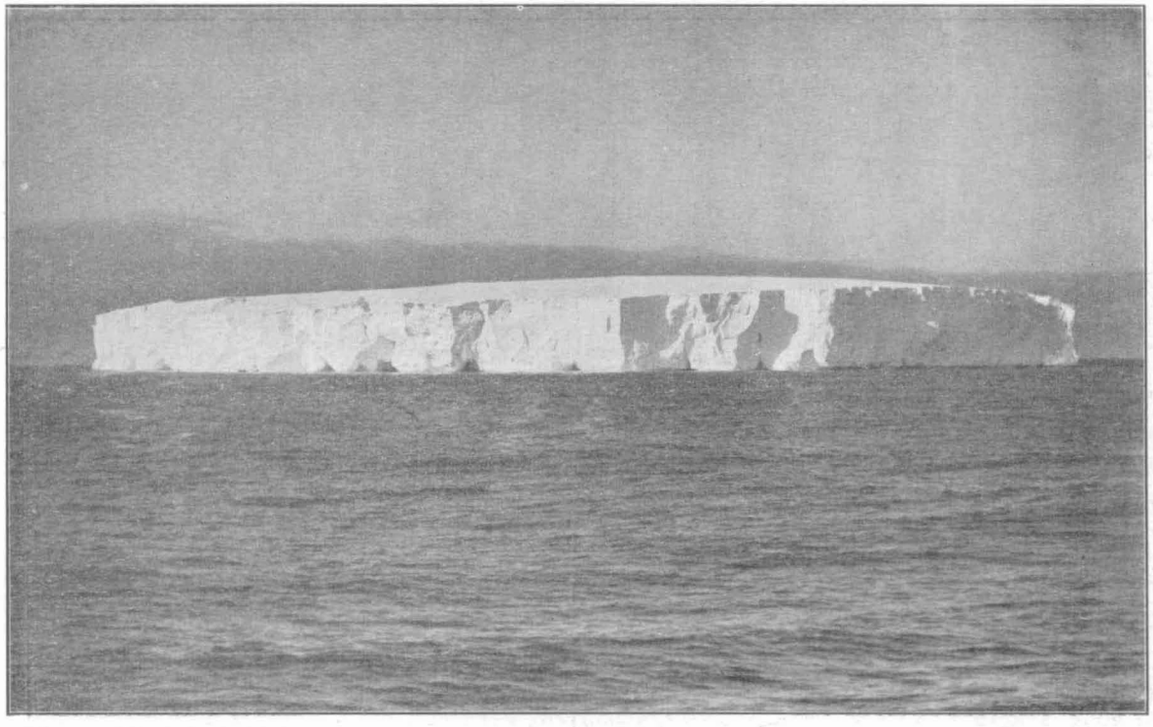


FIG. 1. A tabular iceberg.

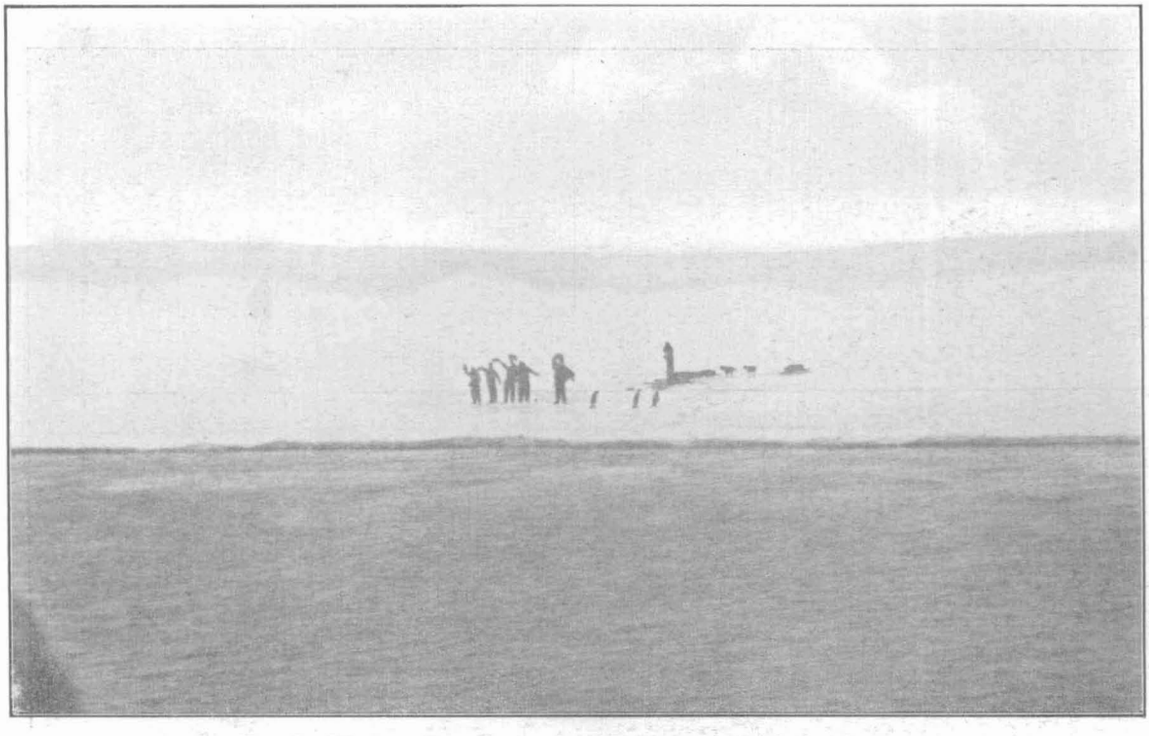


FIG. 2. Western Base Party cheering the arrival of the *Aurora*.

FIG. 1. Heading south through the "roaring forties".

FIG. 2. An easy passage through drifting floes.

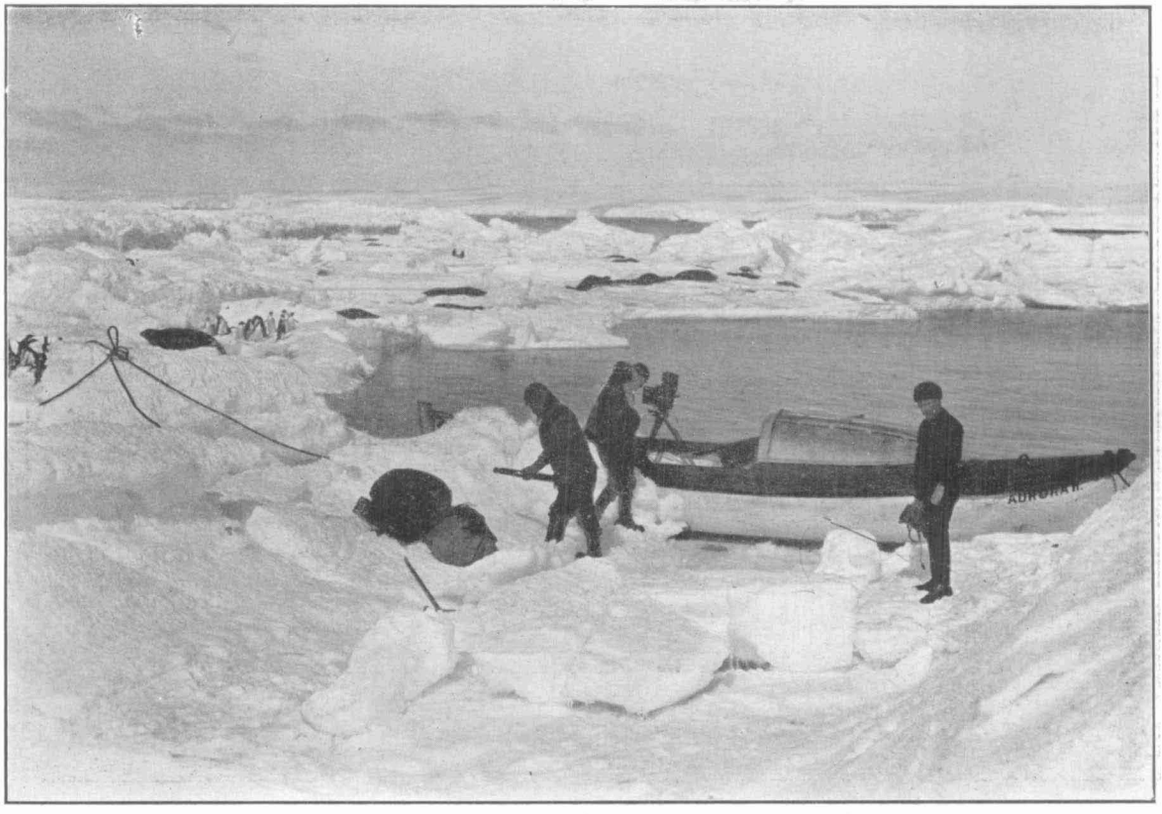


FIG. 1. Landing an exploratory party on the Mackellar Islets.

FIG. 2. Members of land party staffs on board the *Aurora*; January, 1914.

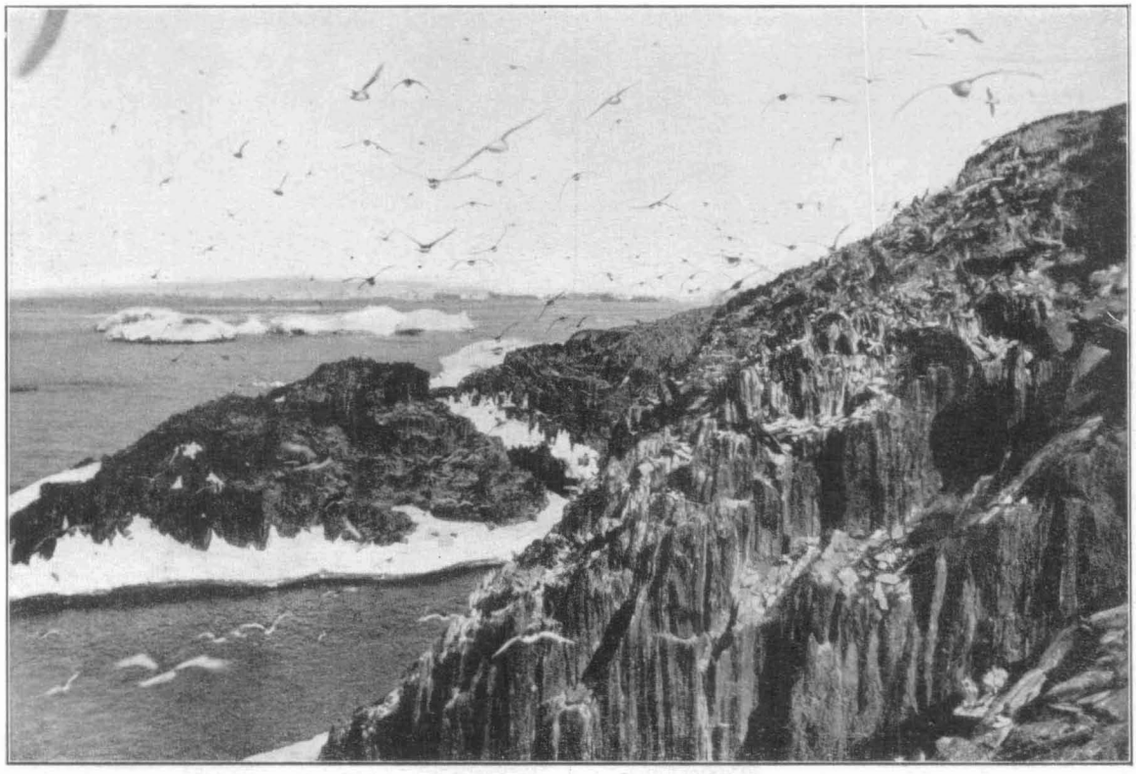


FIG. 1. Antarctic Petrels nest on the slaty rocks at Cape Hunter.

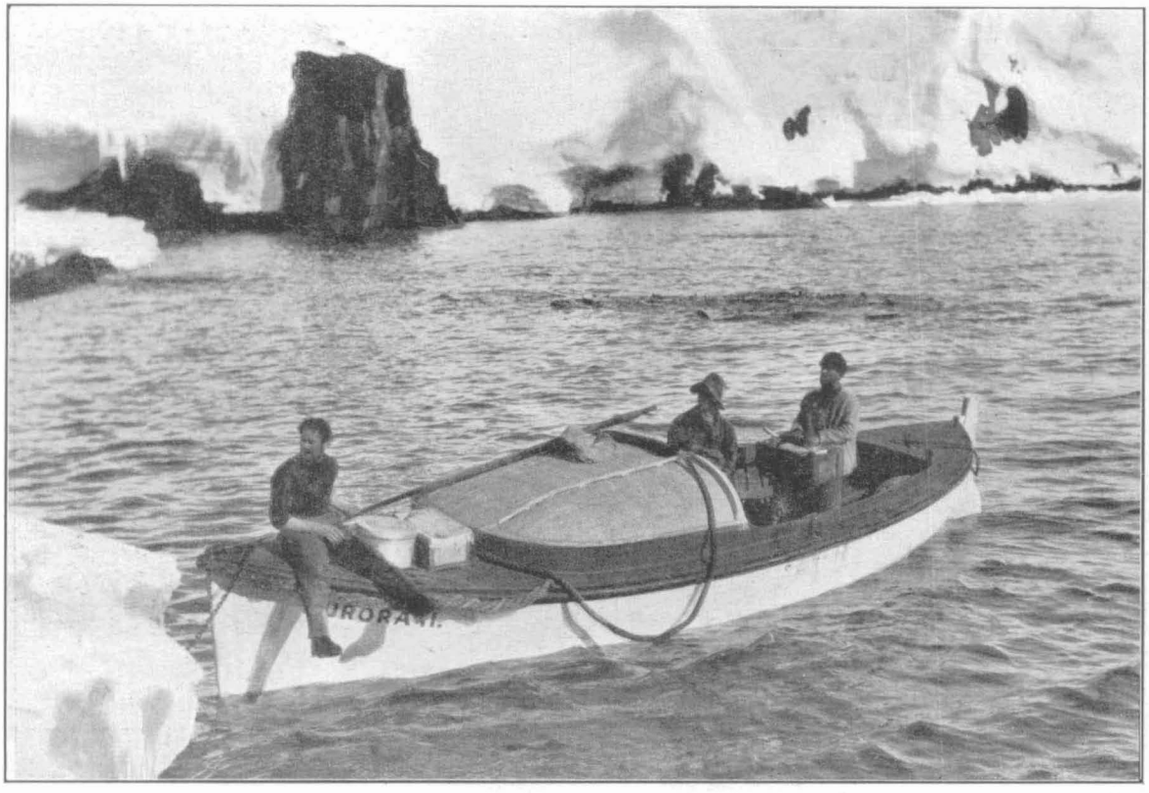
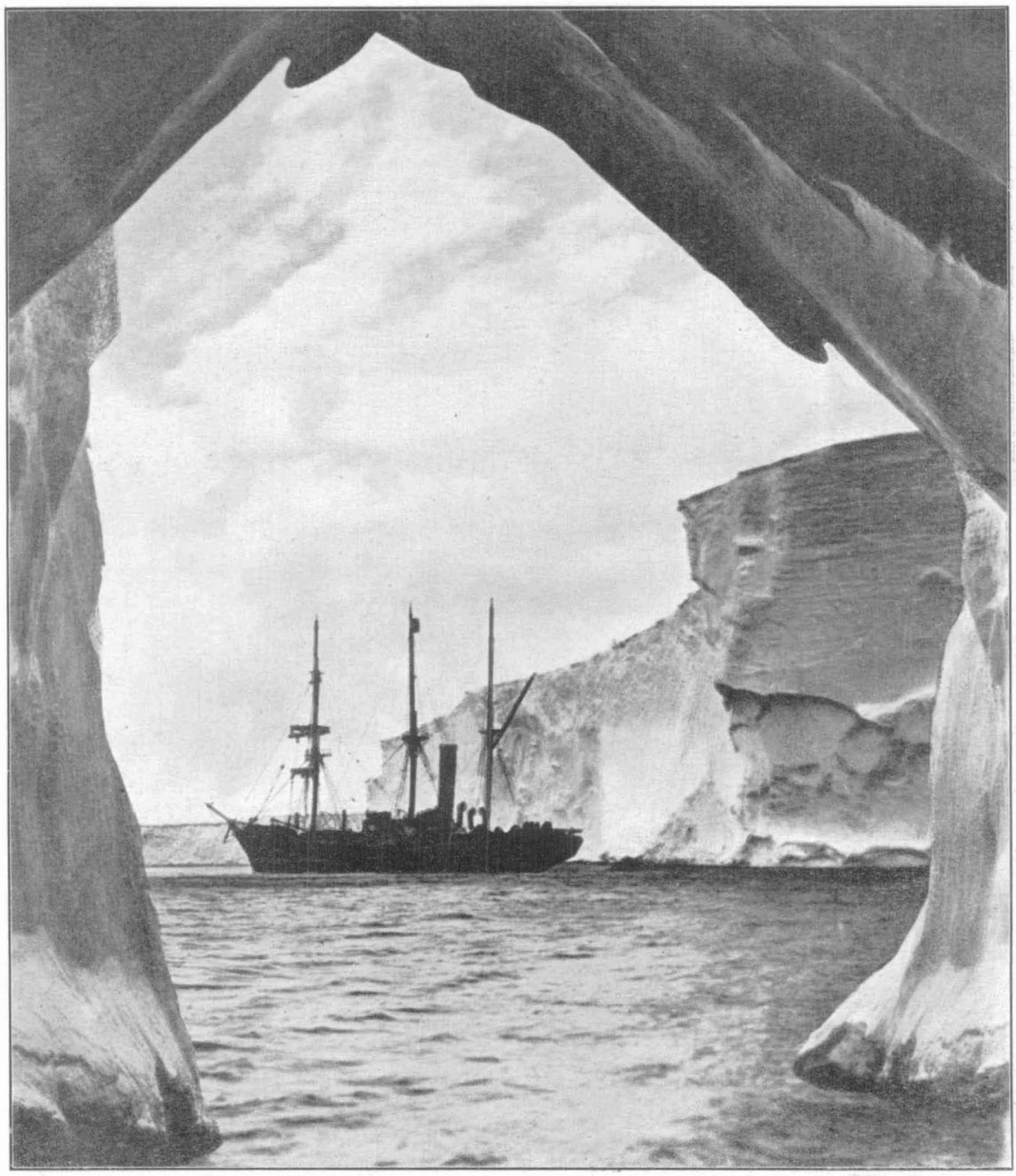
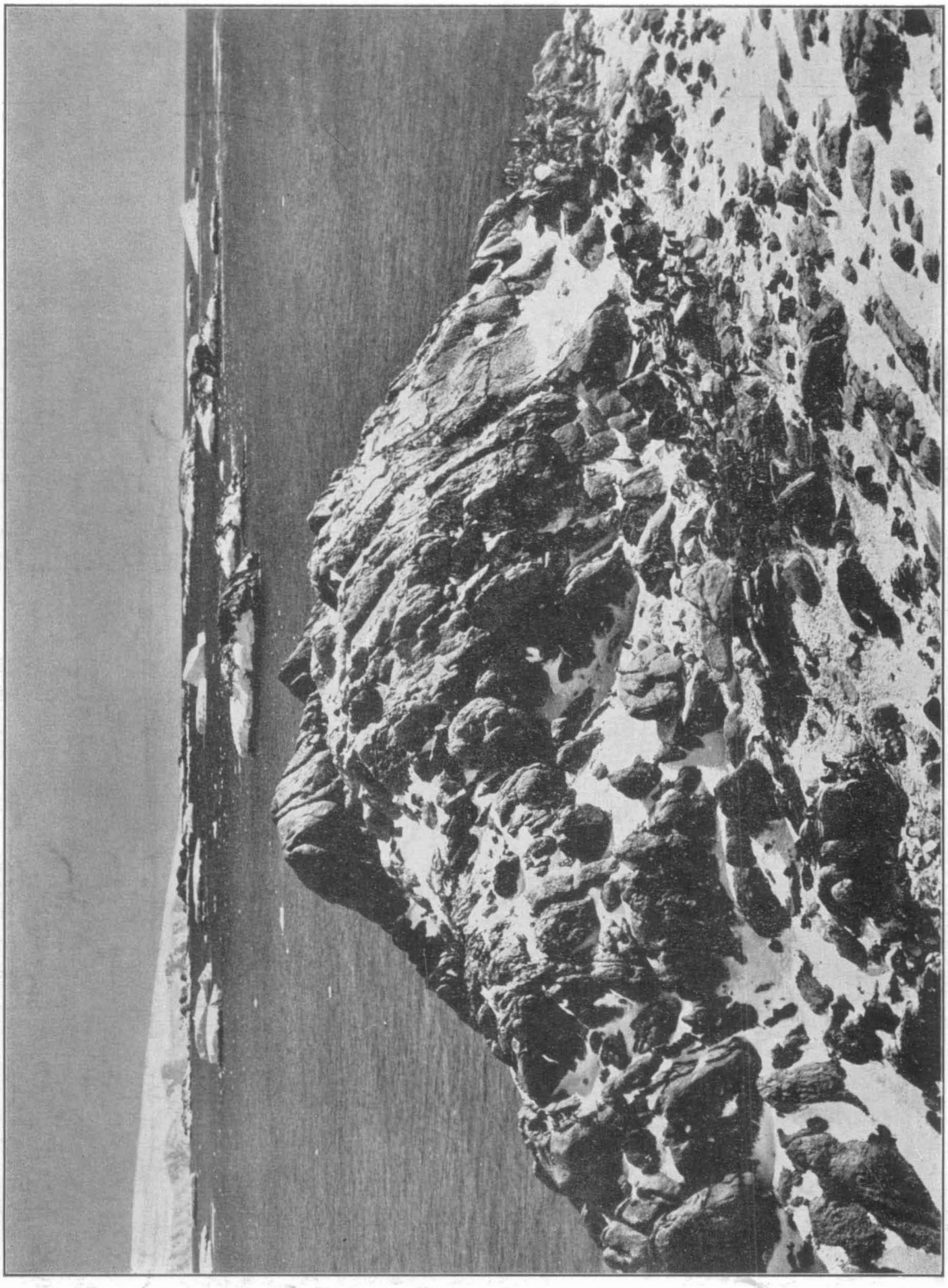


FIG. 2. The motor launch at Cape Hunter.



The sheer ice wall of the Mertz Glacier Tongue.



Islets of the Way Archipelago.

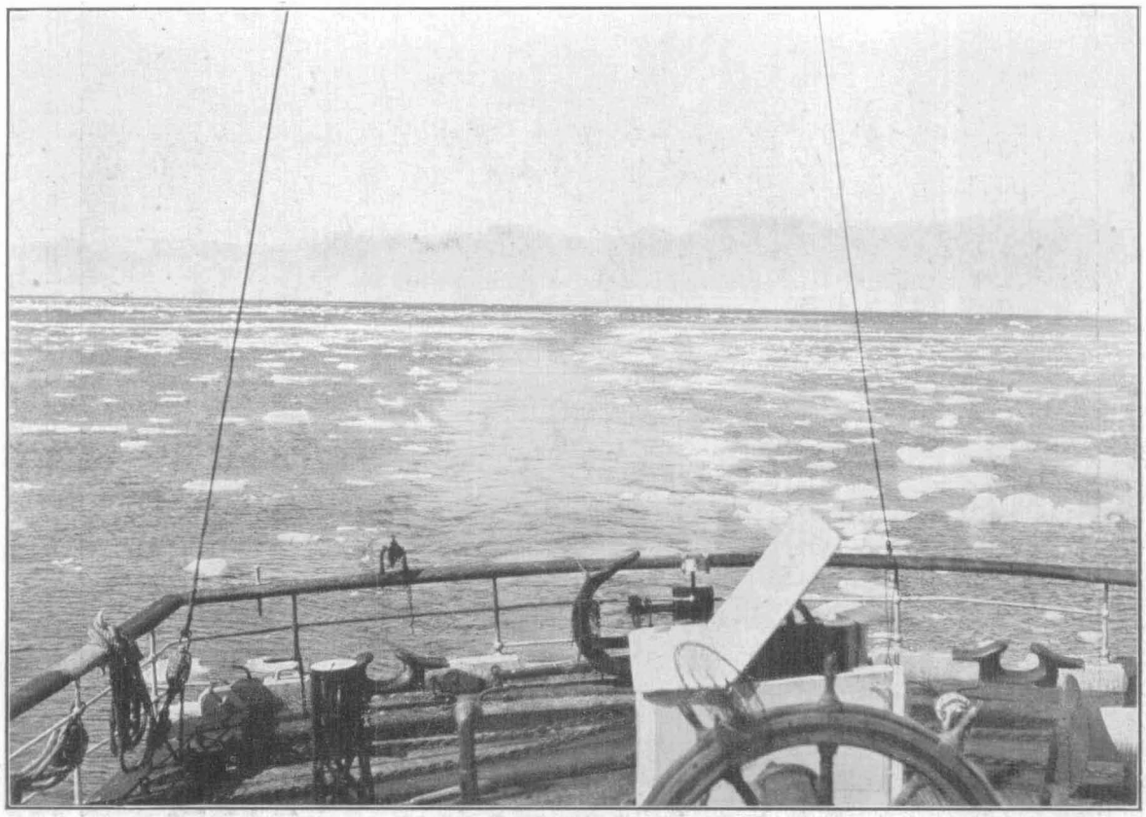


FIG. 1. Brash-ice in the ship's wake.

FIG. 2. The contents of the trawl dumped on the deck.

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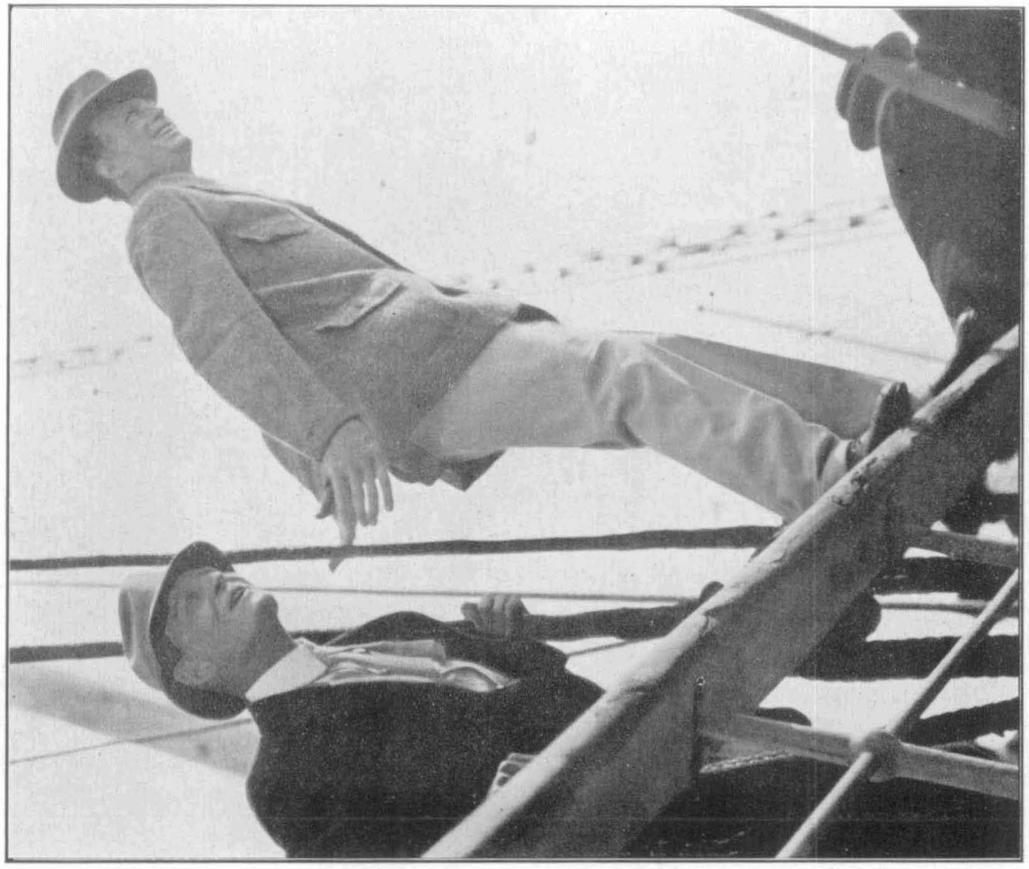

FIG. 2. The moment of arrival off the Semaphore.

FIG. 1. A weather-worn berg of low latitudes.

FIG. 1. The framework of the main hut building, Cape Denison.

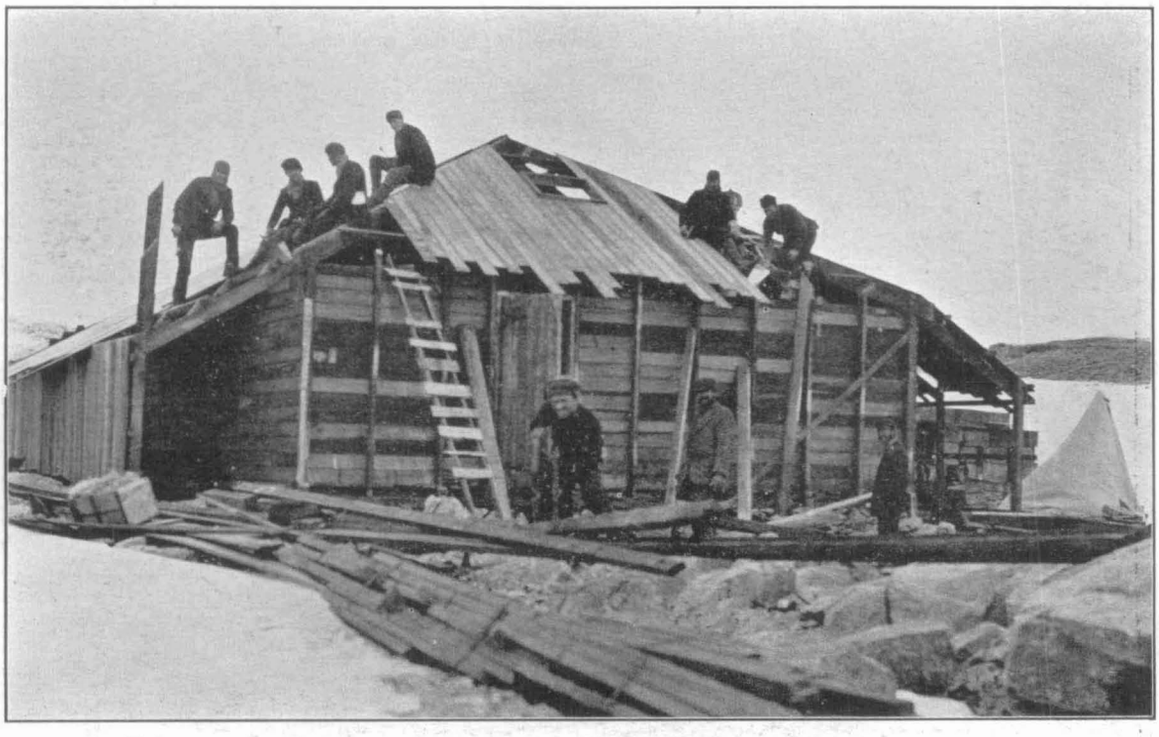

FIG. 2. An advanced stage in the construction of the Hut.

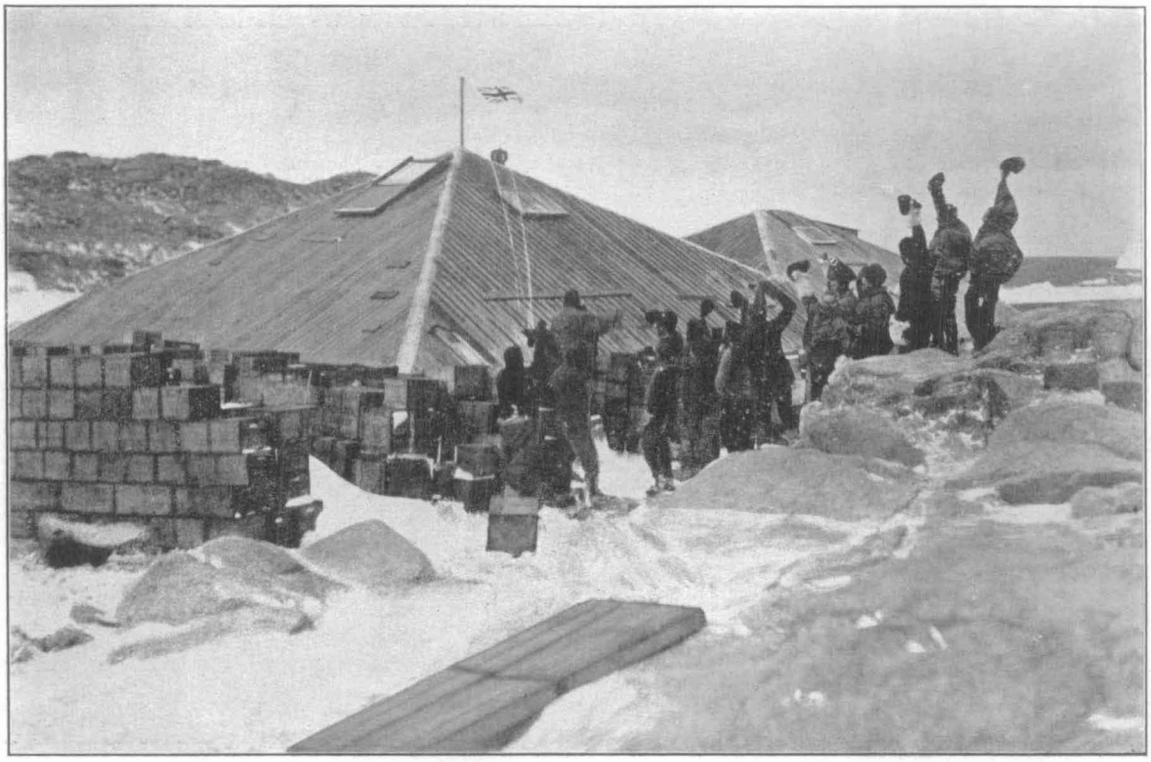

FIG. 1. Raising the flag over the Hut, March, 1912.

FIG. 2. A view of the Hut in early autumn.

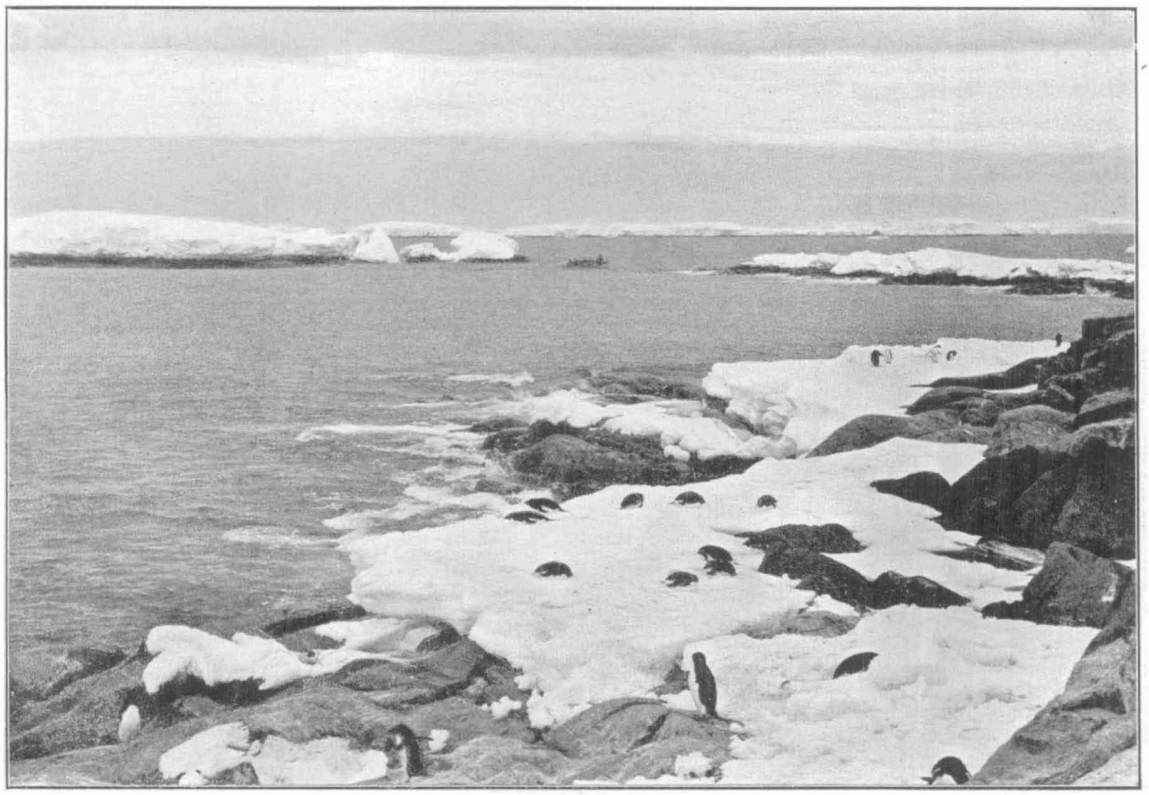

FIG. 1. The shore west of Memorial Hill, in late summer.

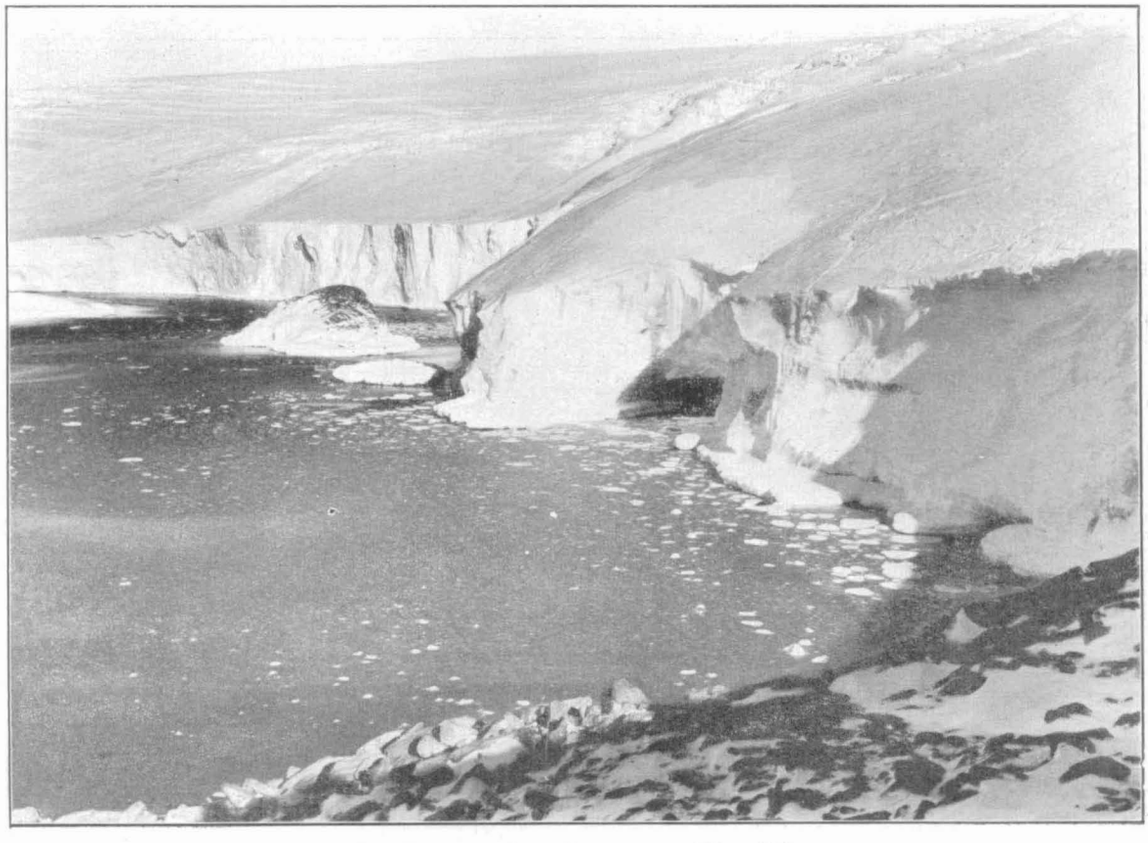

FIG. 2. The view along the coast at John O'Groats.

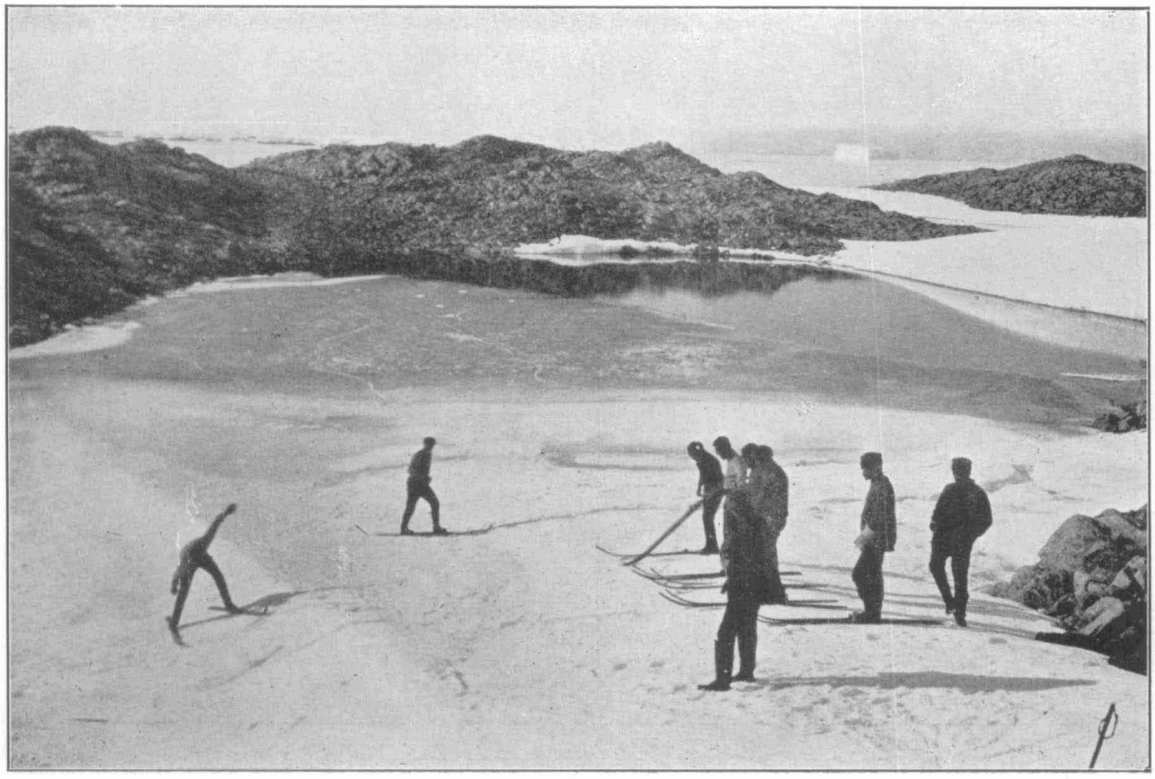

FIG. 1. Round Lake, looking north.

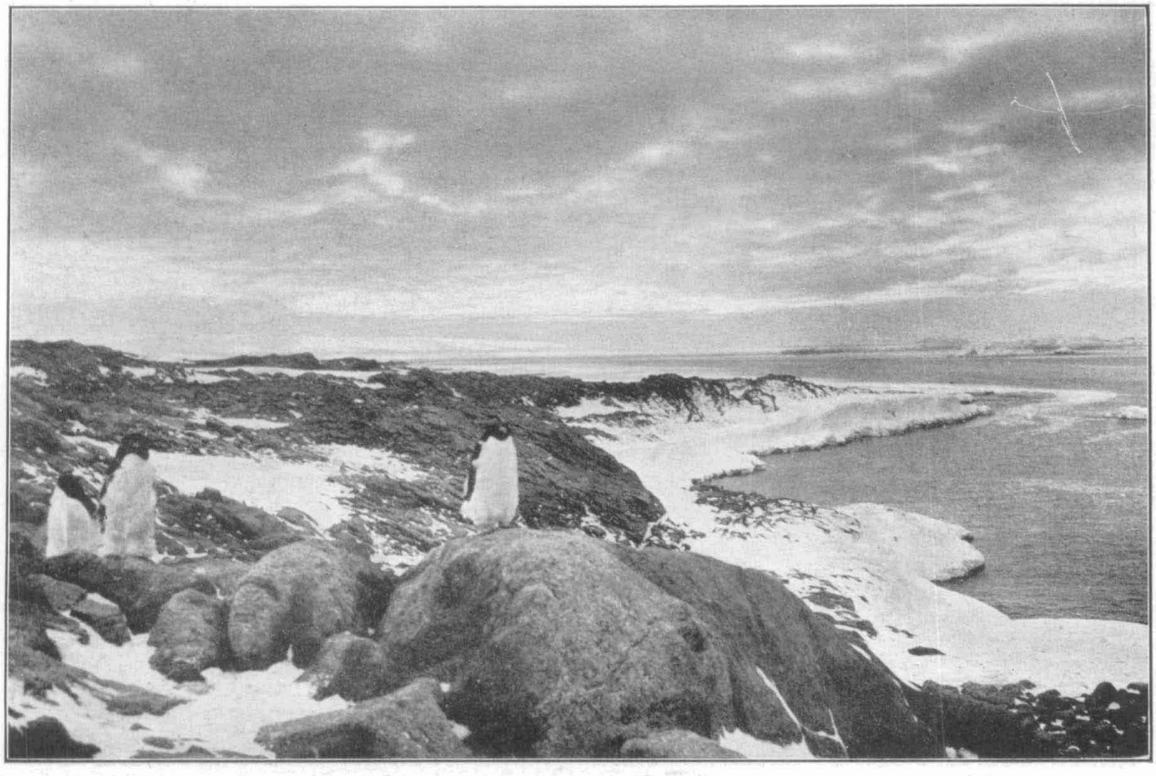

FIG. 2. The last of the penguins; late autumn.

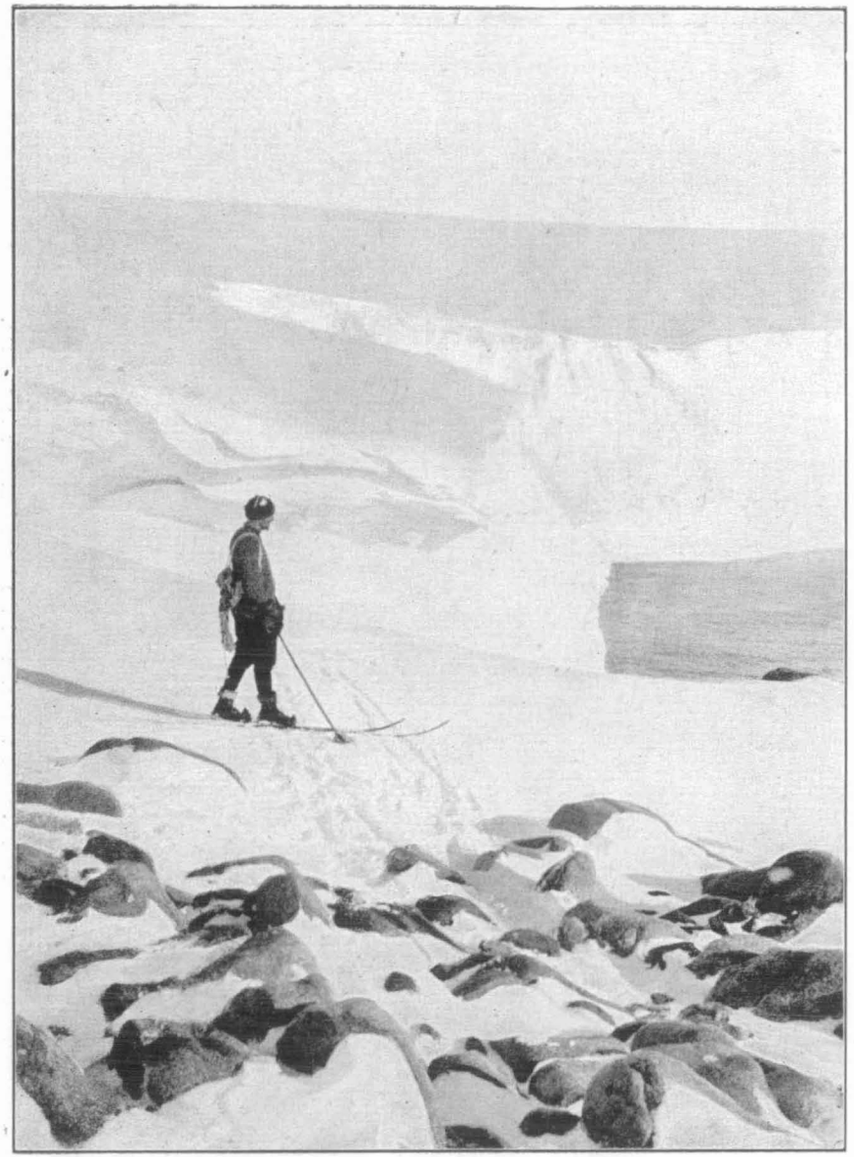

FIG. 1. Ice cliffs at Land's End.

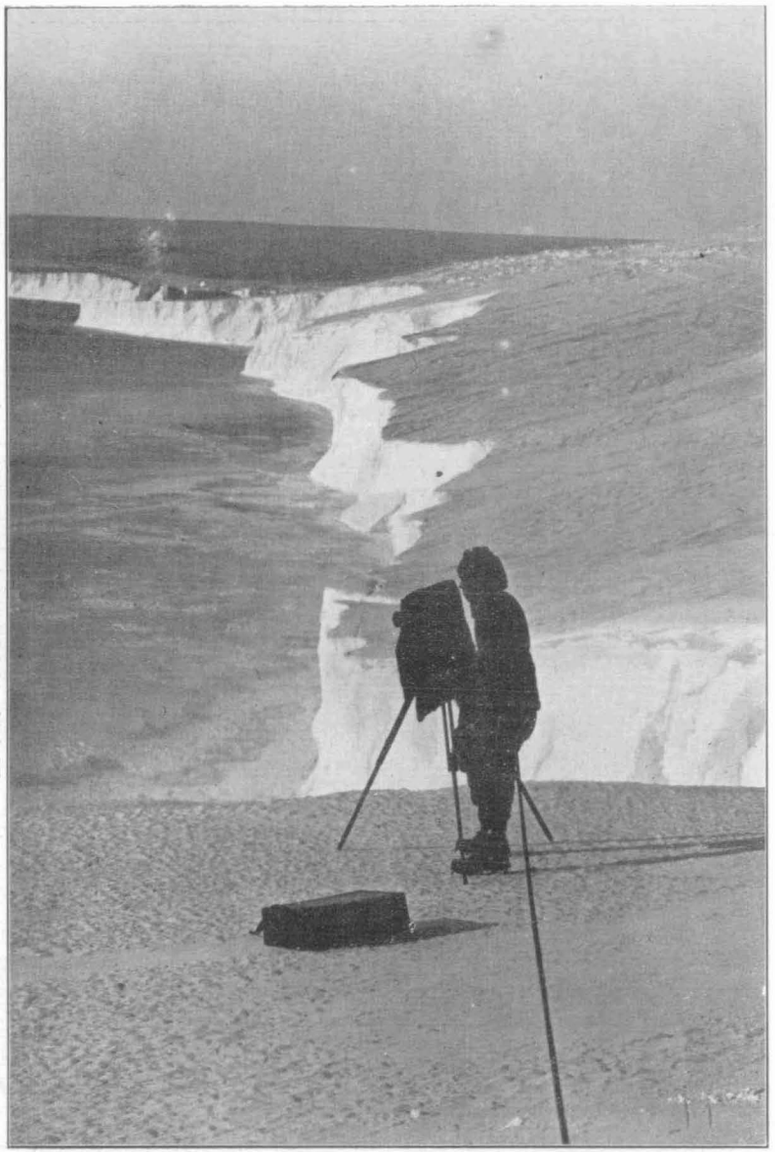

FIG. 2. The margin of the land-ice to the east of Cape Denison.

FIG. 1. A summer view of the Hut.

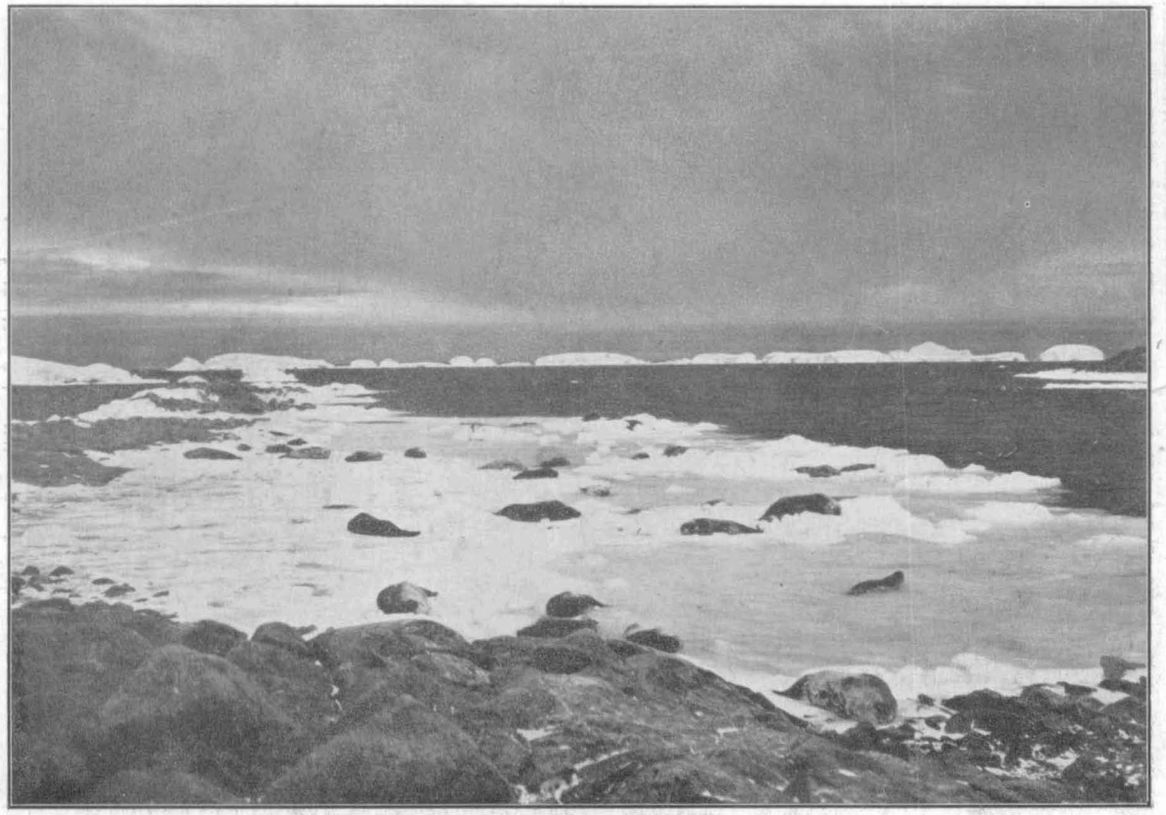

FIG. 2. The west side of the Boat Harbour in autumn.

FIG. 1. Basilisk and Ginger.

FIG. 2. Dogs were used for short sledging trips during the winter months.

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FIG. 1. View looking from the living-room of the Hut into the workshop.

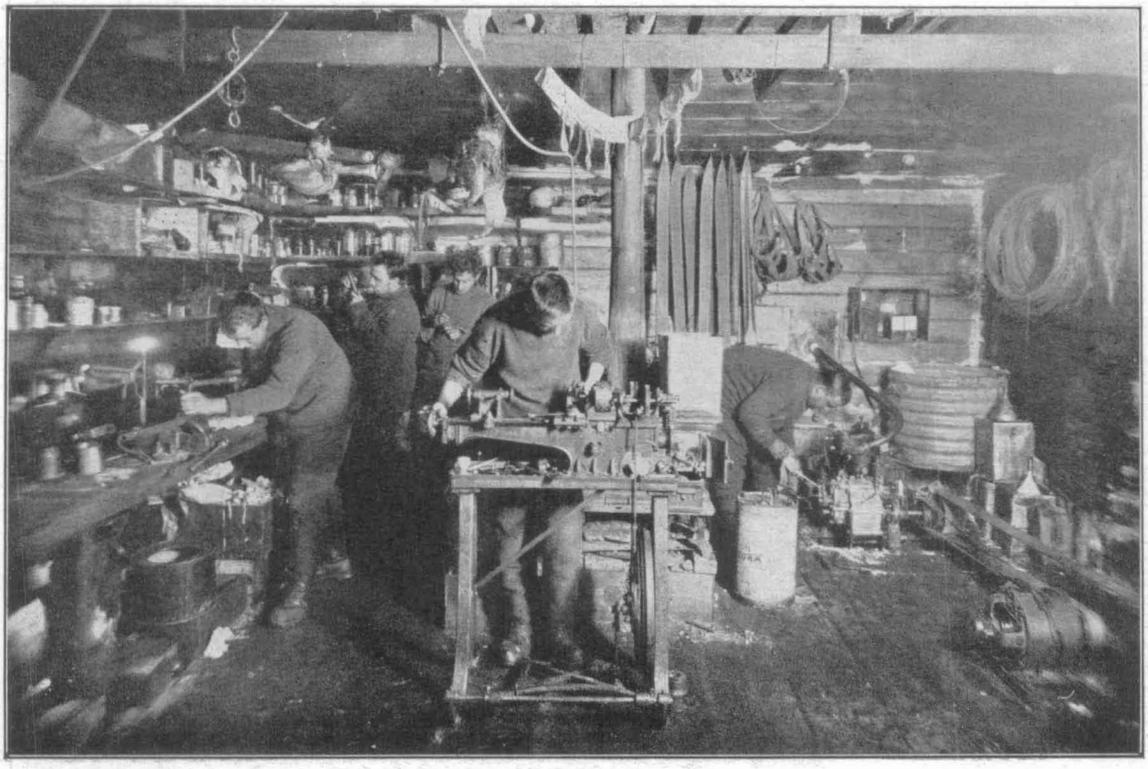

FIG. 2. Busy days in the workshop.

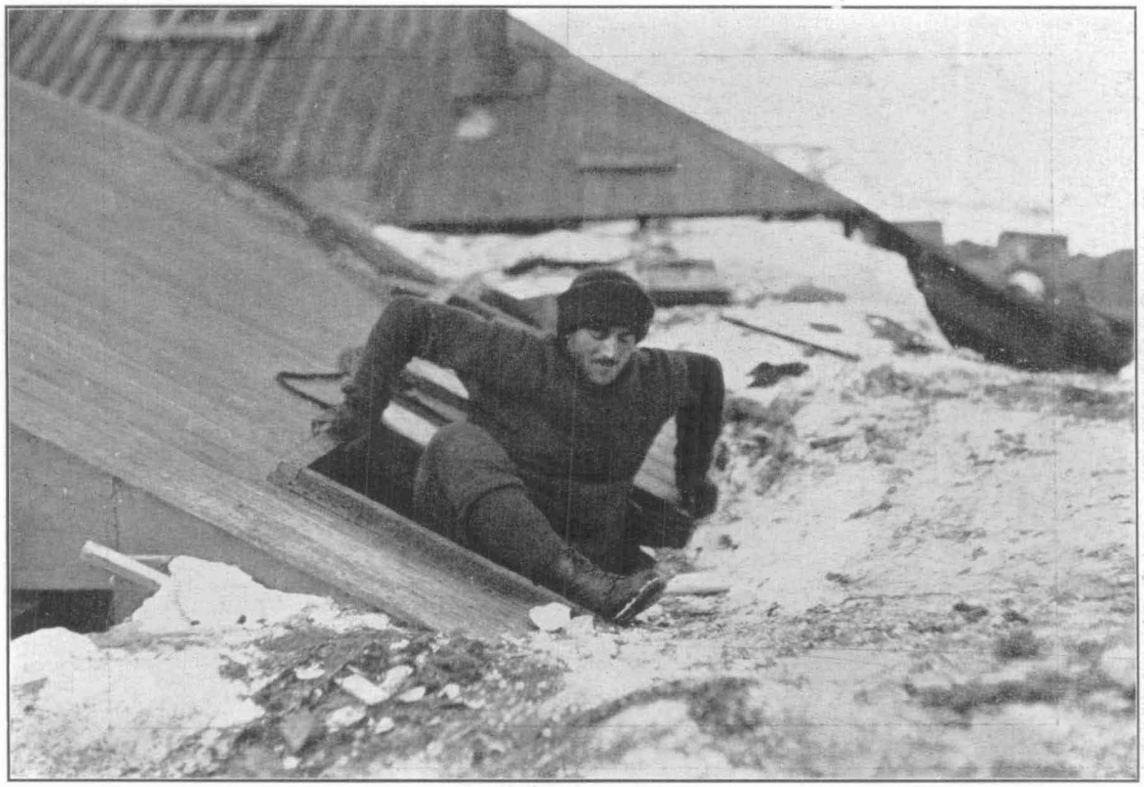

FIG. 1. Exit from the Hut by way of the roof door.

FIG. 2. In the catacombs.

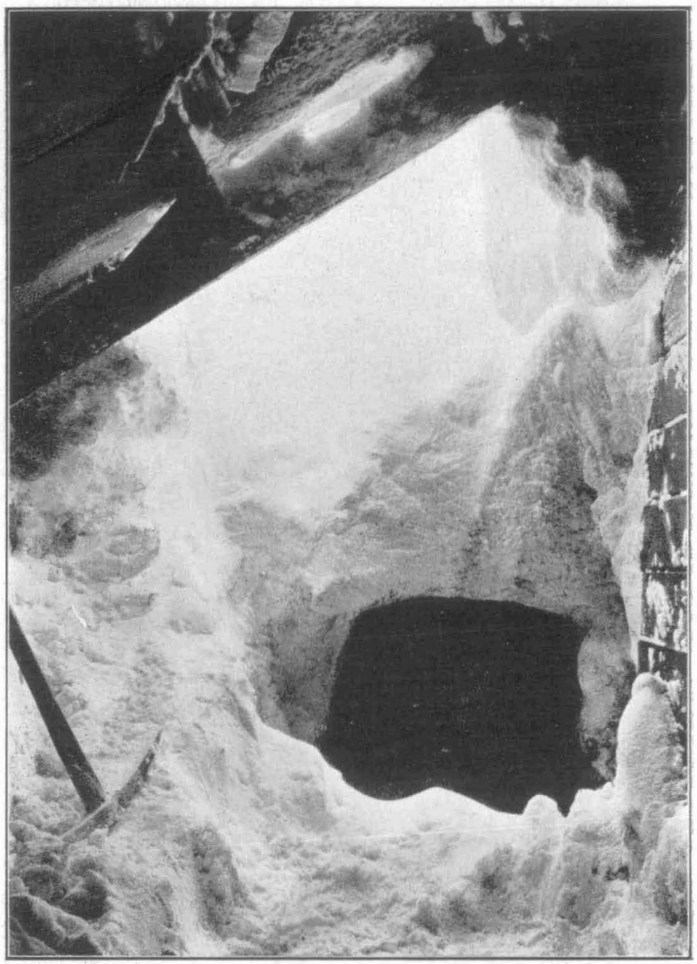

FIG. 1. The winter entrance to the Hut.

FIG. 2. Hodgeman emerging from the Hut into daylight.

FIG. 1. Sledging to Aladdin's Cave.

FIG. 2. "Spell O".

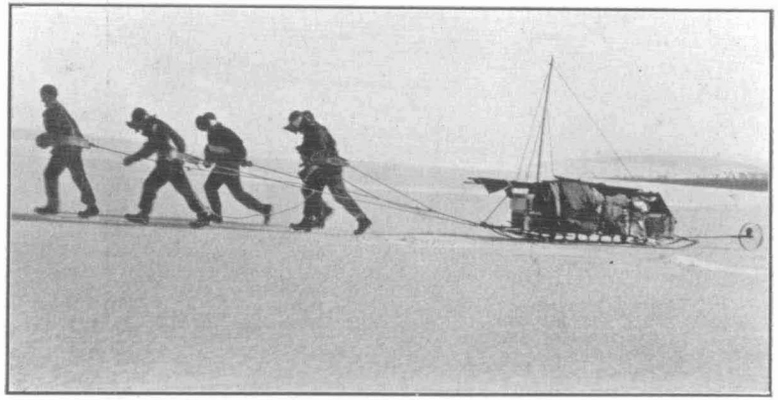

FIG. 3. En route to Aladdin's Cave.

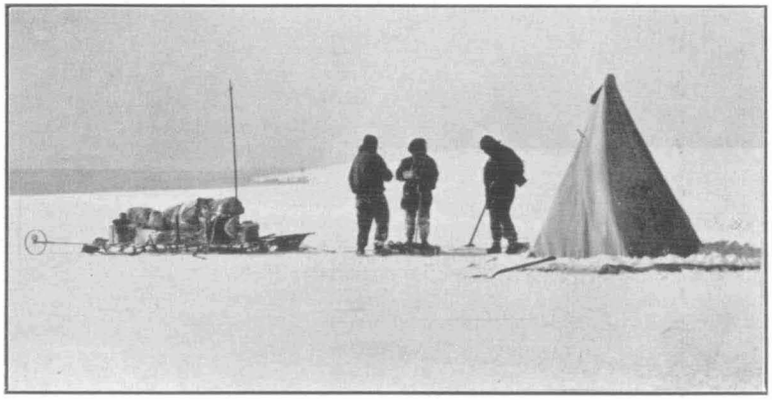

FIG. 4. Camped on the coastal ice slopes.

A corner of the Hut.

FIG. 1. Struggling to reach the anemometer.

FIG. 2. Arrived breathless at the Screen.

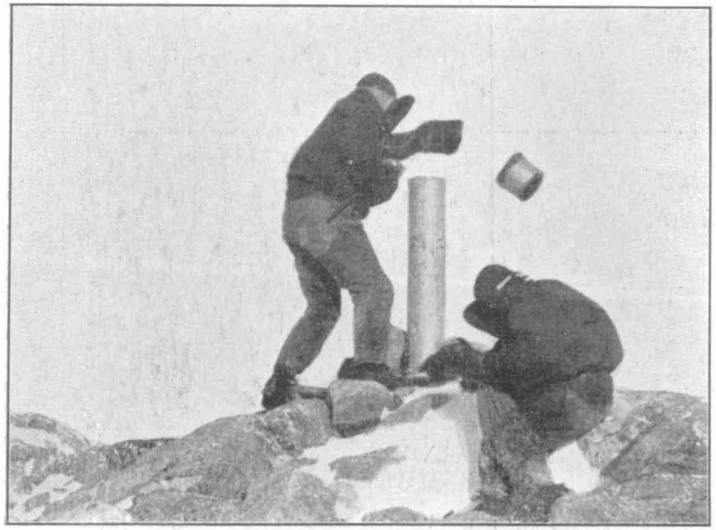

FIG. 3. The Snow-Gauge.

FIG. 4. Leaning on the wind.

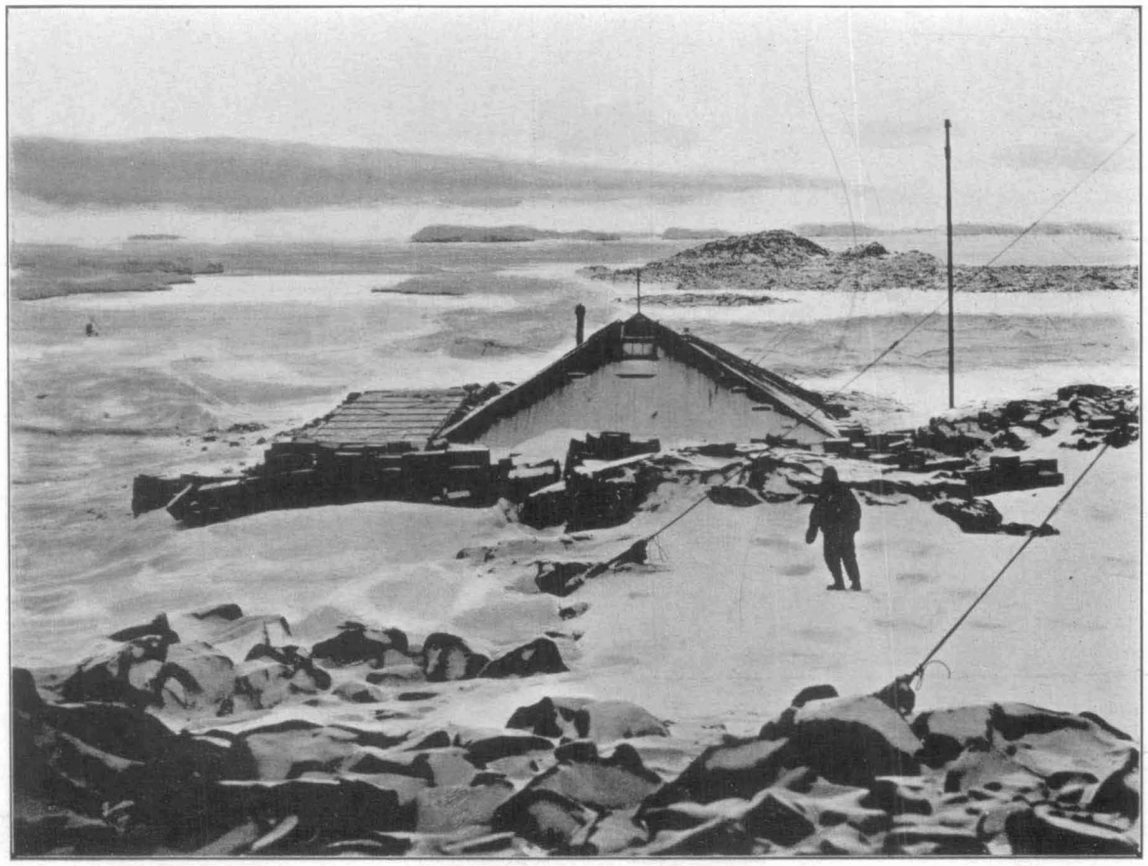

FIG. 1. The Hut and Tide-Gauge from the south.

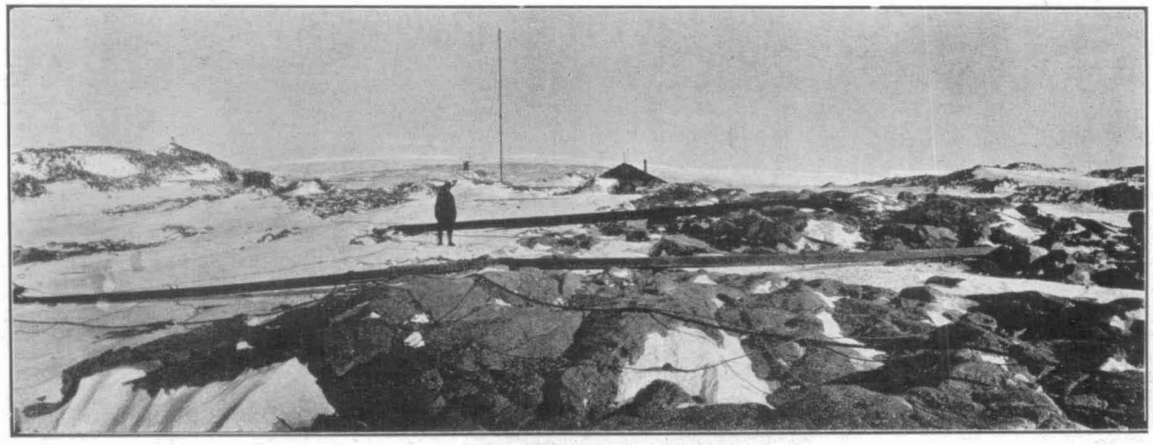

FIG. 2. Winter Quarters as seen from the north.

FIG. 1. The blizzard wind made progress difficult.

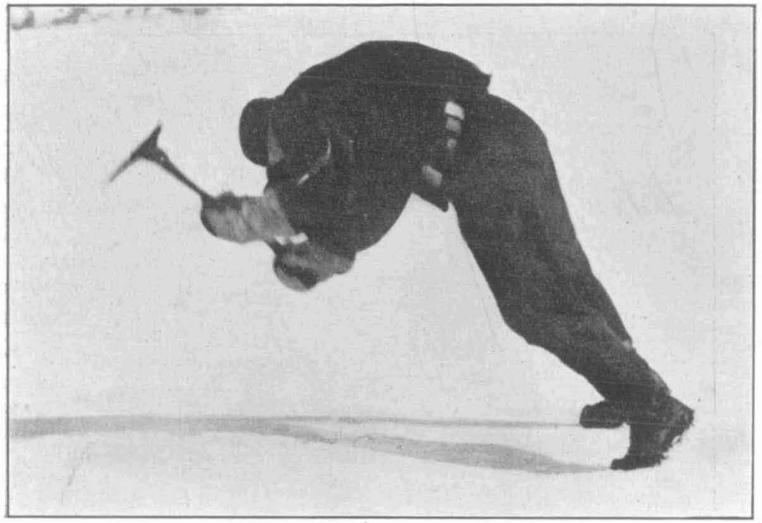

FIG. 2. Quarrying ice in the face of a high wind.

FIG. 3. Conversing in a high wind.

FIG. 4. Ice formed around the face.

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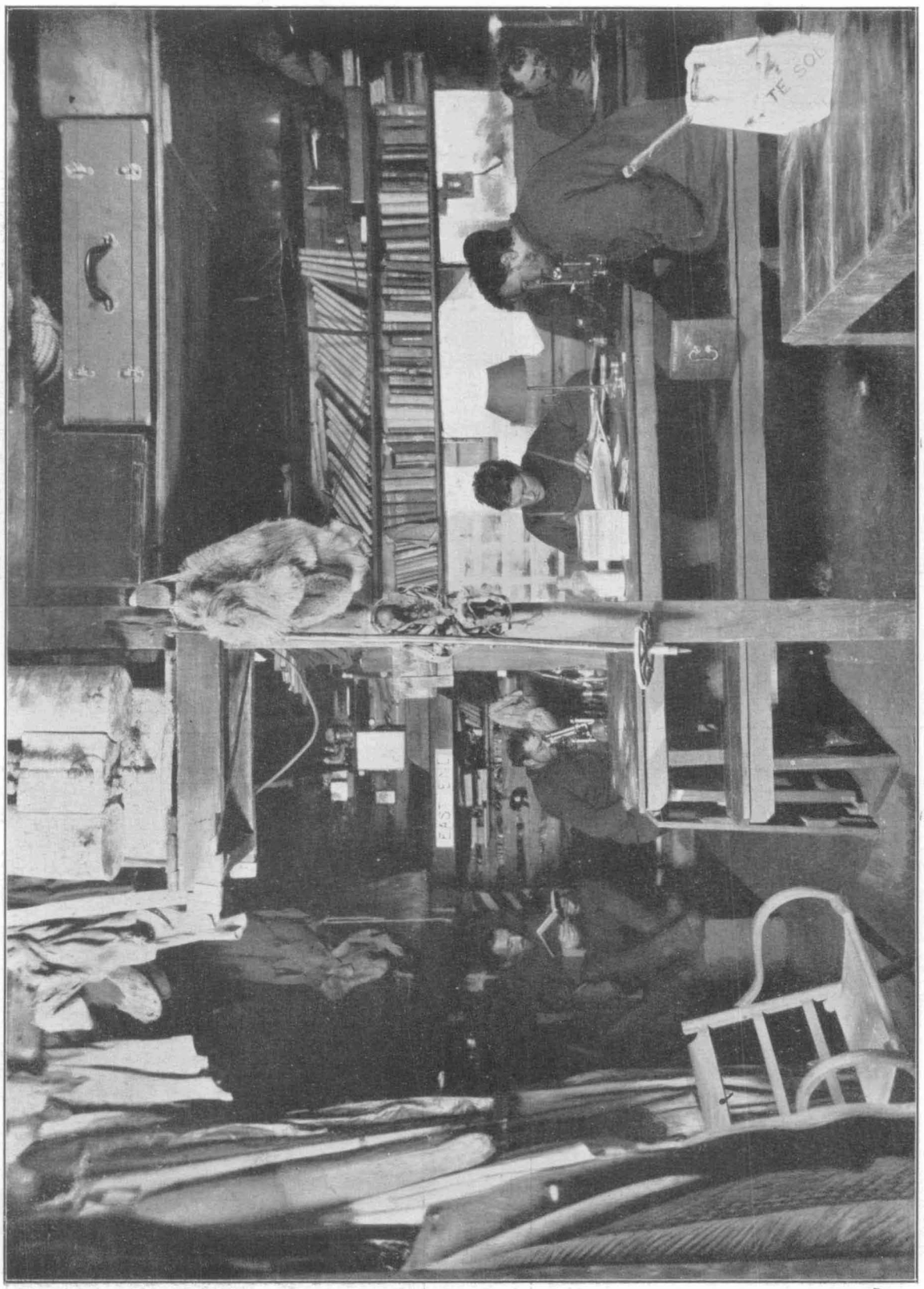


A winter afternoon in the Hut.

FIG. 1. Erecting a wireless mast.

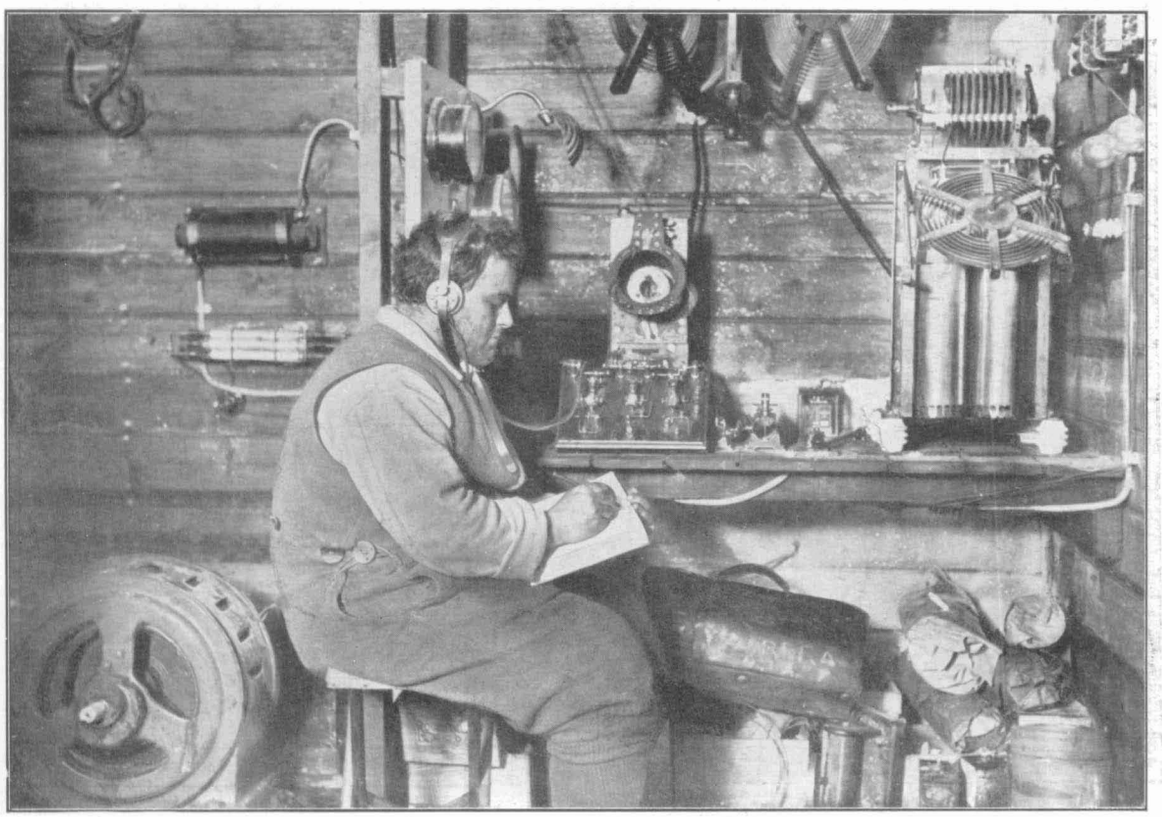


FIG. 2. The wireless transmitting and receiving equipment.

FIG. 1. Evening recreation in the Hut.

FIG. 2. Hurley as tonsorial artist.

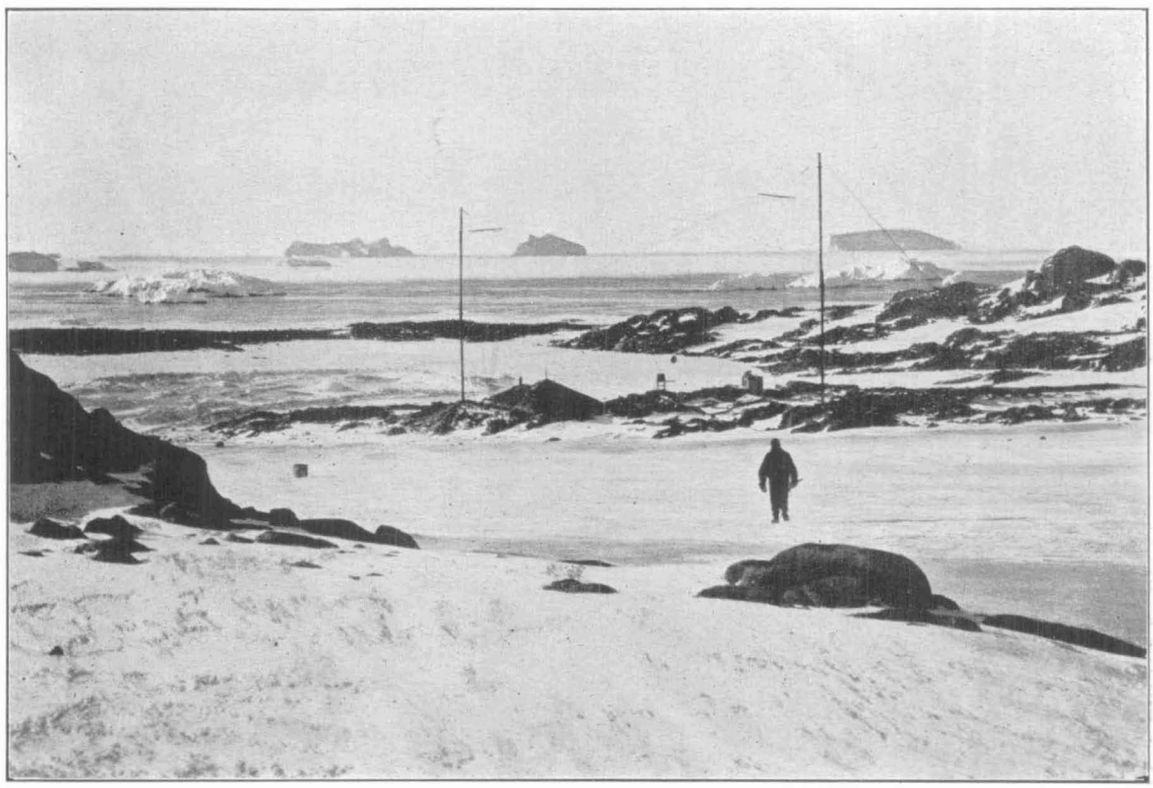
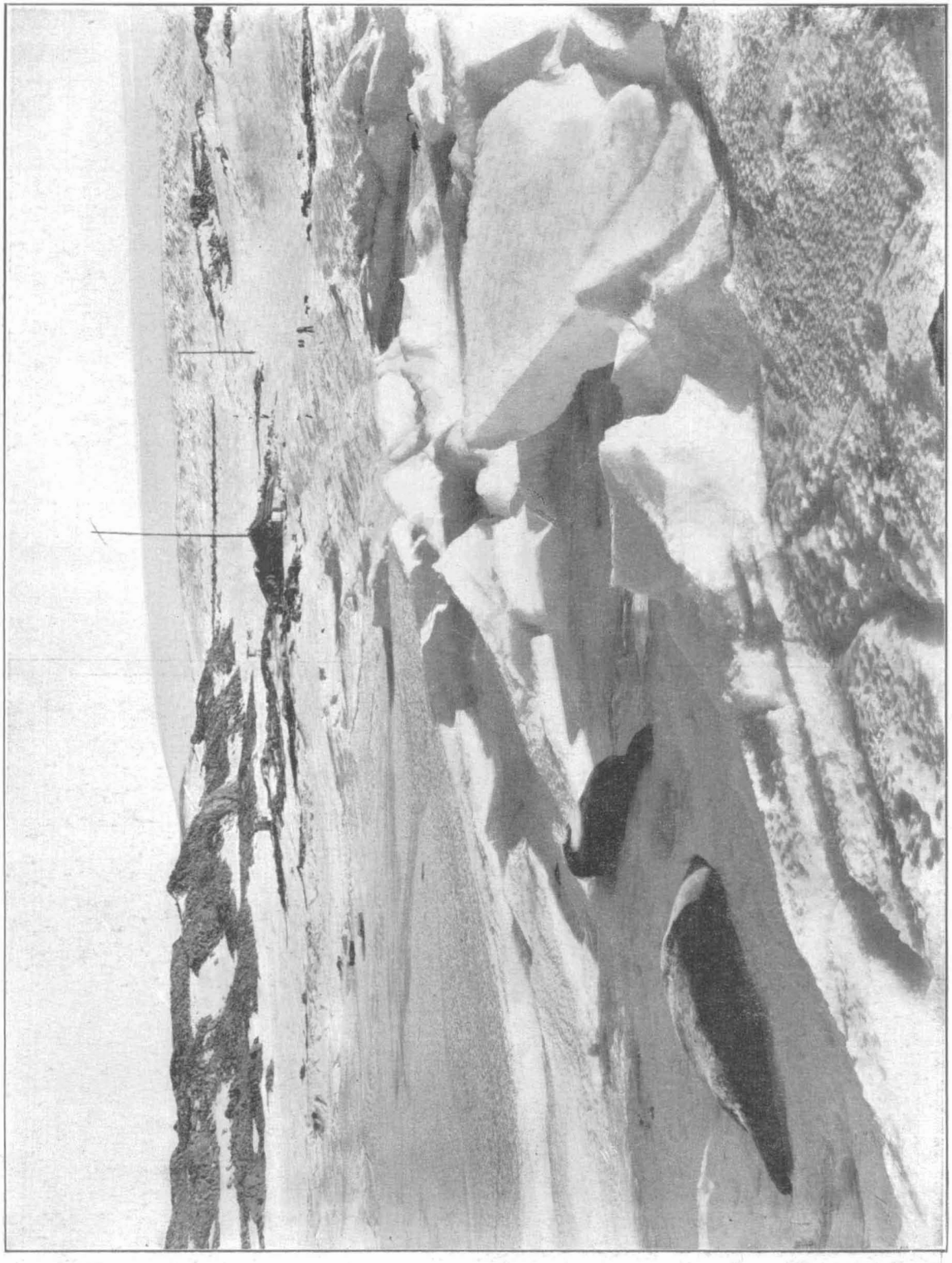


FIG. 1. The Hut and wireless masts.

FIG. 2. The ice cliffs of Commonwealth Bay.



Winter Quarters viewed from the frozen surface of the Boat Harbour.

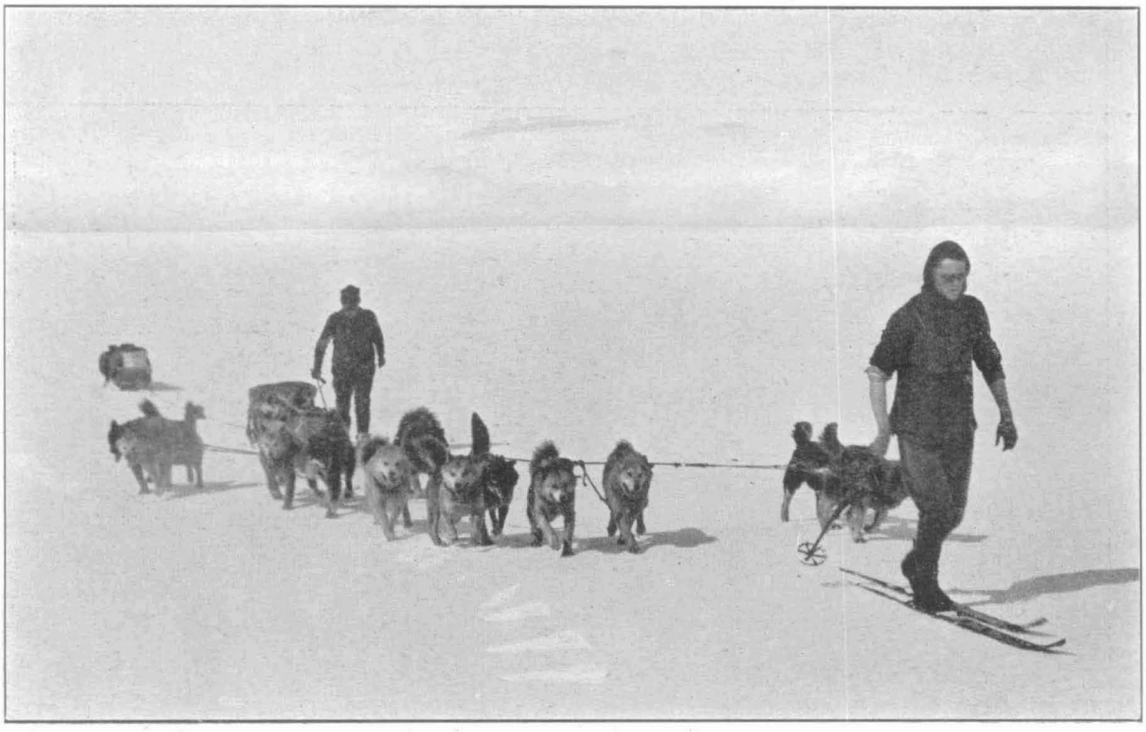


FIG. 1. Sledging across the Plateau.

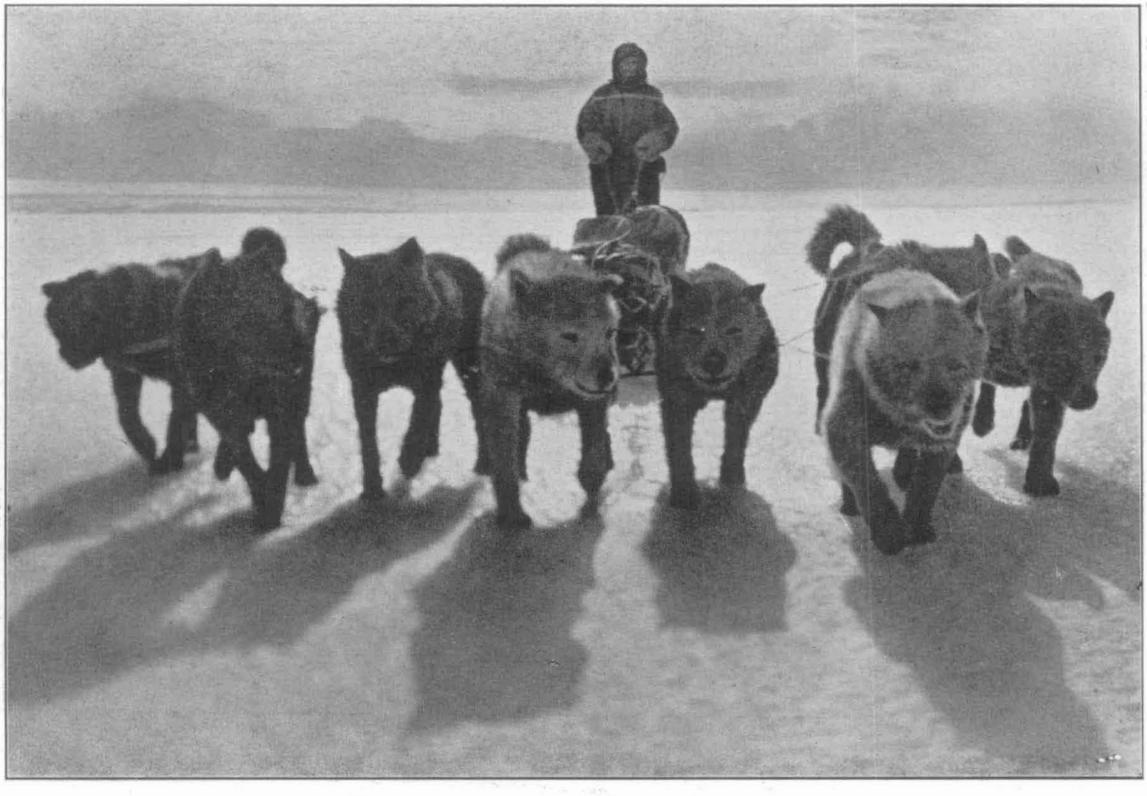


FIG. 2. Sledging on the coastal ice slopes.

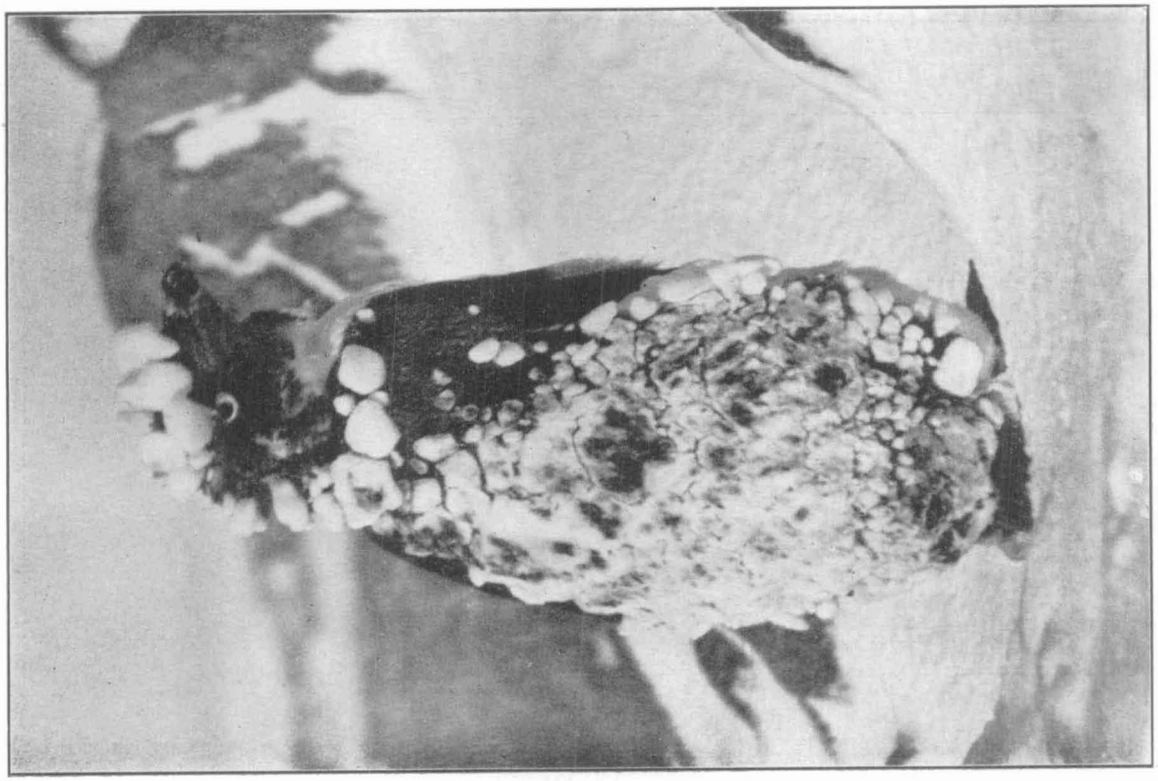


FIG. 2. A sorry plight.

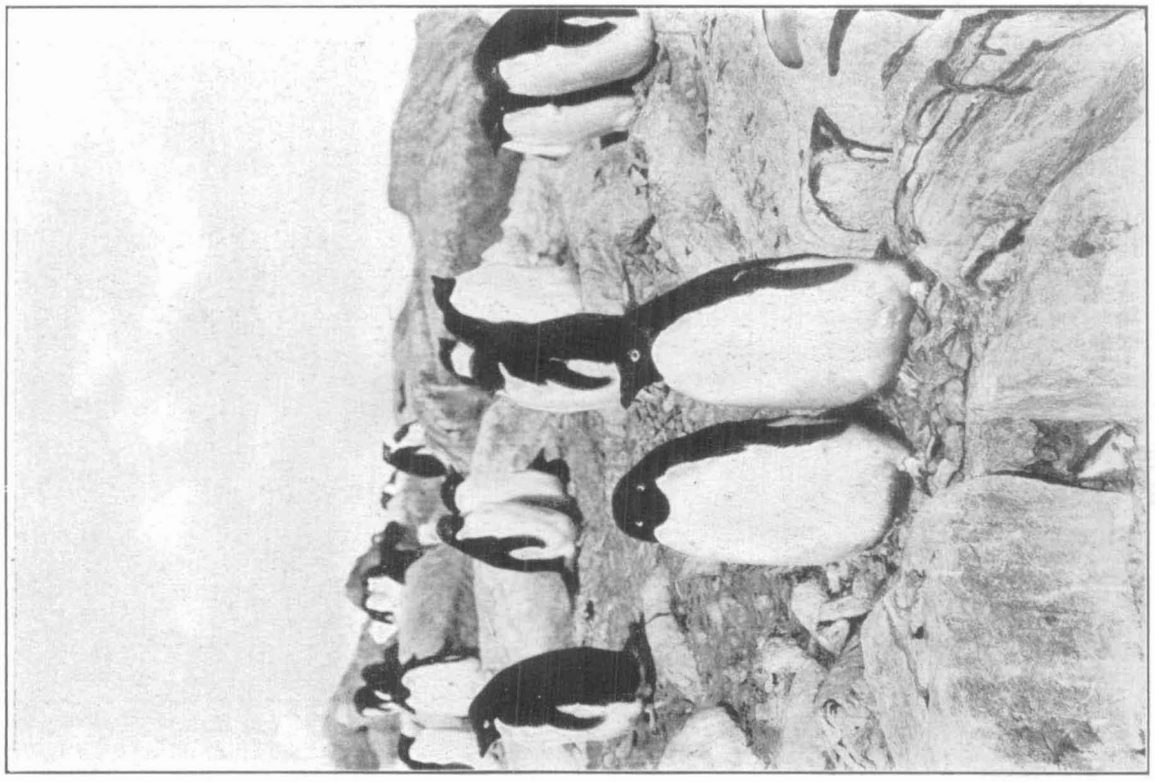


FIG. 1. Adelie Penguins mated.

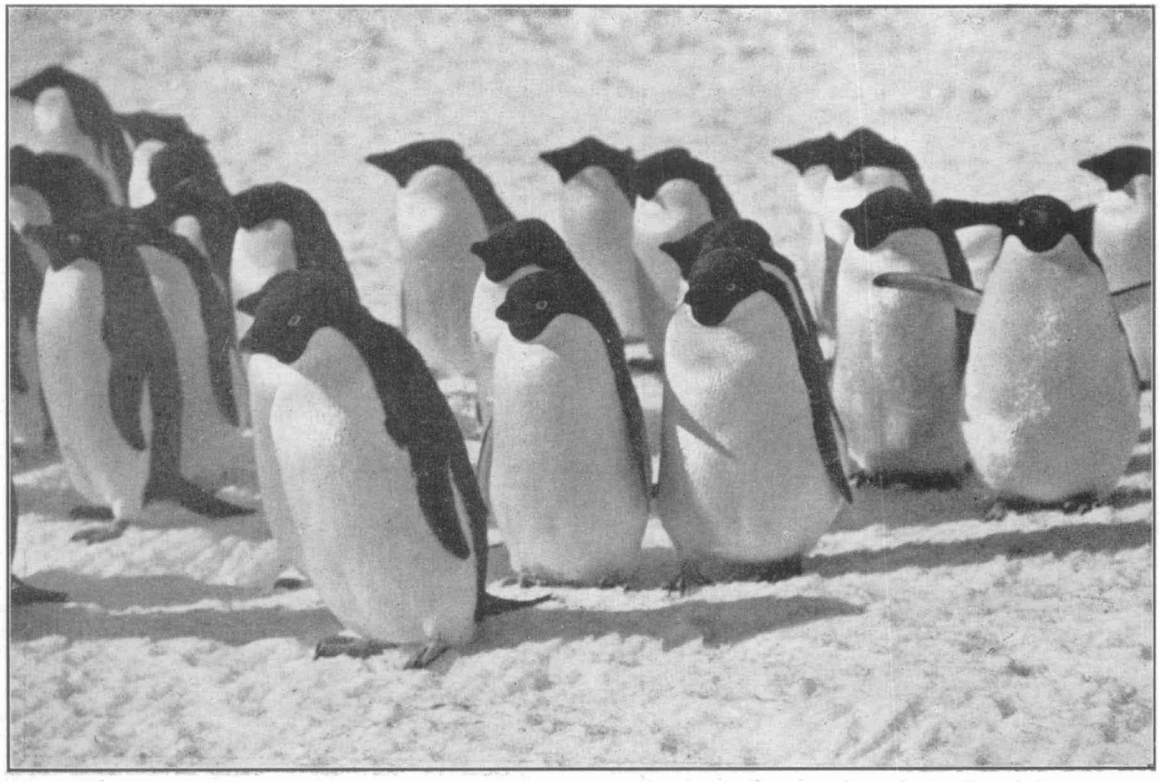


FIG. 1. Adelie Penguins sleek and fat.

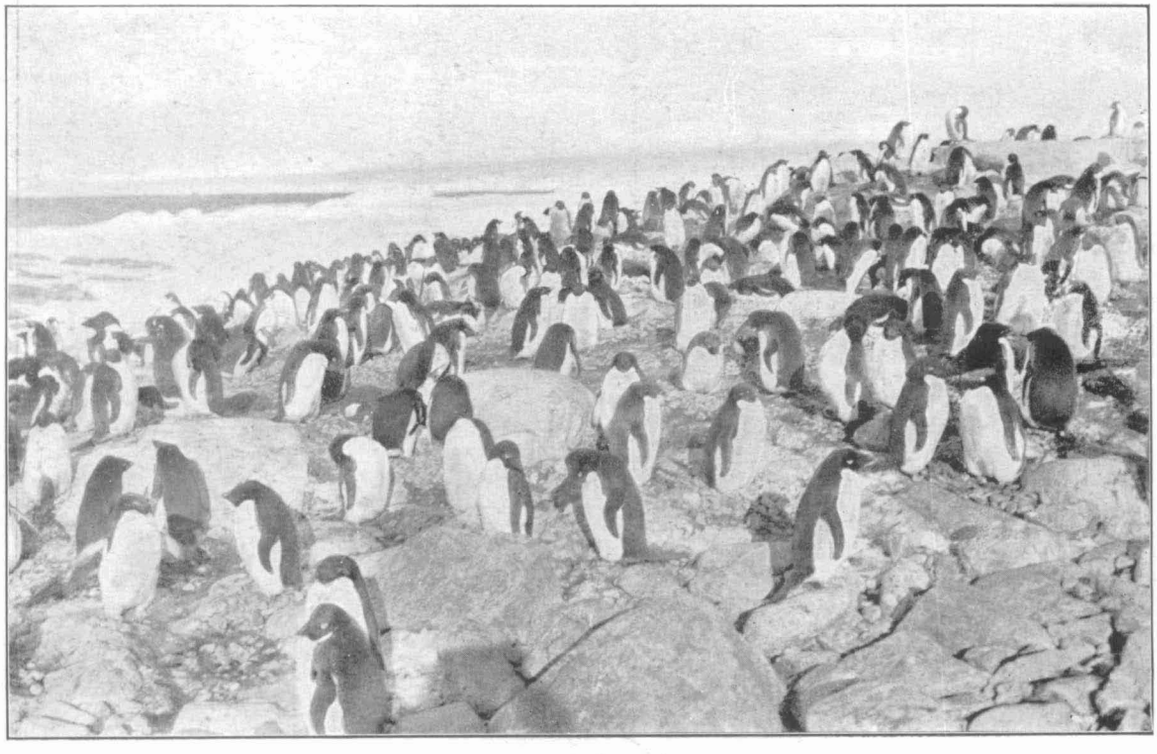
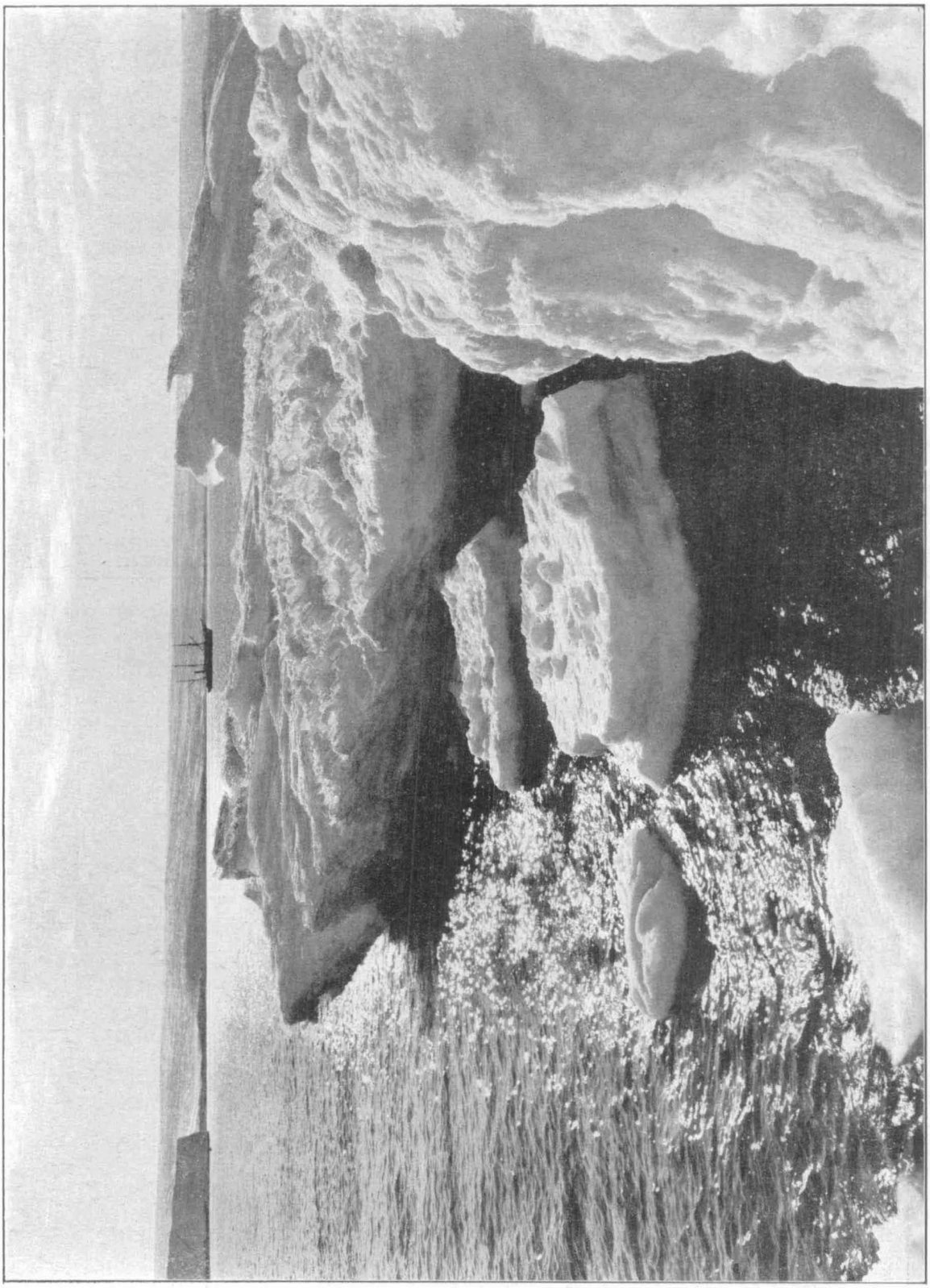


FIG. 2. An Adelie Penguin rookery.



Commonwealth Bay in mid-summer.

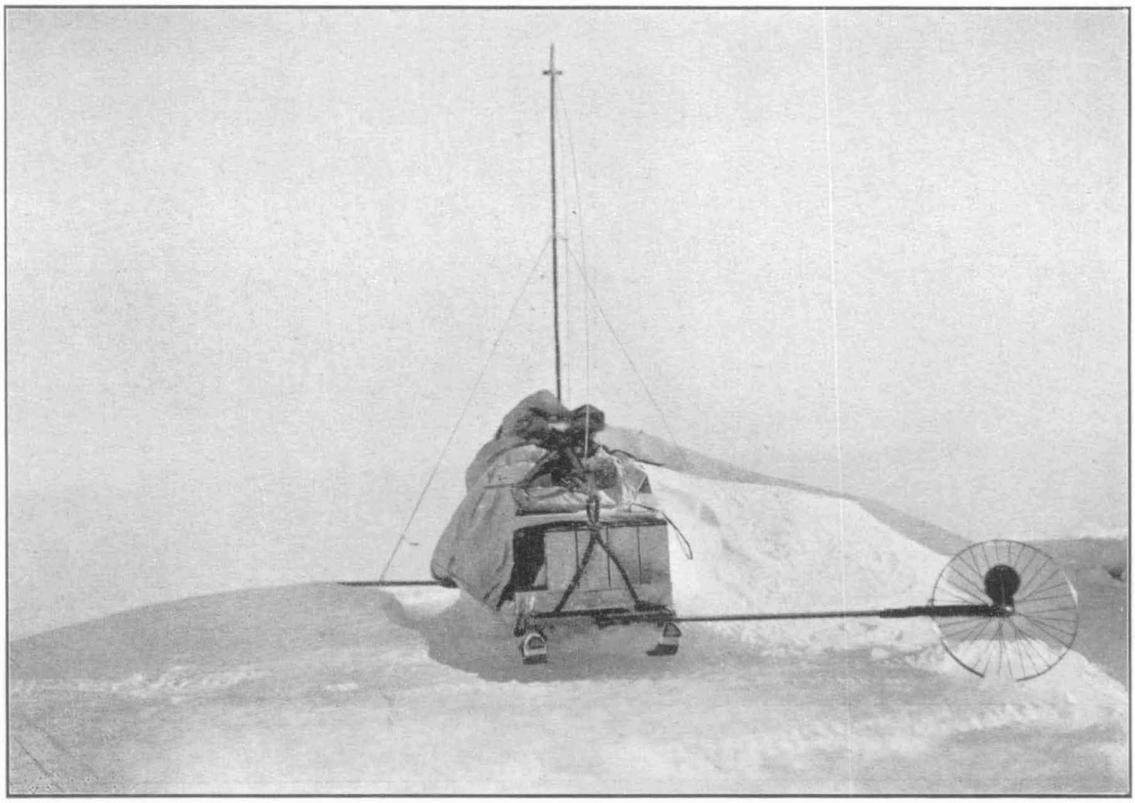


FIG. 1. Sledge cached in March, 1912, as found in the following August.

FIG. 2. Weather-bound in Aladdin's Cave.

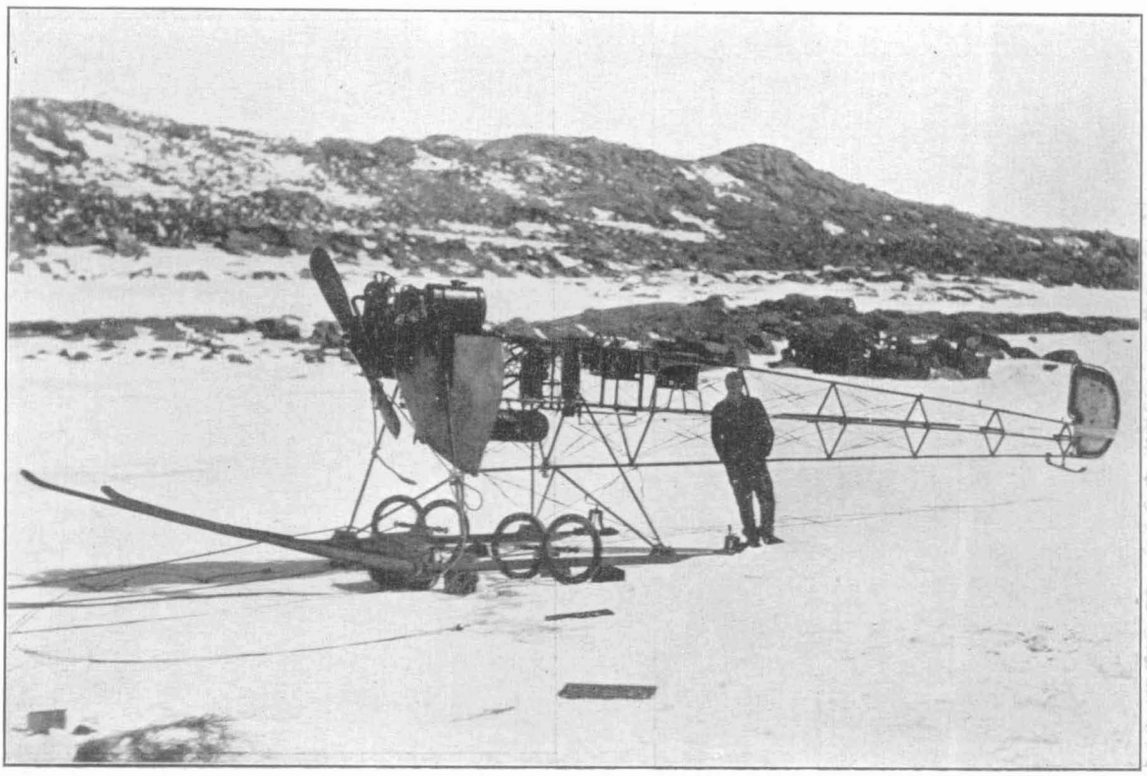


FIG. 1. The air-tractor.

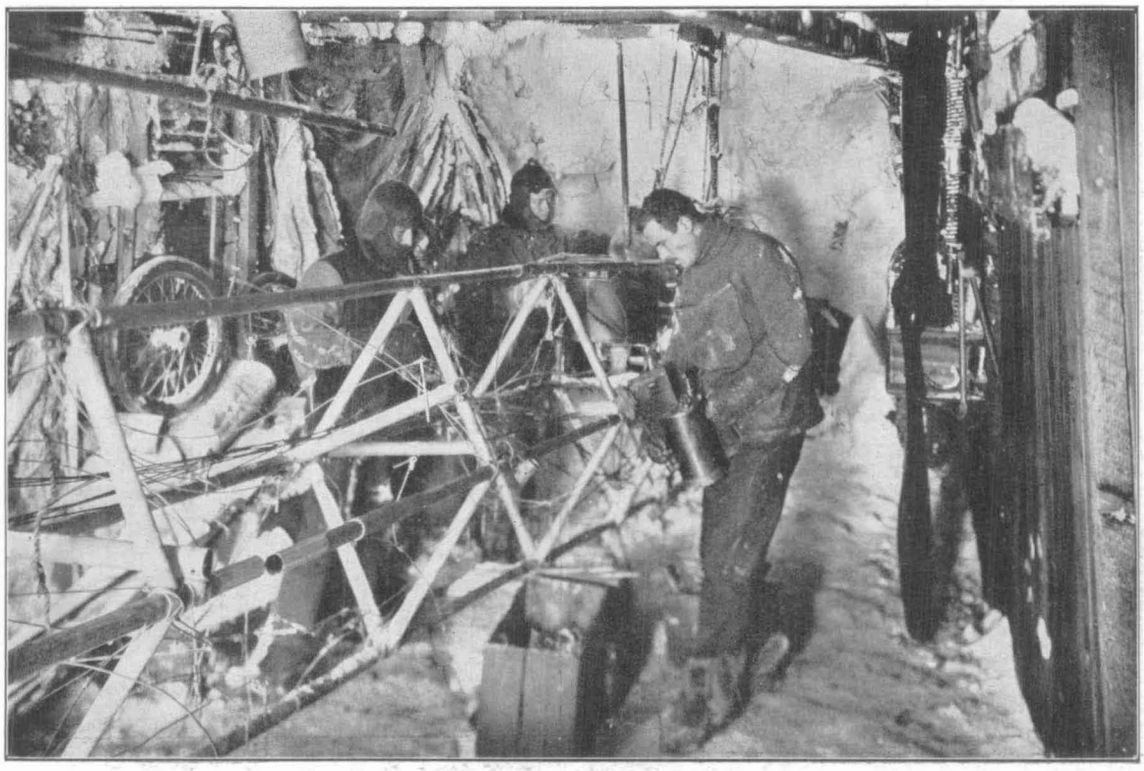


FIG. 2. Repairing the air-tractor in the hangar.

FIG. 1. Erecting tent in high wind: first stage.

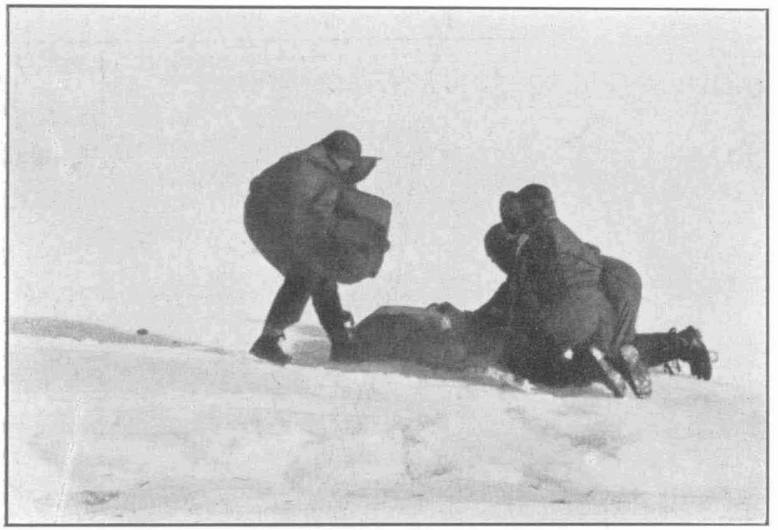


FIG. 2. Erecting tent in high wind: second stage.

FIG. 3. Erecting tent in high wind: third stage.

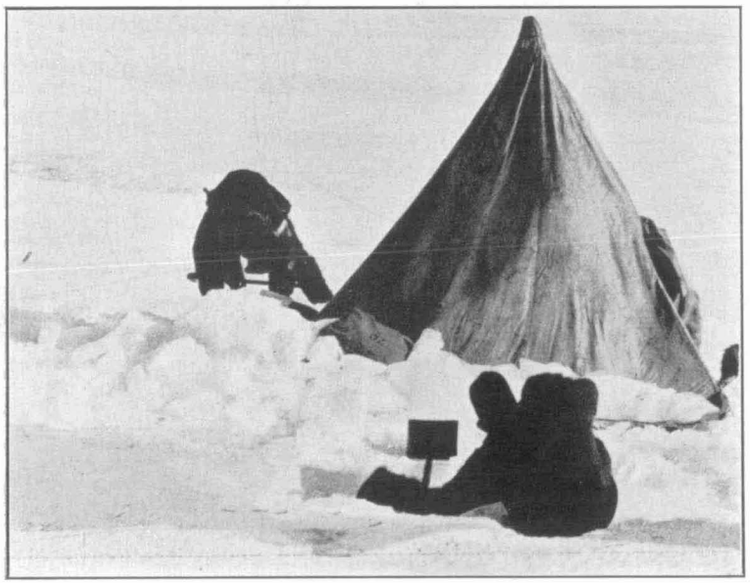


FIG. 4. Erecting tent in high wind: final stage

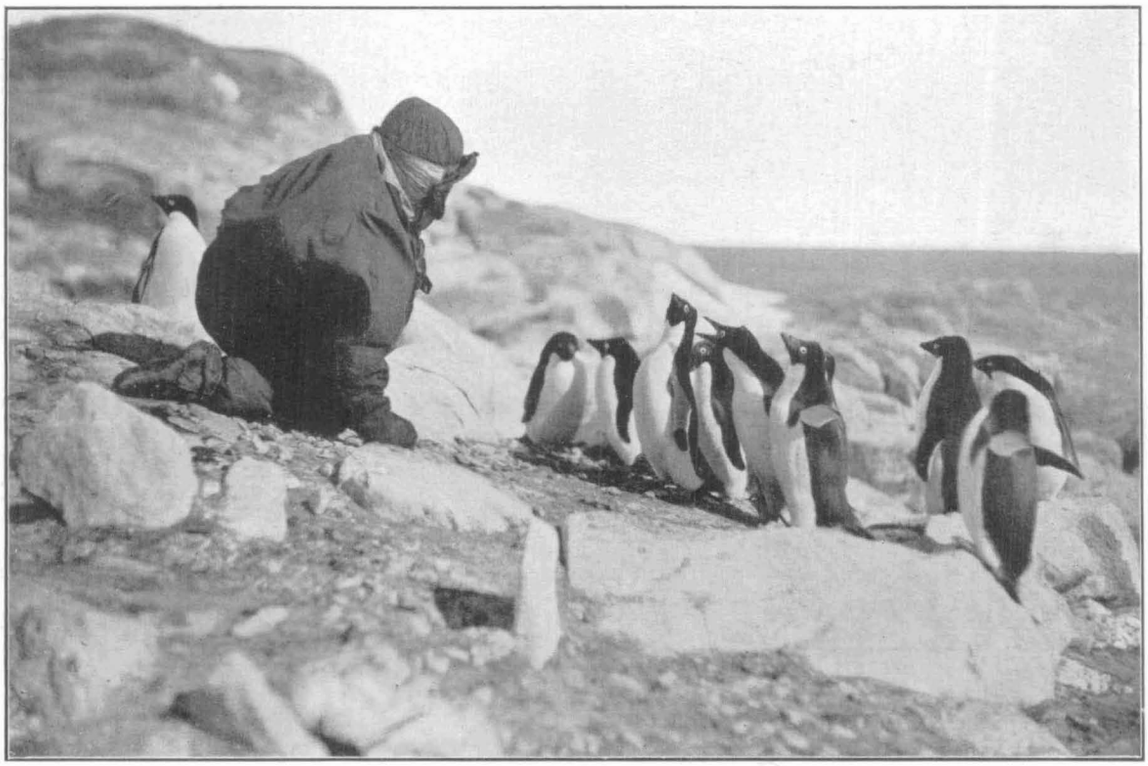


FIG. 1. Hunter interviewing the penguins.

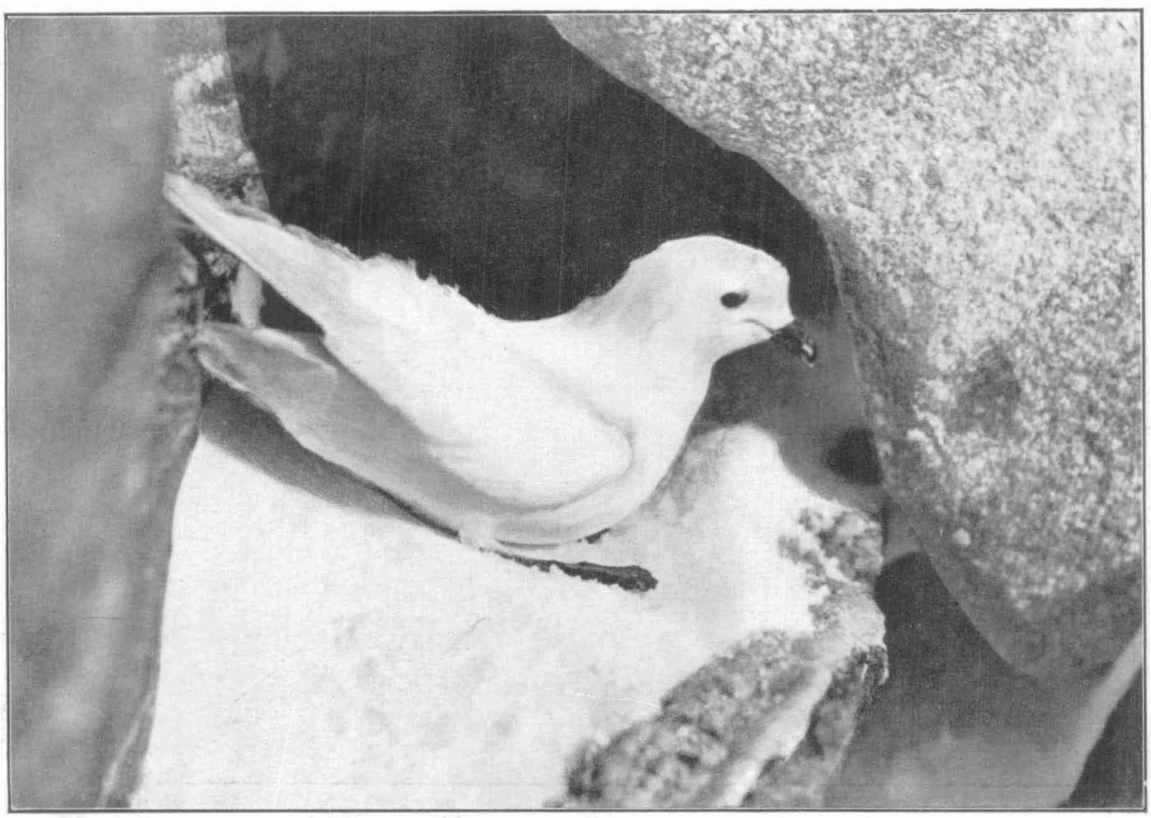


FIG. 2. A Snow Petrel emerging from its nest.

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FIG. 1. The surface of the glacier at Aladdin's Cave.

FIG. 2. Dr. Mertz emerging from Aladdin's Cave.

FIG. 1. Seaweed cast up on shore-ice.

FIG. 2. A Weddell Seal.

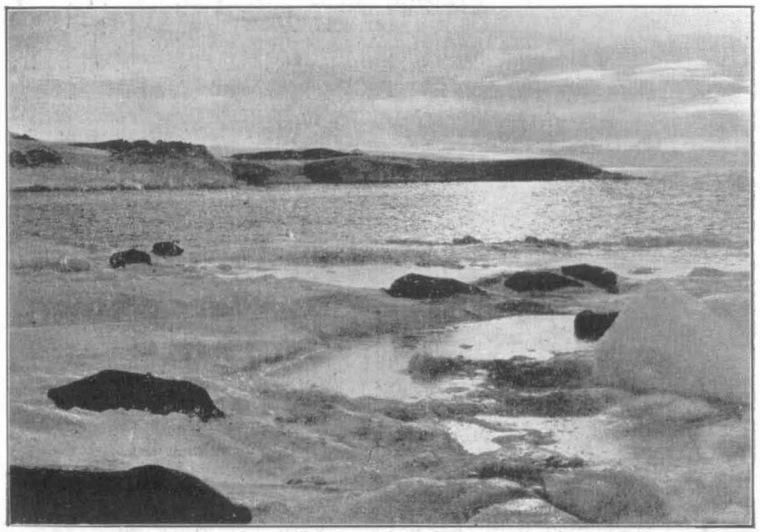

FIG. 3. Autumn near Cape Denison.

FIG. 4. Weddell Seals.

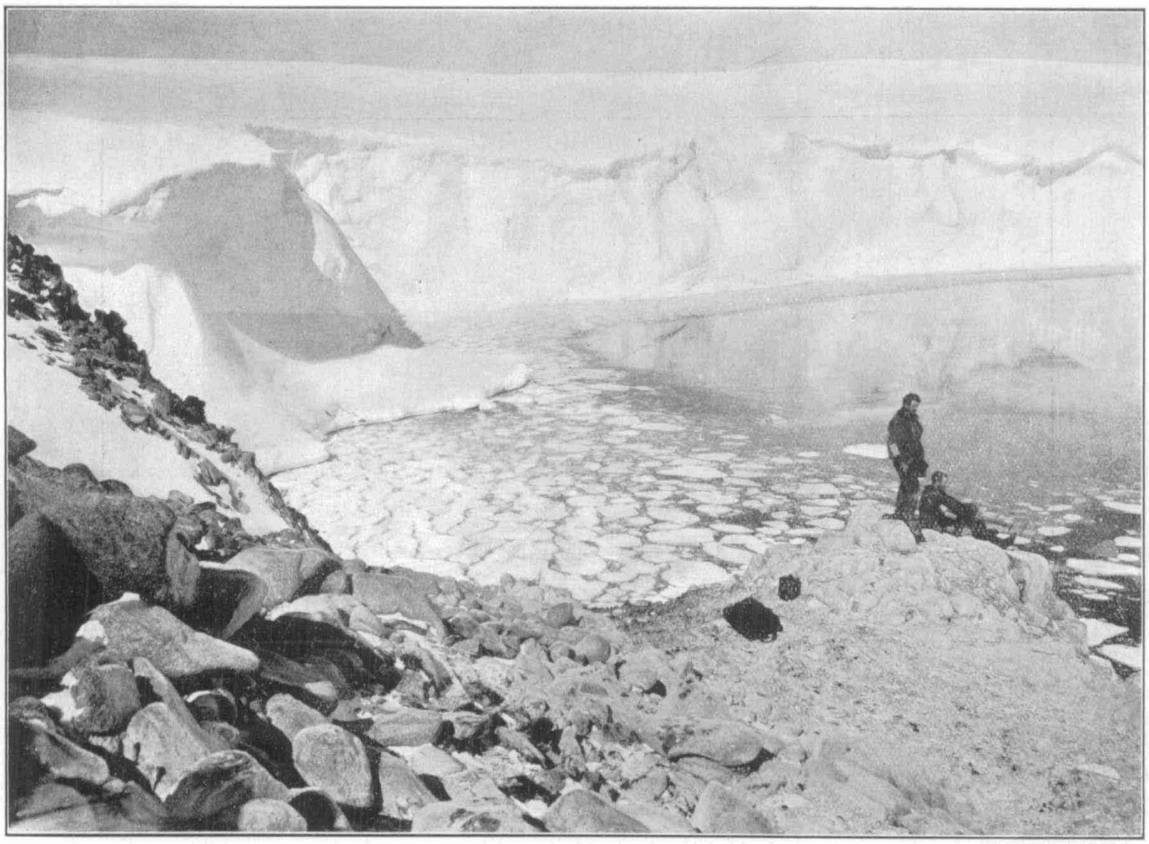

FIG. 1. Pancake-ice.

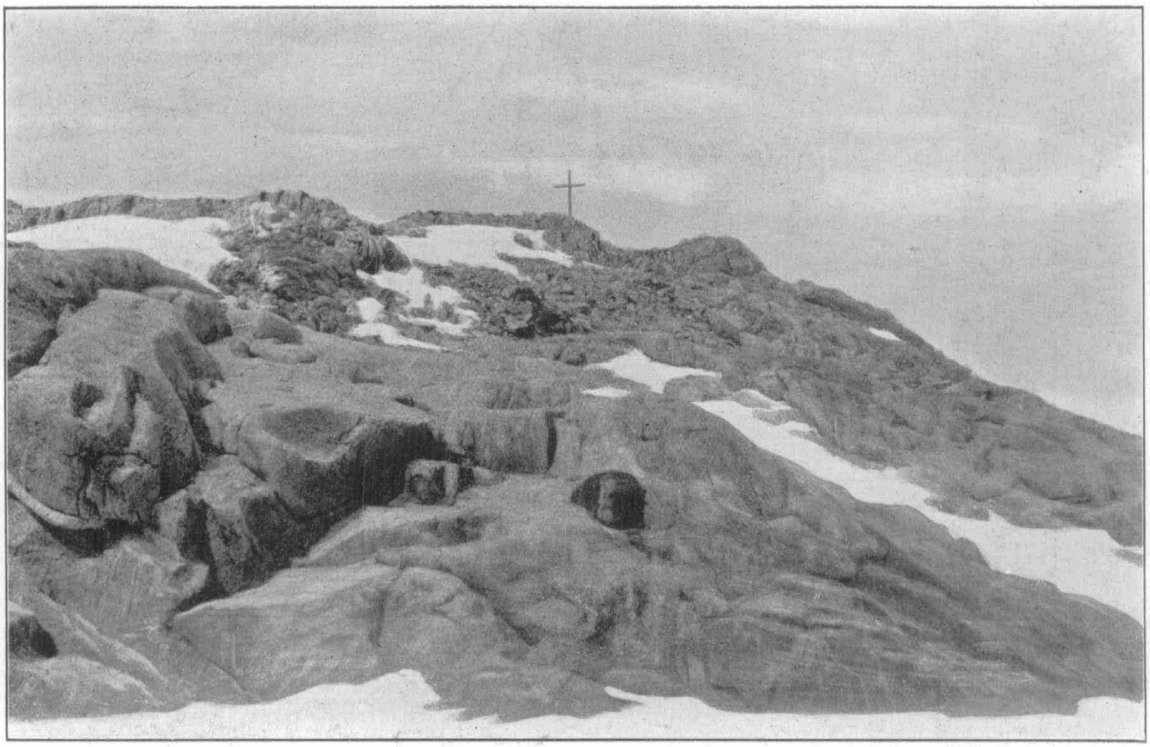

FIG. 2. Memorial Hill from the east.

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FIG. 1. The dogs tethered during a halt on the far-east sledge journey.

FIG. 2. Breaking camp on the Plateau.

FIG. 1. The eastern parties camped on the Plateau.

FIG. 2. The Far-East Party traversing the Plateau.

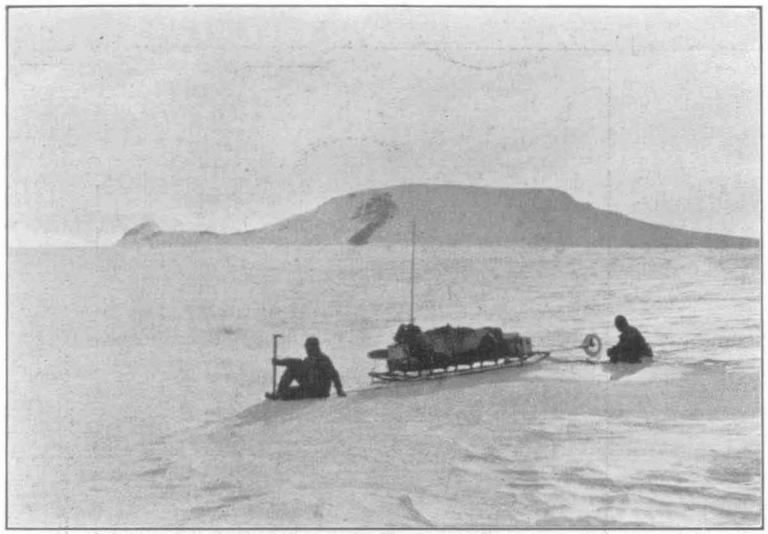

FIG. 1. Aurora Peak.

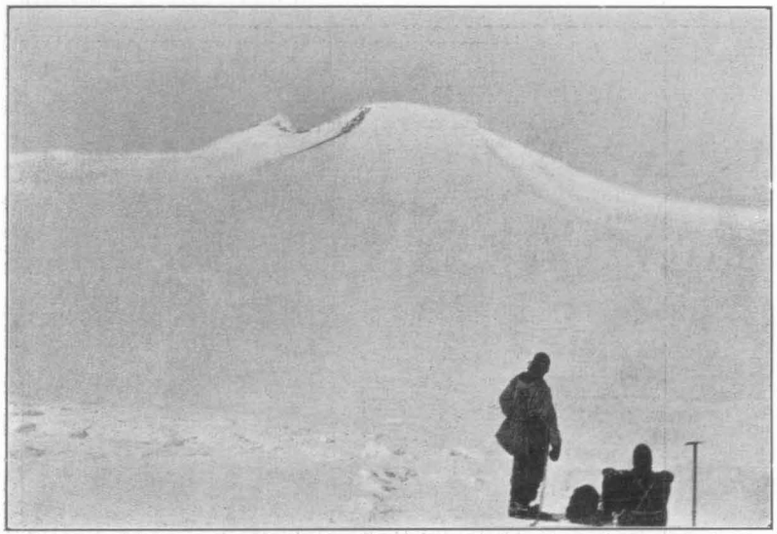

FIG. 2. Aurora Peak.

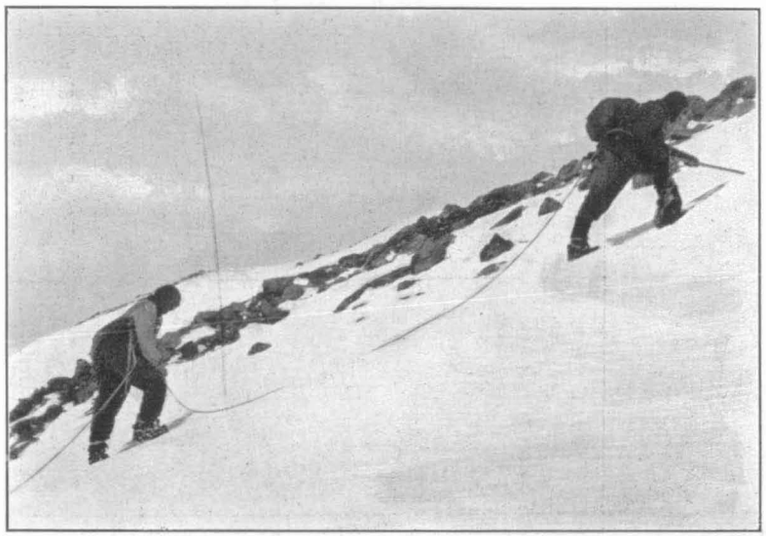

FIG. 3. Ascending Aurora Peak.

FIG. 4. The summit of Aurora Peak.

FIG. 1. Madigan taking observations for position.

FIG. 2. The tent after a blizzard.

FIG. 3. Breaking camp.

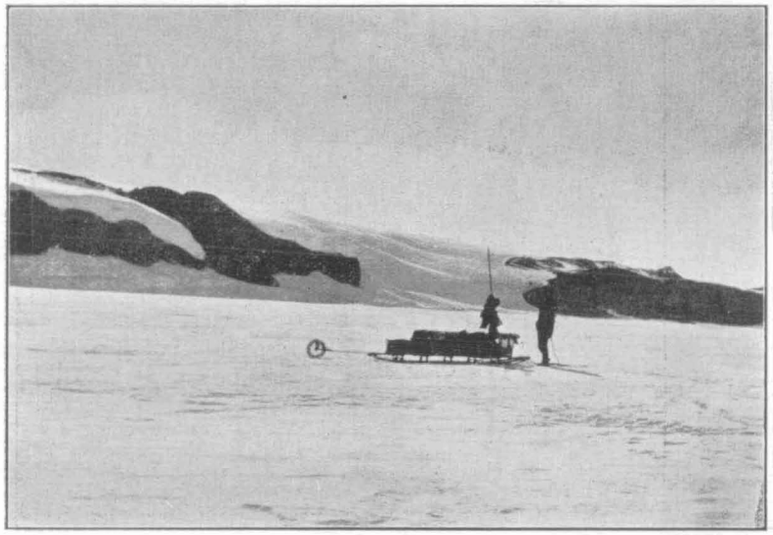

FIG. 4. The coast near Penguin Point.

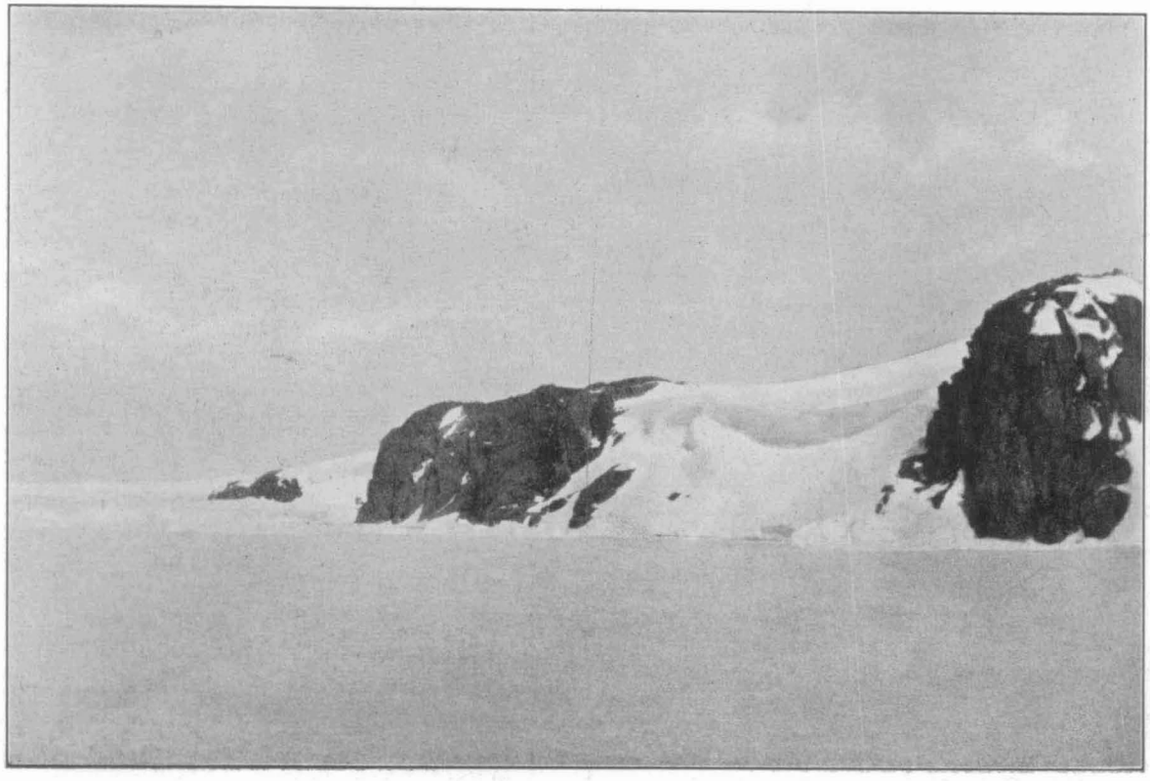

FIG. 1. Penguin Point.

FIG. 2. King George Land coastline.

FIG. 1. Over the sea-ice.

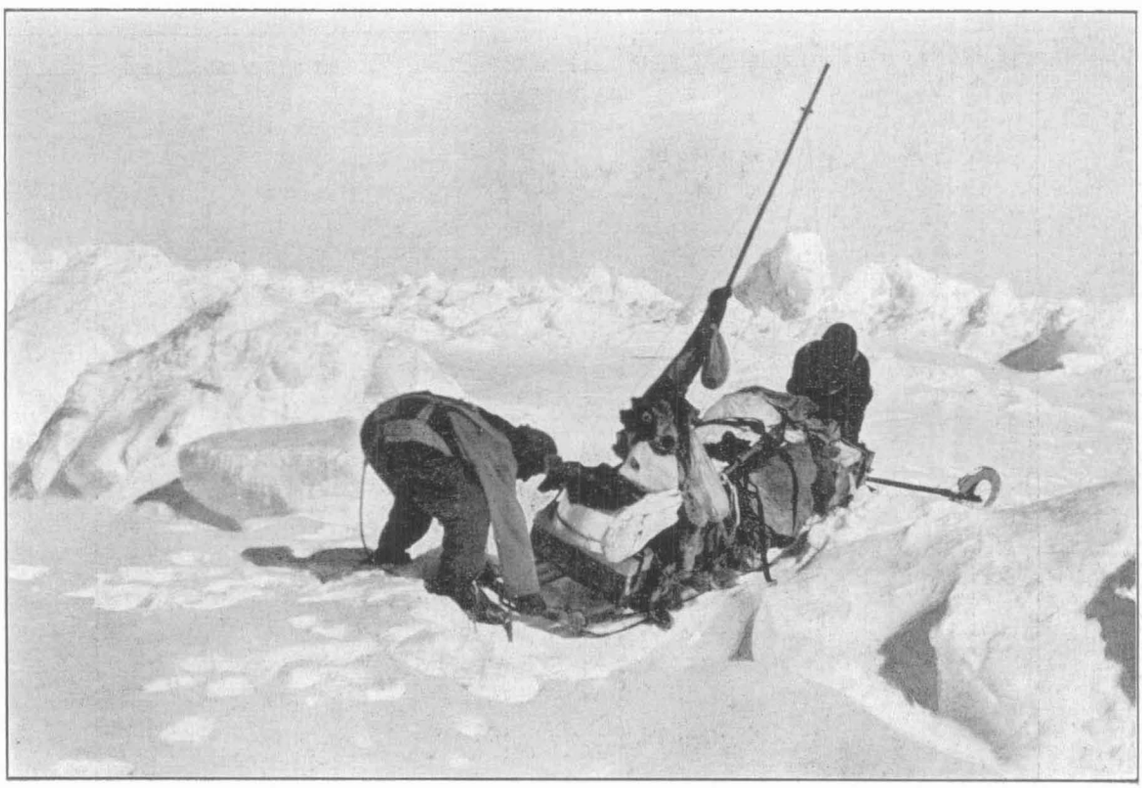

FIG. 2. Crossing pressure-ice.

FIG. 1. A pressure-ice pinnacle.

FIG. 2. The Eastern Sledge Party.

FIG. 1. Traversing the Ninnis Glacier Tongue.

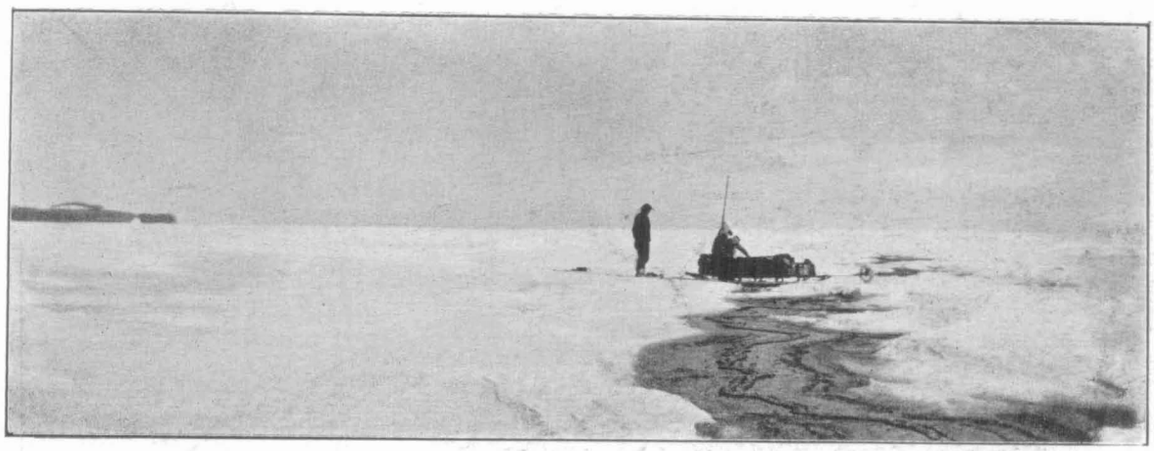

FIG. 2. On the sea-ice north of Horn Bluff.

FIG. 1. Distant view of Horn Bluff.

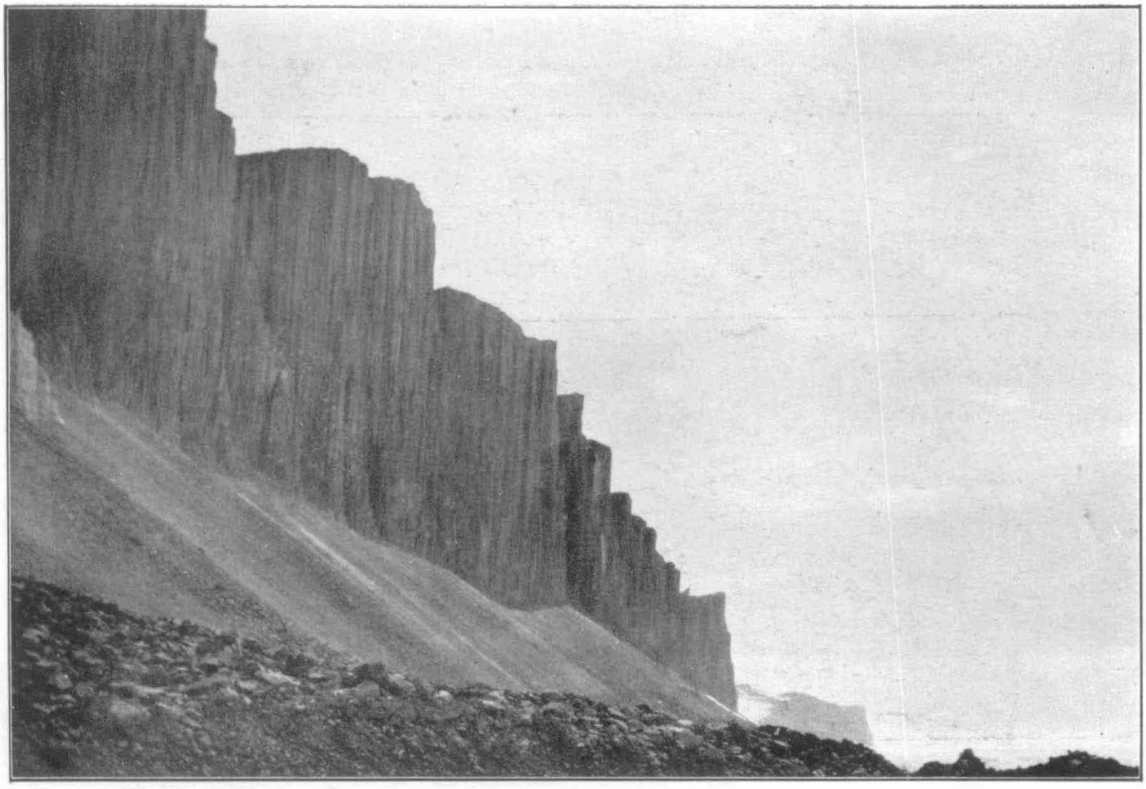

FIG. 2. The cliffs at Horn Bluff.

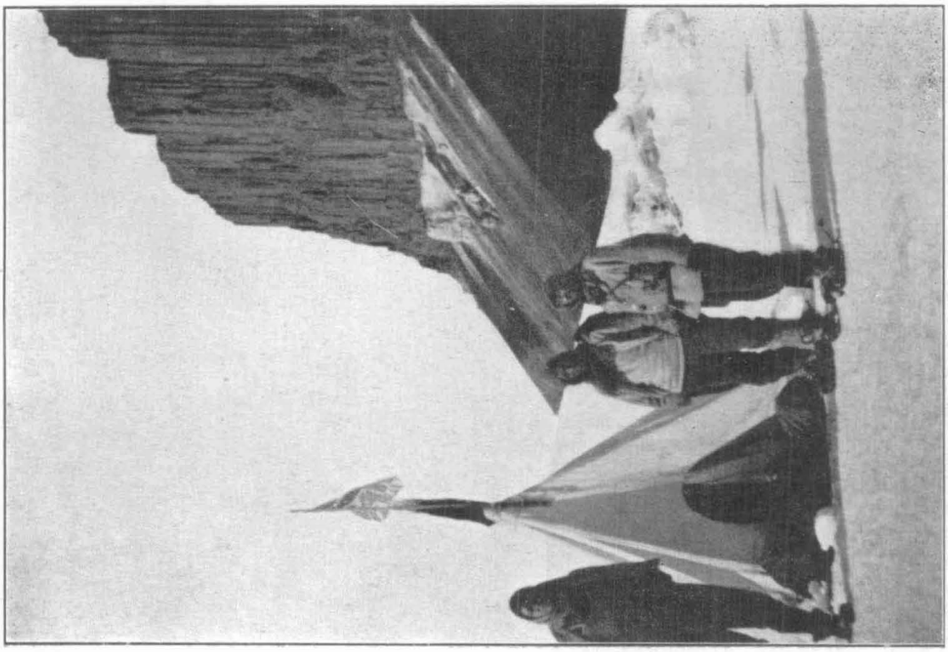

Fig. 2. Camped at Horn Bluff.

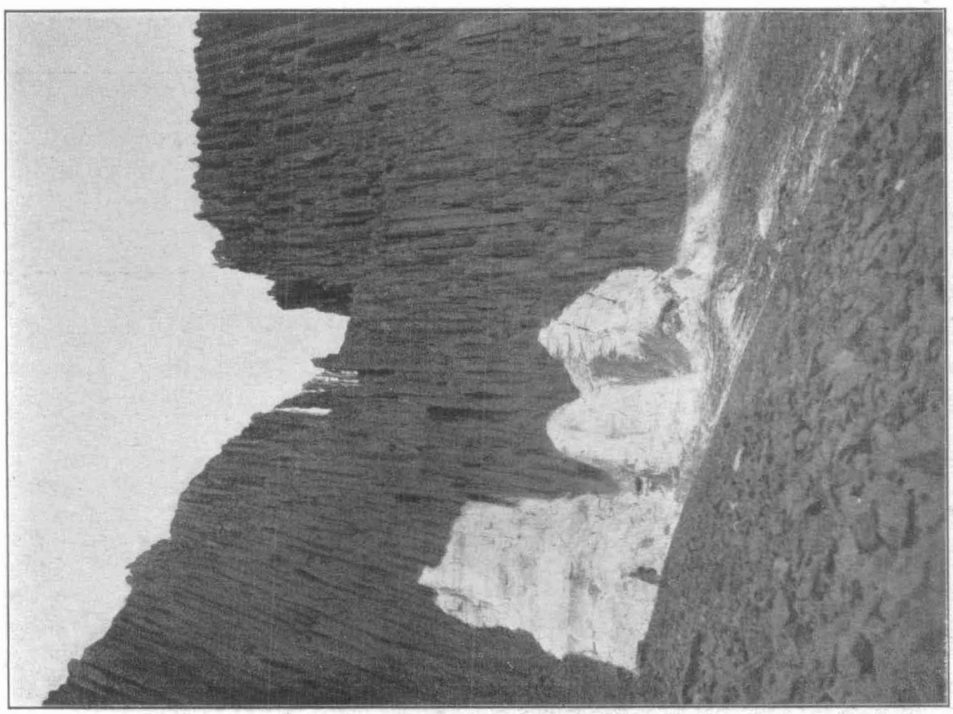

Fig. 1. The organ-pipe cliffs of Horn Bluff.

FIG. 1. The coastal margin near Penguin Point.

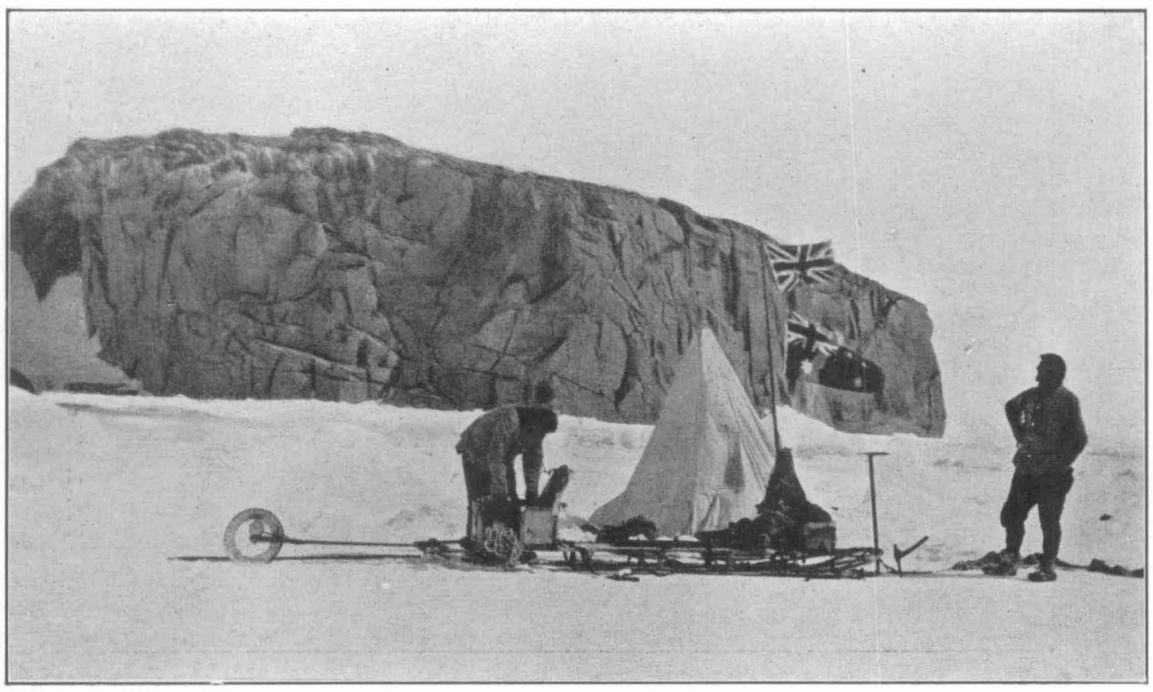

FIG. 2. The rock mass at Penguin Point.

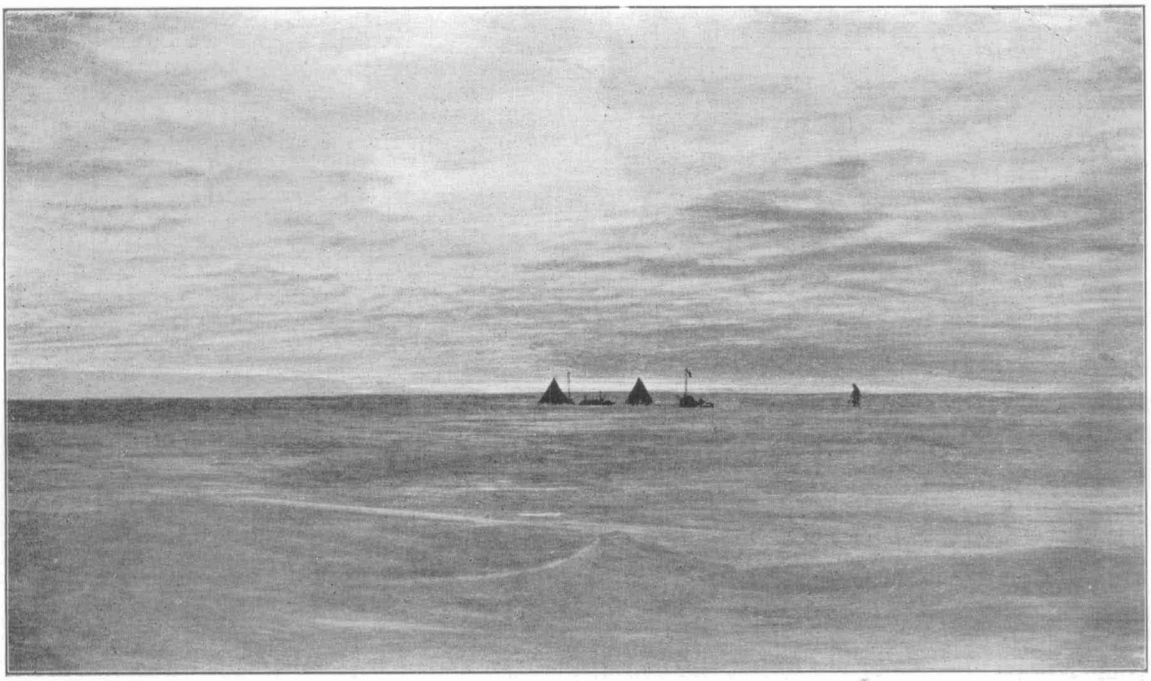

FIG. 1. Camped on the Plateau: the Southern Party and Supporting Party.

FIG. 2. The Southern Supporting Party.

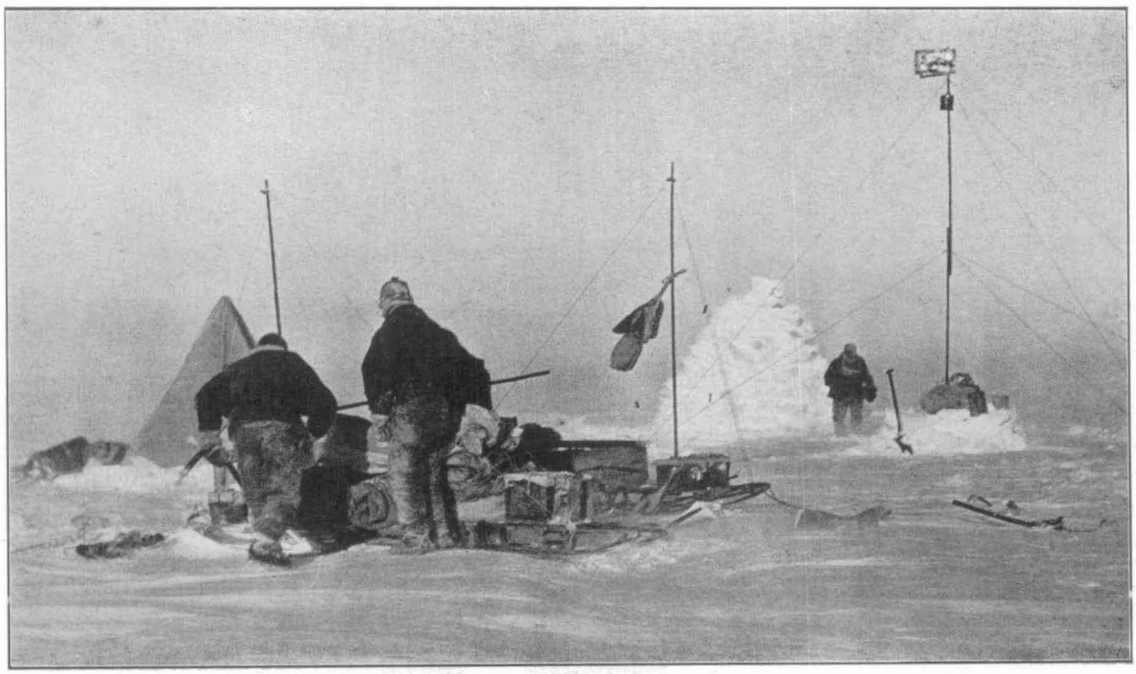

FIG. 1. The sixty-seven mile depot.

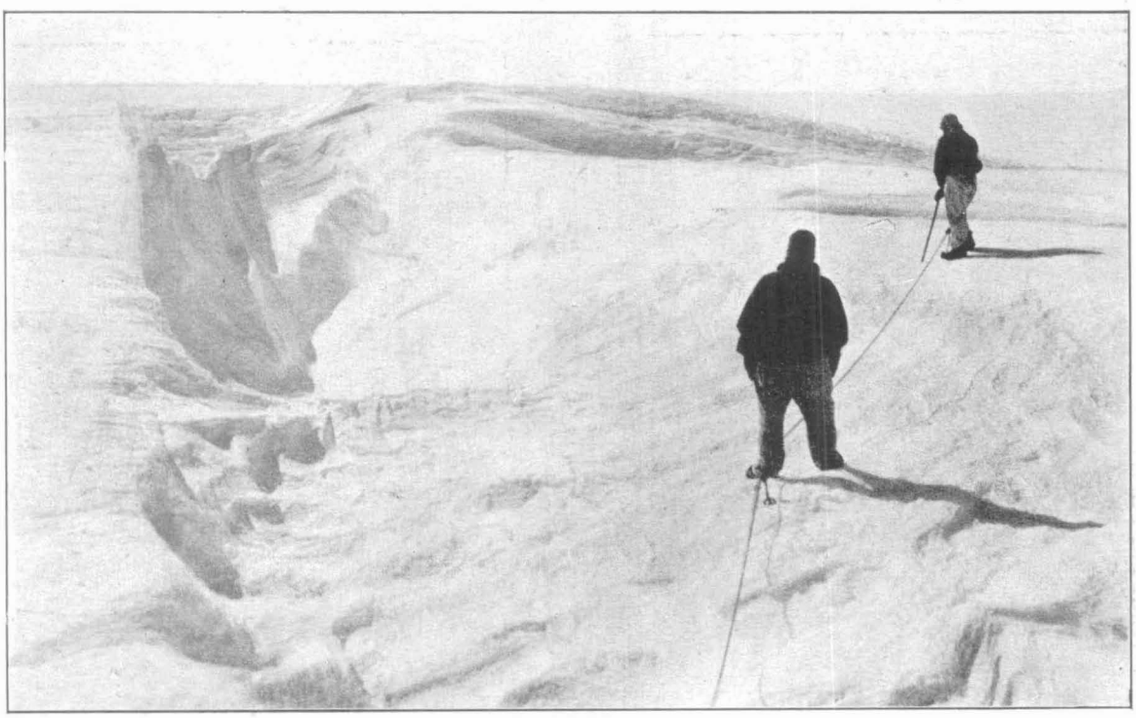

FIG. 2. The Nodules.

FIG. 1. The Southern Party's 301-mile camp.

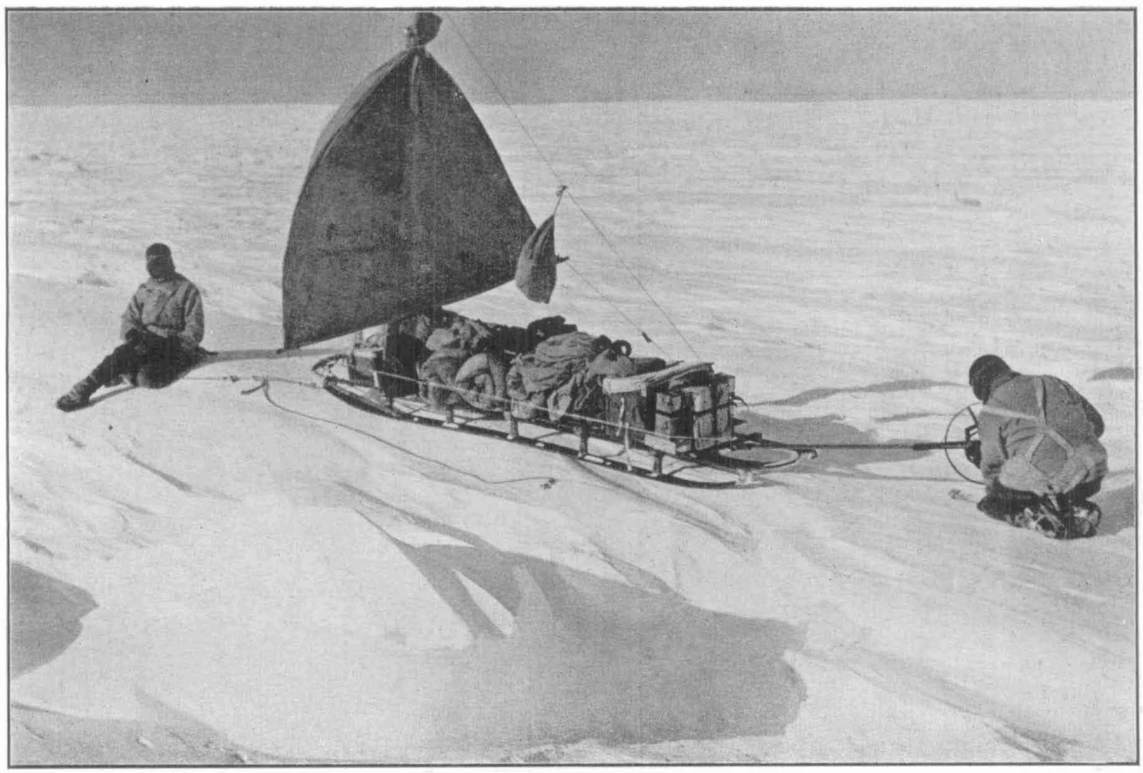

FIG. 2. The wind-weathered surface of the Plateau.

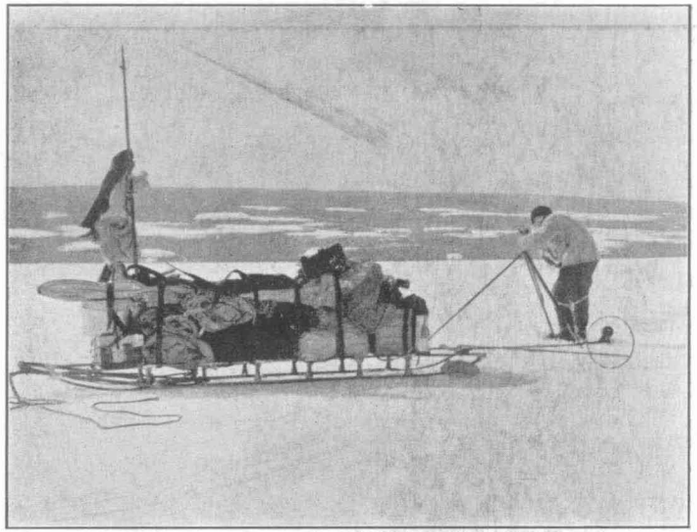

FIG. 1. Stillwell charting the coastline.

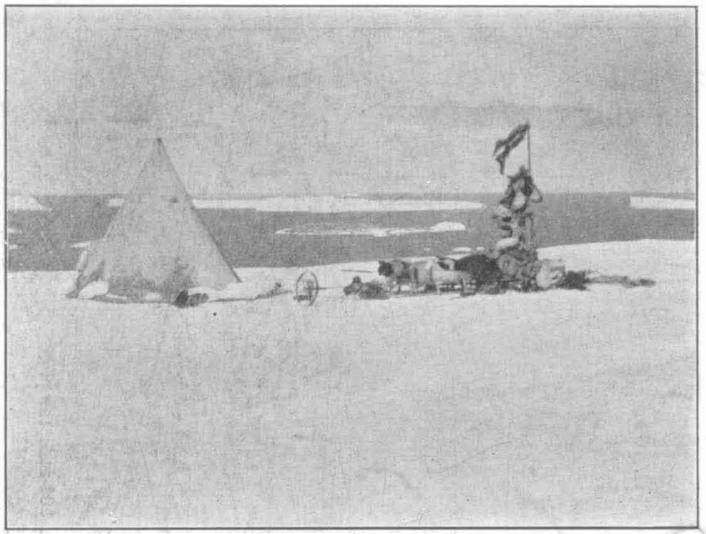

FIG. 2. A lunch camp.

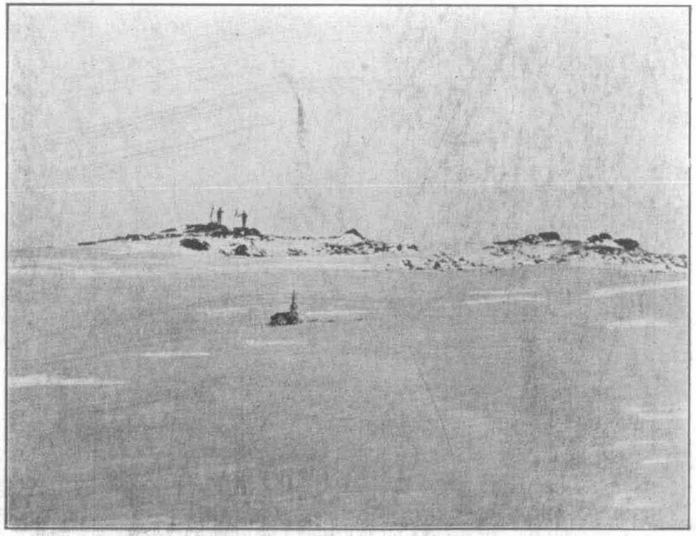

FIG. 3. Madigan Nunatak from the west.

FIG. 4. The Near-east Party at Madigan Nunatak.

FIG. 1. Islands and drift-ice near Cape Gray.

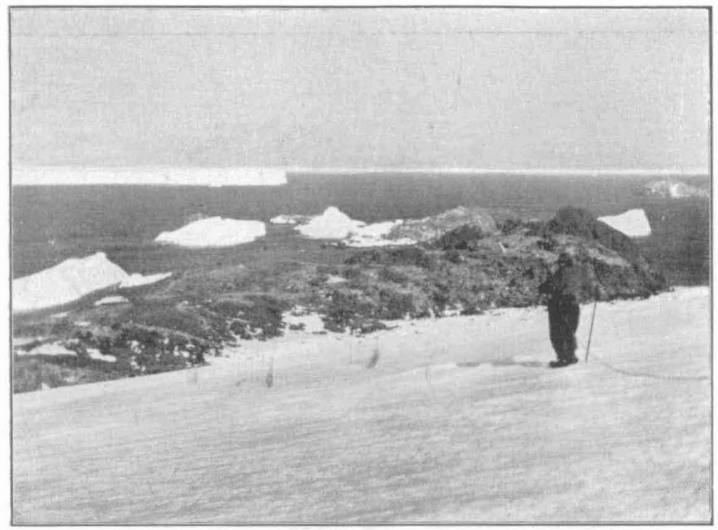

FIG. 2. A large island under the ice cliff.

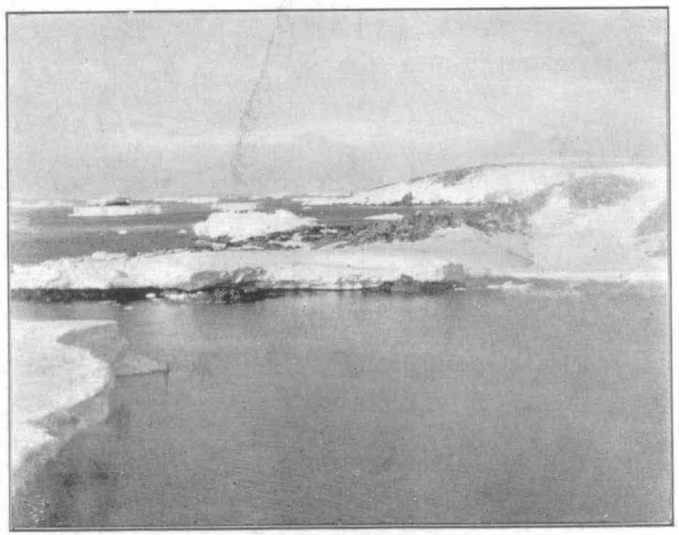

FIG. 3. Outcrop at Cape Pigeon Rocks.

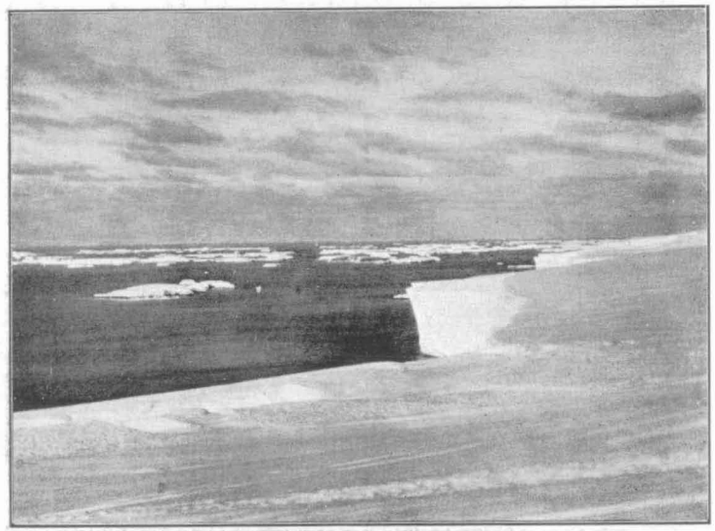

FIG. 4. Coastline near Mount Hunt.

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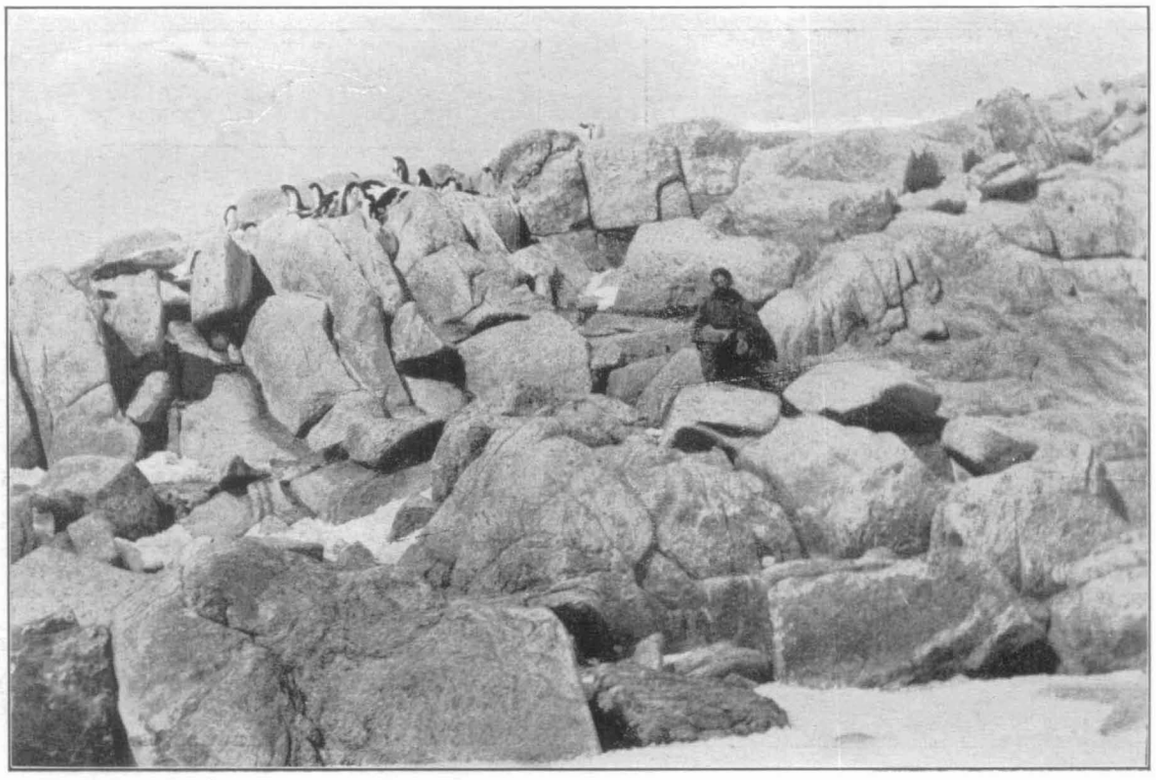


FIG. 1. Garnetiferous gneiss at Garnet Point.

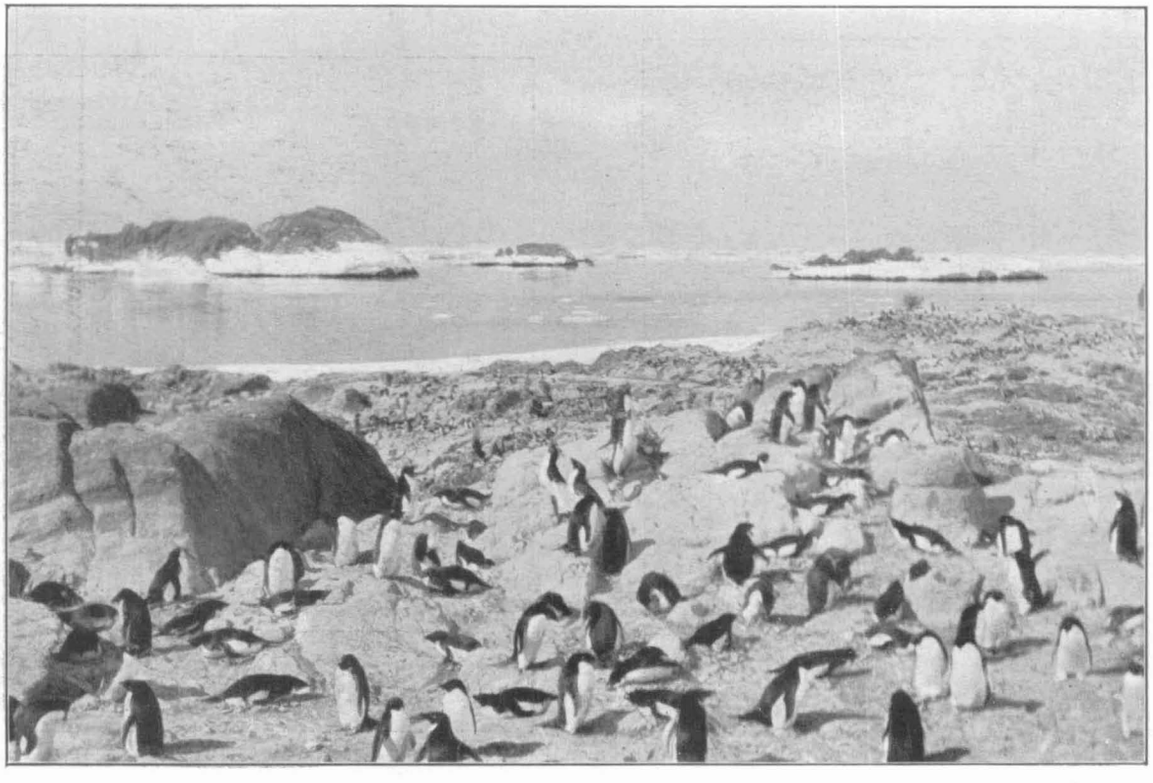


FIG. 2. Looking east from Cape Gray.

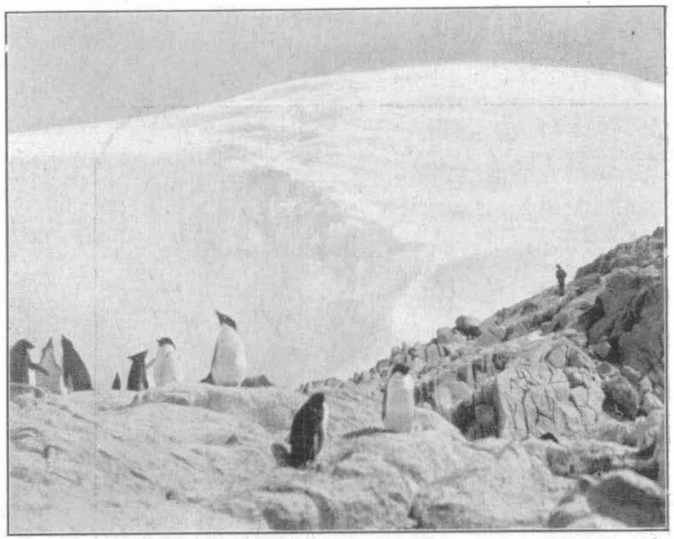


FIG. 1. At Garnet Point.

FIG. 2. At Cape Pigeon Rocks.

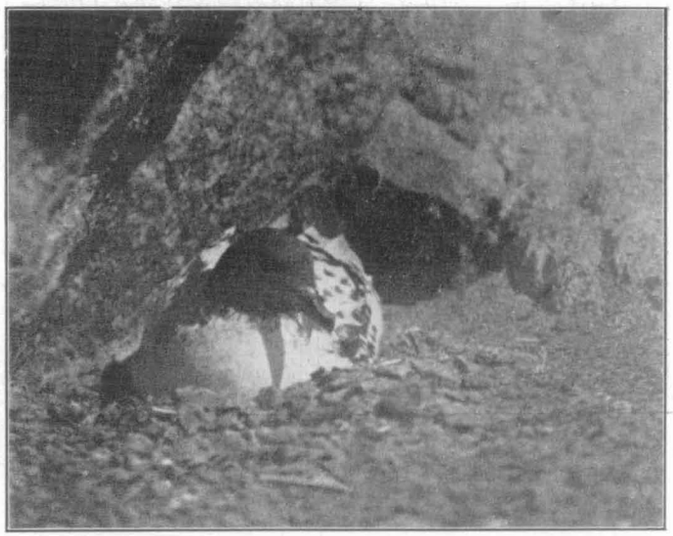


FIG. 3. A Cape Pigeon on the nest.

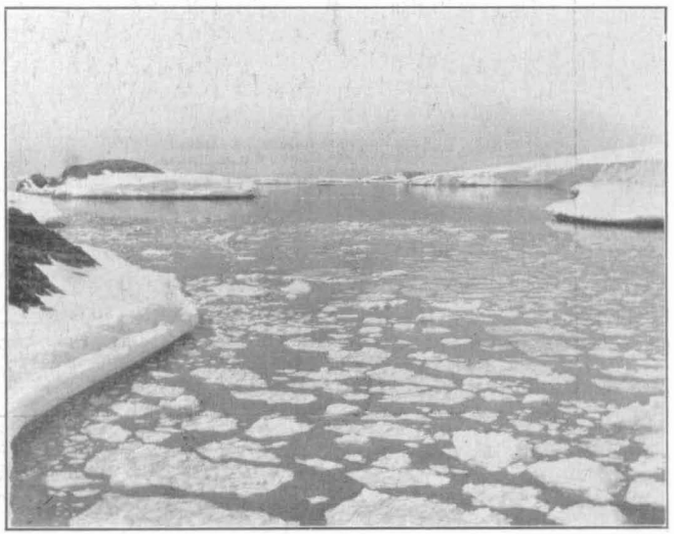


FIG. 4. View at Cape Gray.

Returning from Aurora Peak.

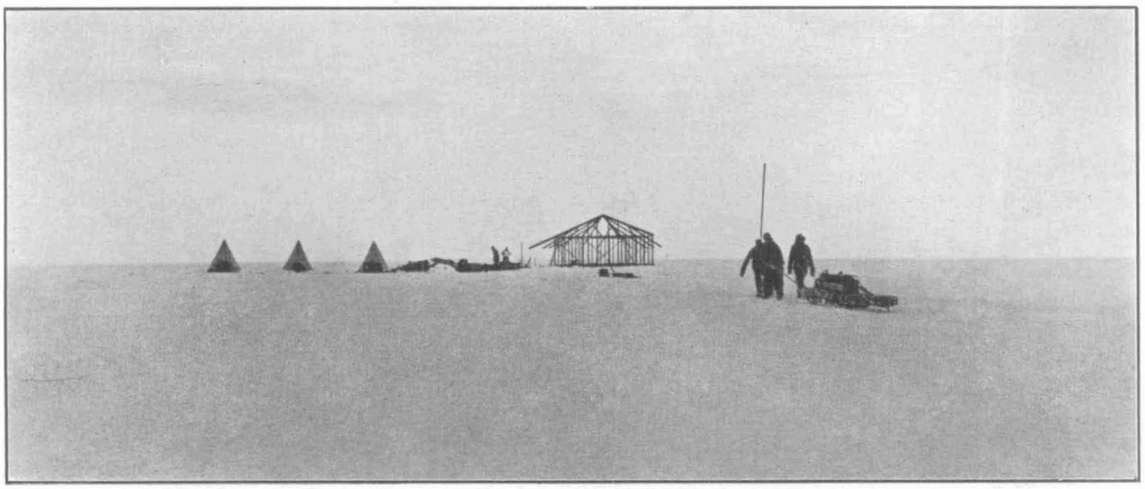


FIG. 1. First stage in erection of the Western Base hut.

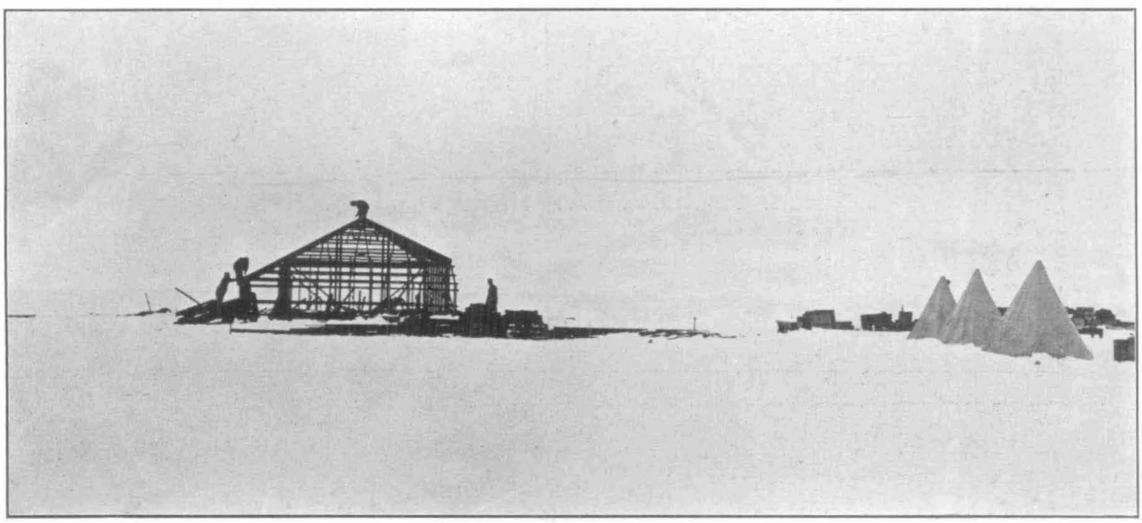


FIG. 2. The Western Base hut begins to take form.

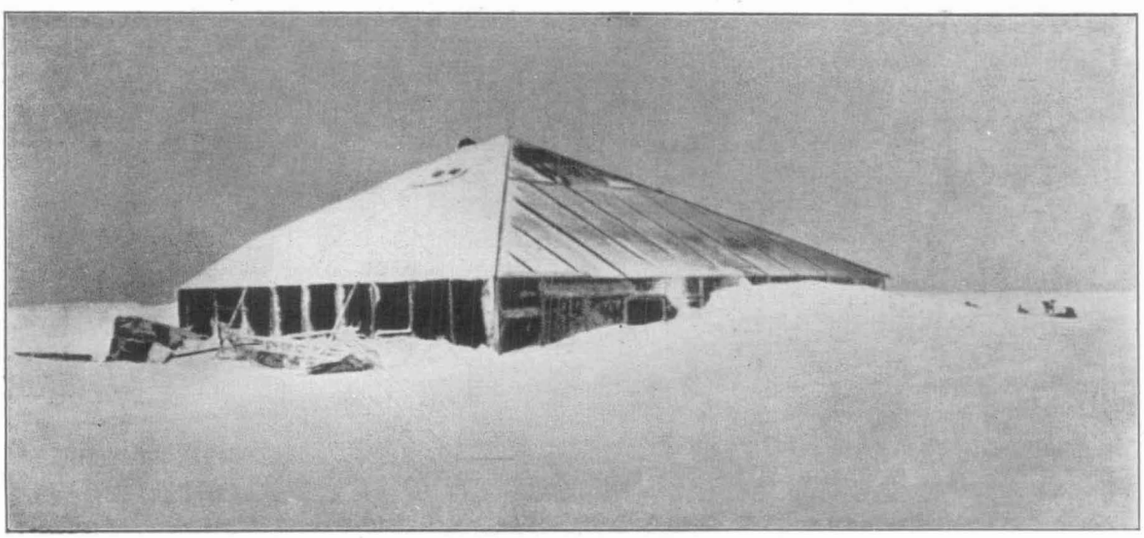


FIG. 3. The hut at the Western Base immediately after completion.

FIG. 1. The start on the autumn sledging journey.

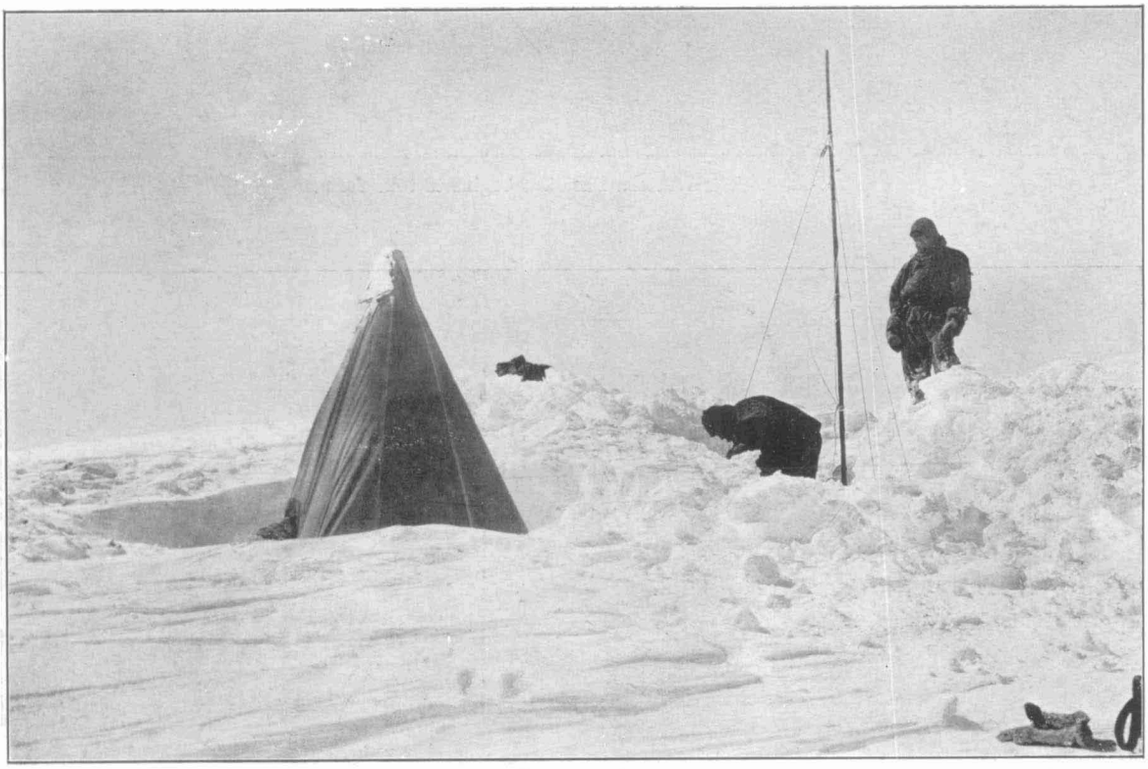


FIG. 2. Camp deeply buried in drift-snow.

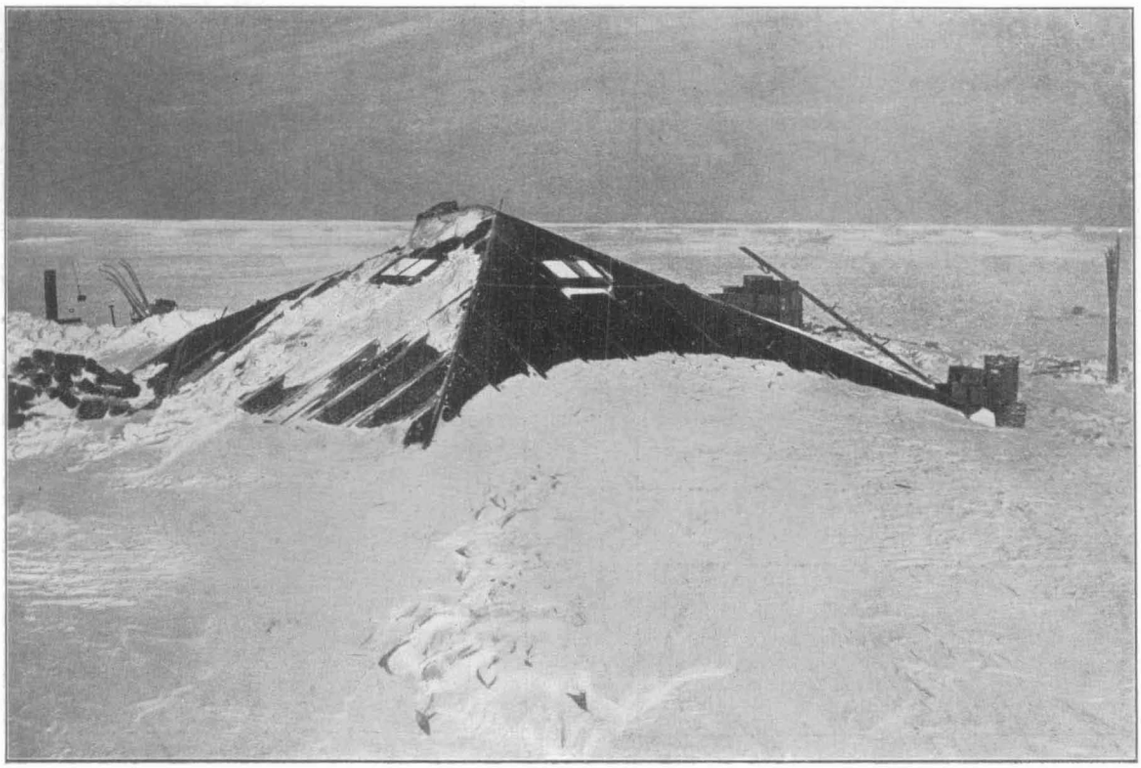


FIG. 1. The Hut on the Shackleton Shelf in autumn.

FIG. 2. The Hut and surroundings, late autumn.

FIG. 1. Dragging out snow from the Grottoes.

FIG. 2. Snow house over the vertical shaft.

FIG. 3. Quarrying ice for domestic purposes.

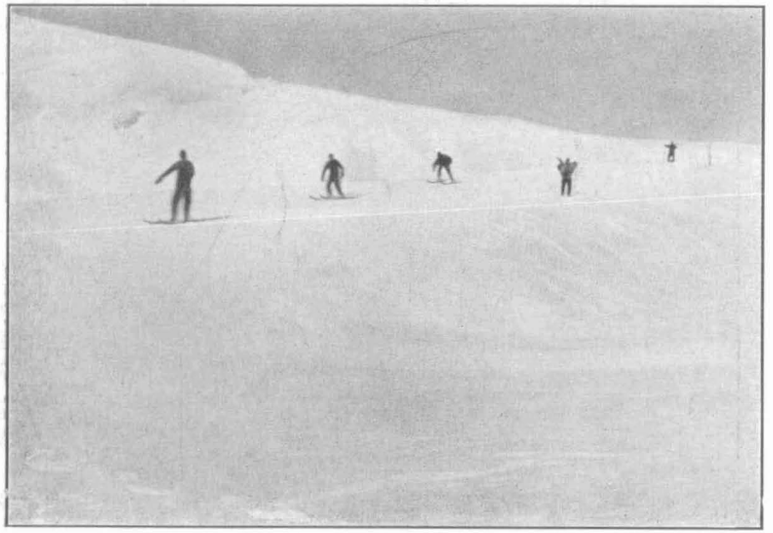


FIG. 4. Skiing as a pastime.

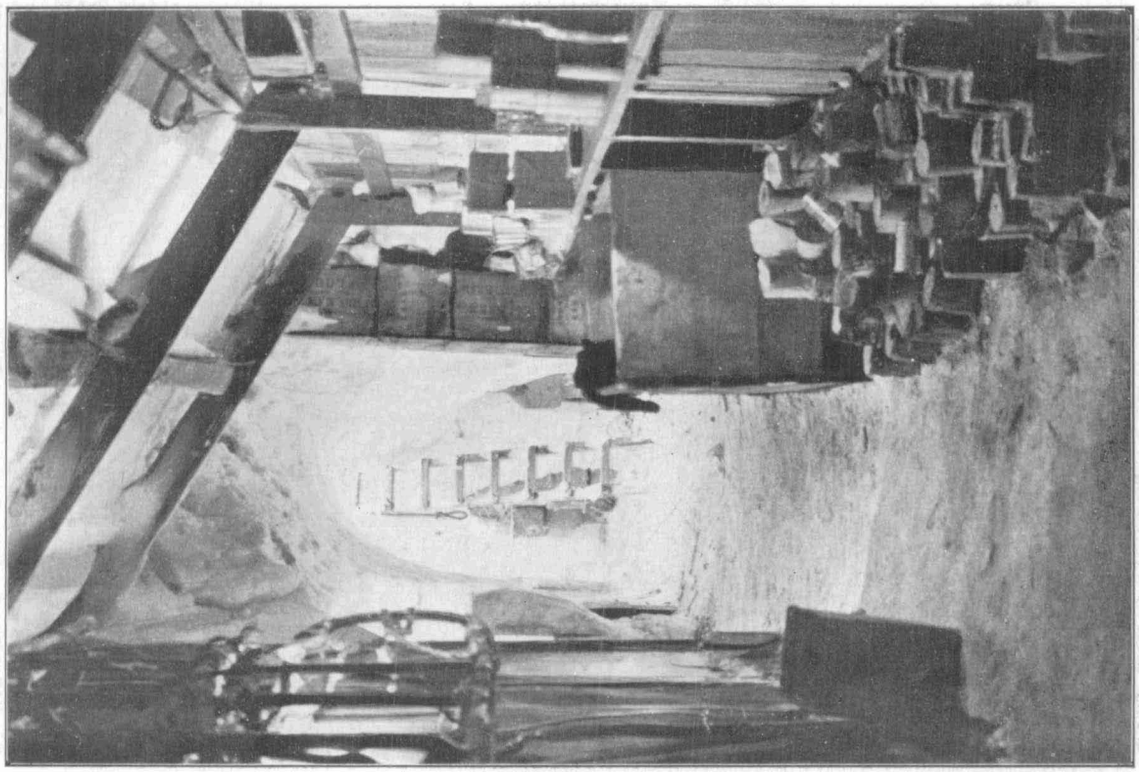


FIG. 2. The ladder exit from the Hut.

FIG. 1. A corner of the enclosed verandah.

* 82908—1 M

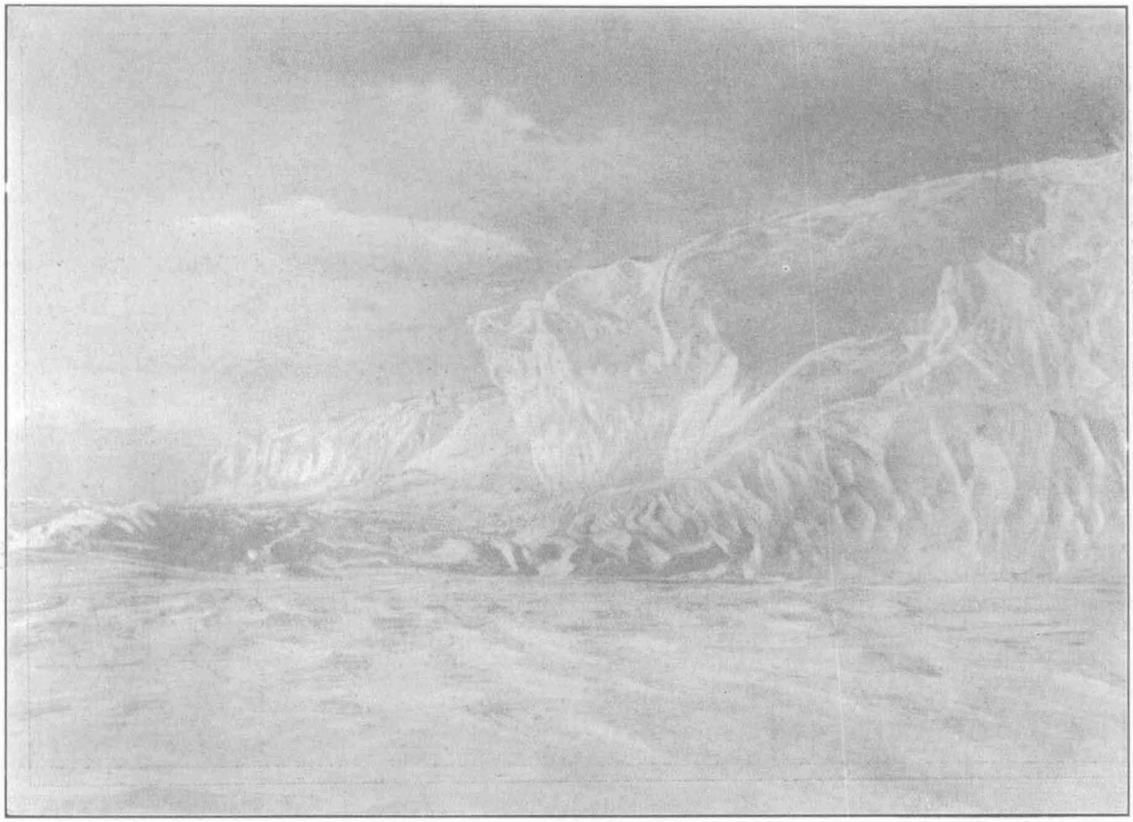


FIG. 1. The wind-weathered face of the Shackleton Ice-Shelf.

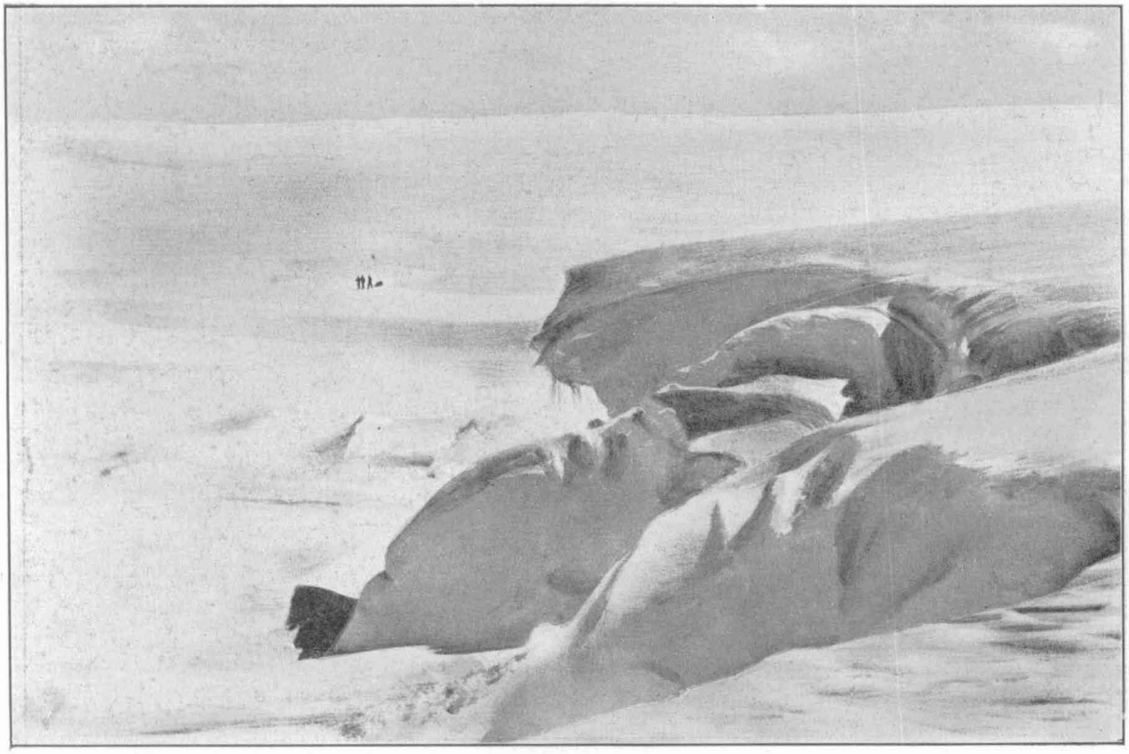


FIG. 2. View across the sea-ice from the Shackleton Ice-Shelf.

FIG. 1. Snowed up.

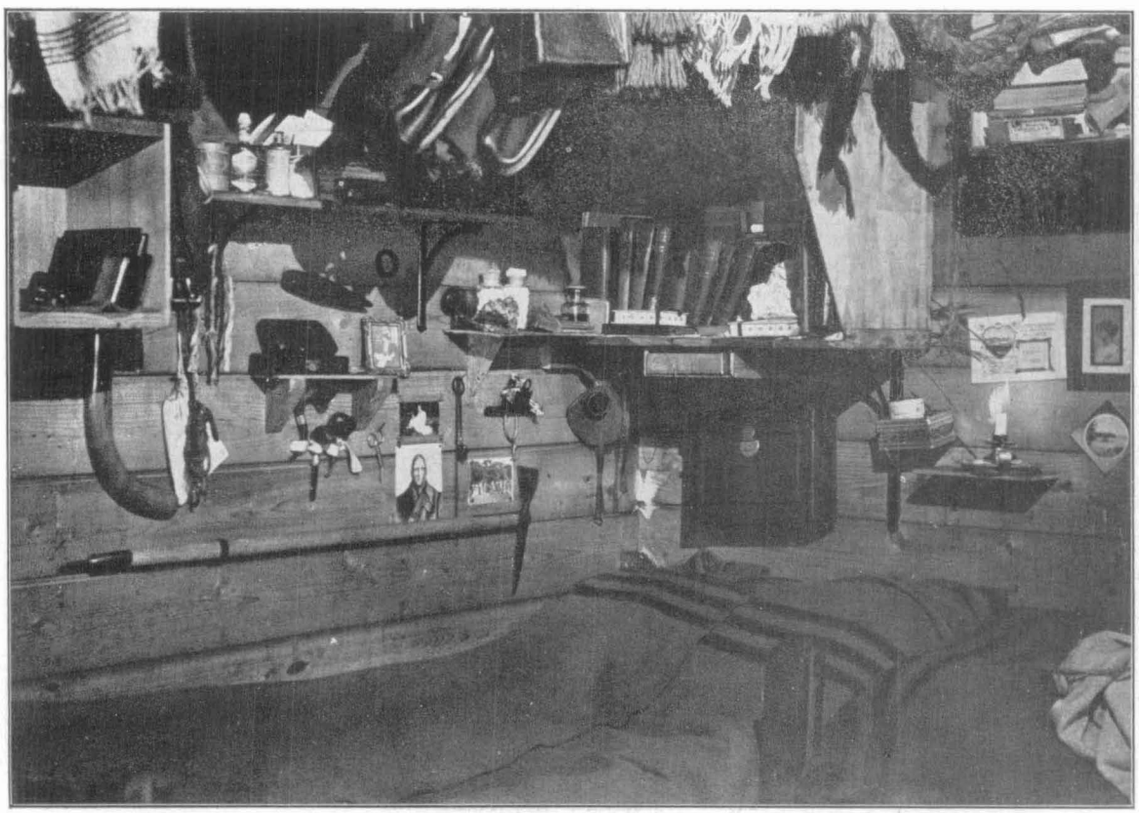


FIG. 2. A corner of the Hut.

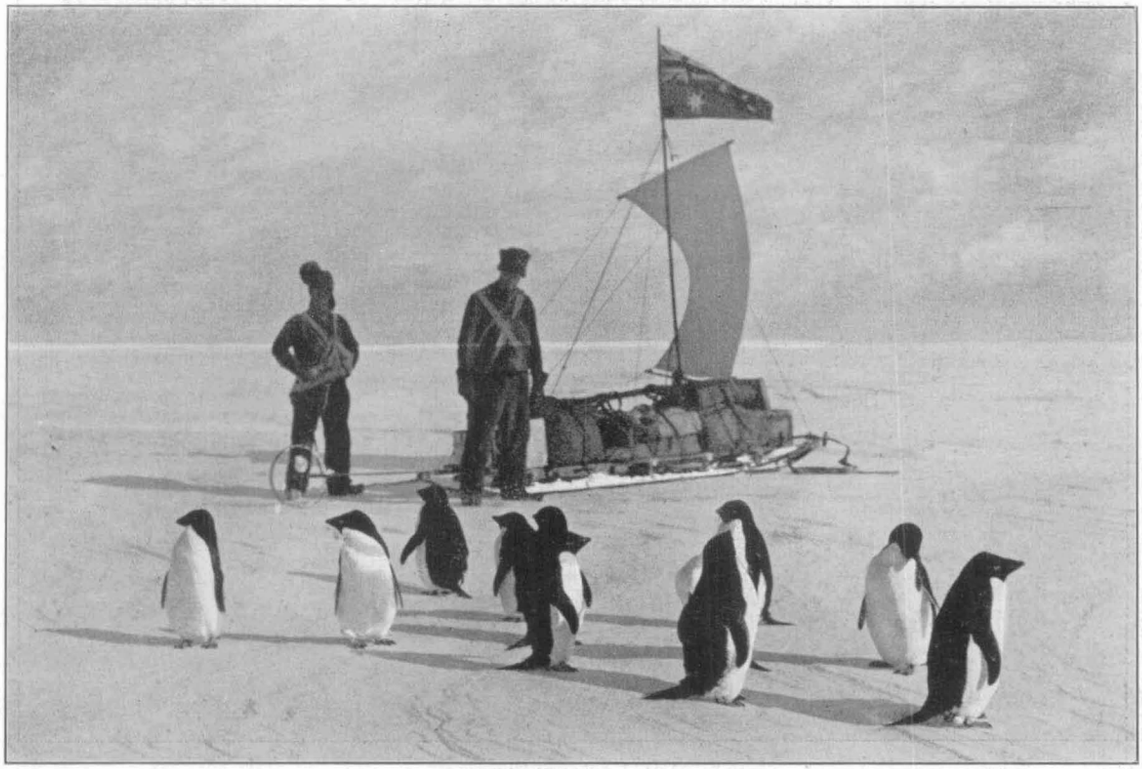


FIG. 1. Sledging over sea-ice.

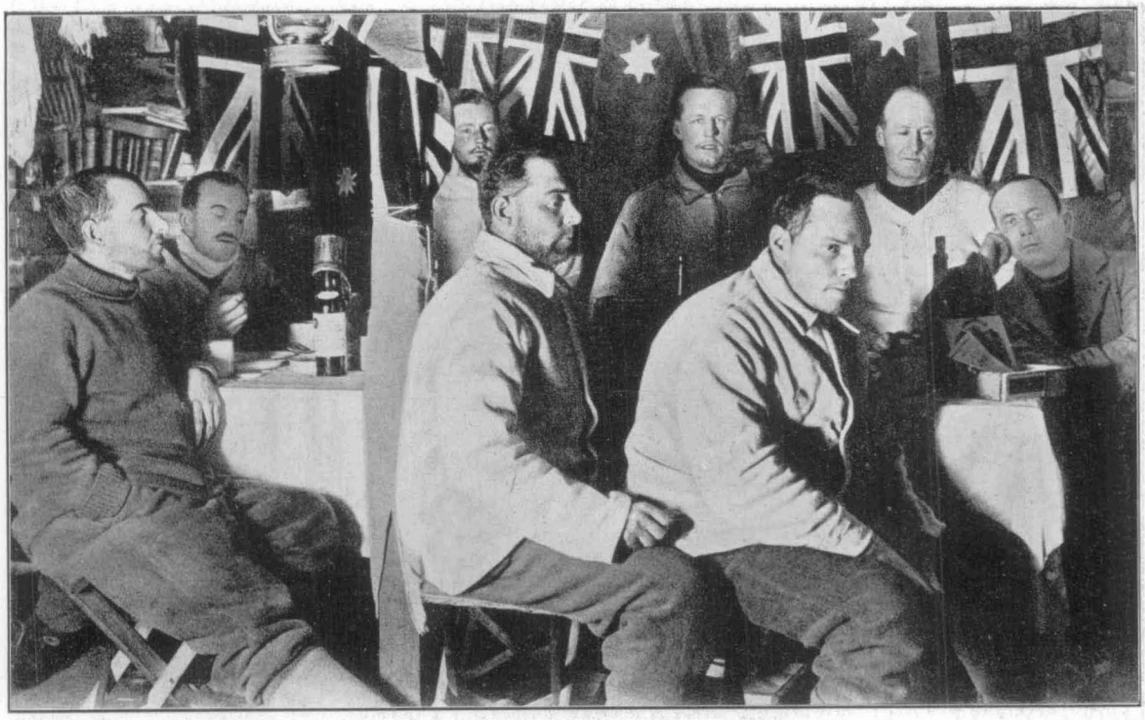


FIG. 2. Celebrating Mid-Winter's Day.

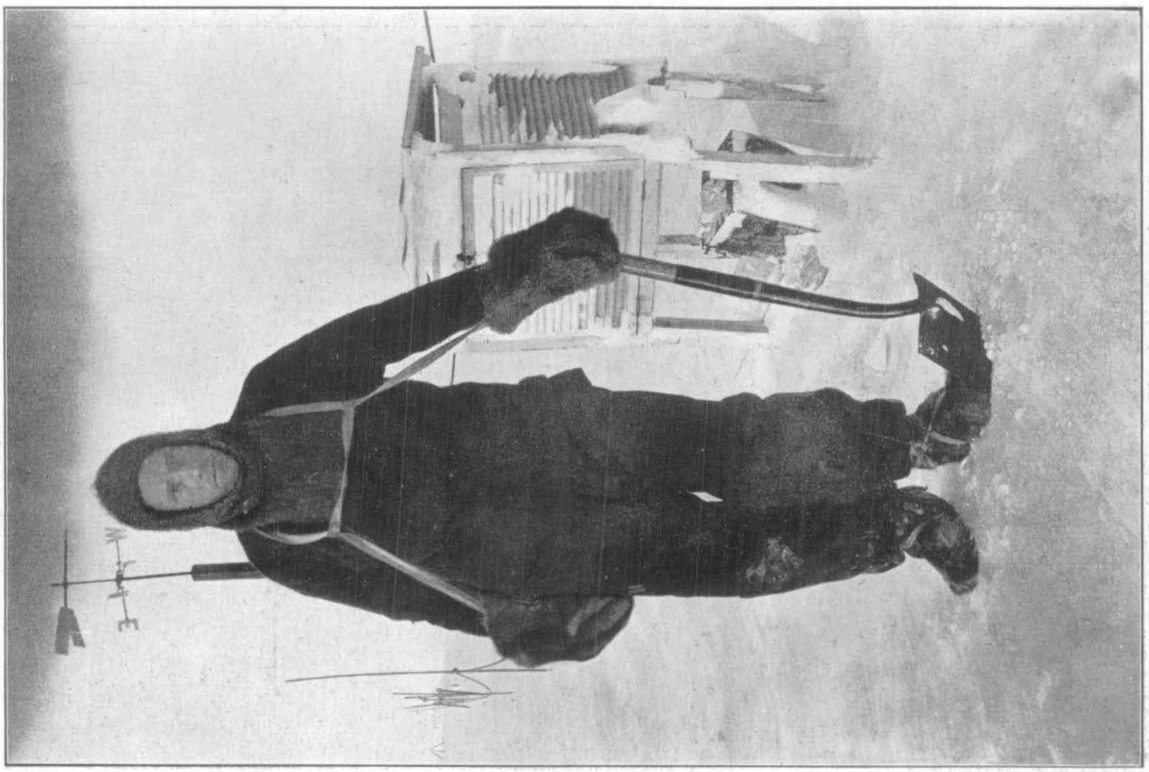


FIG. 2. Kennedy, the magnetician.

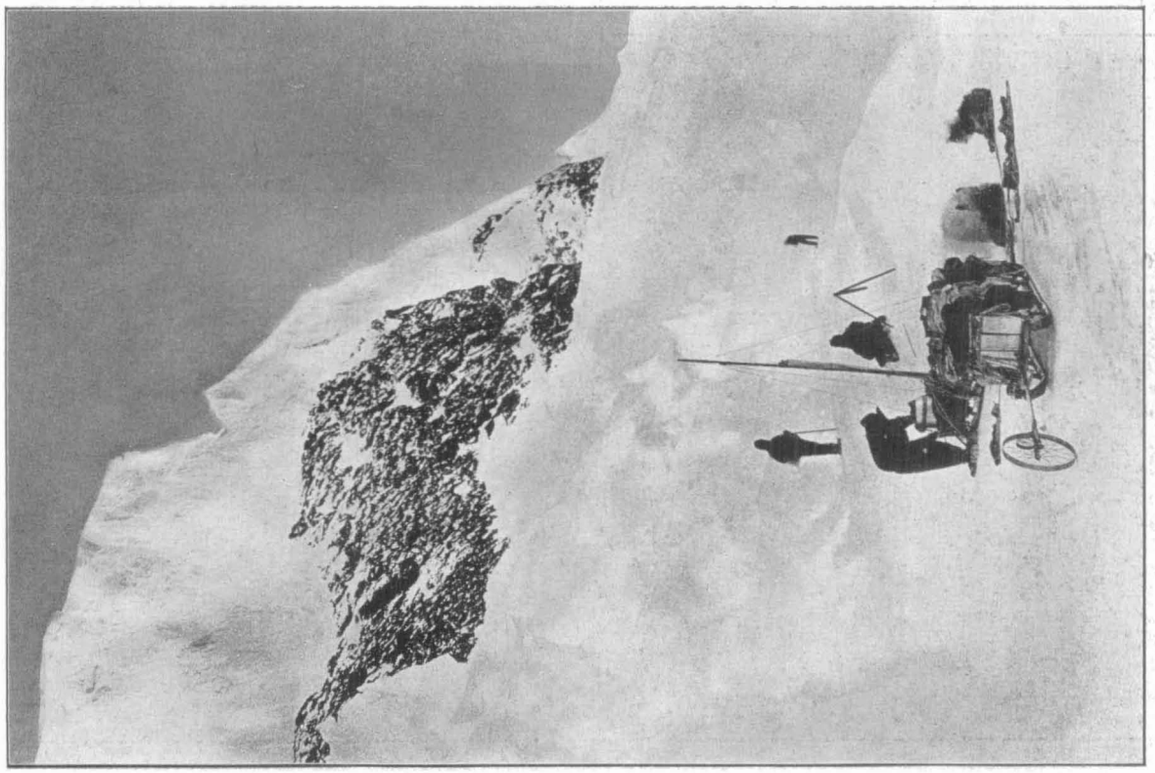


FIG. 1. Avalanche Rocks.

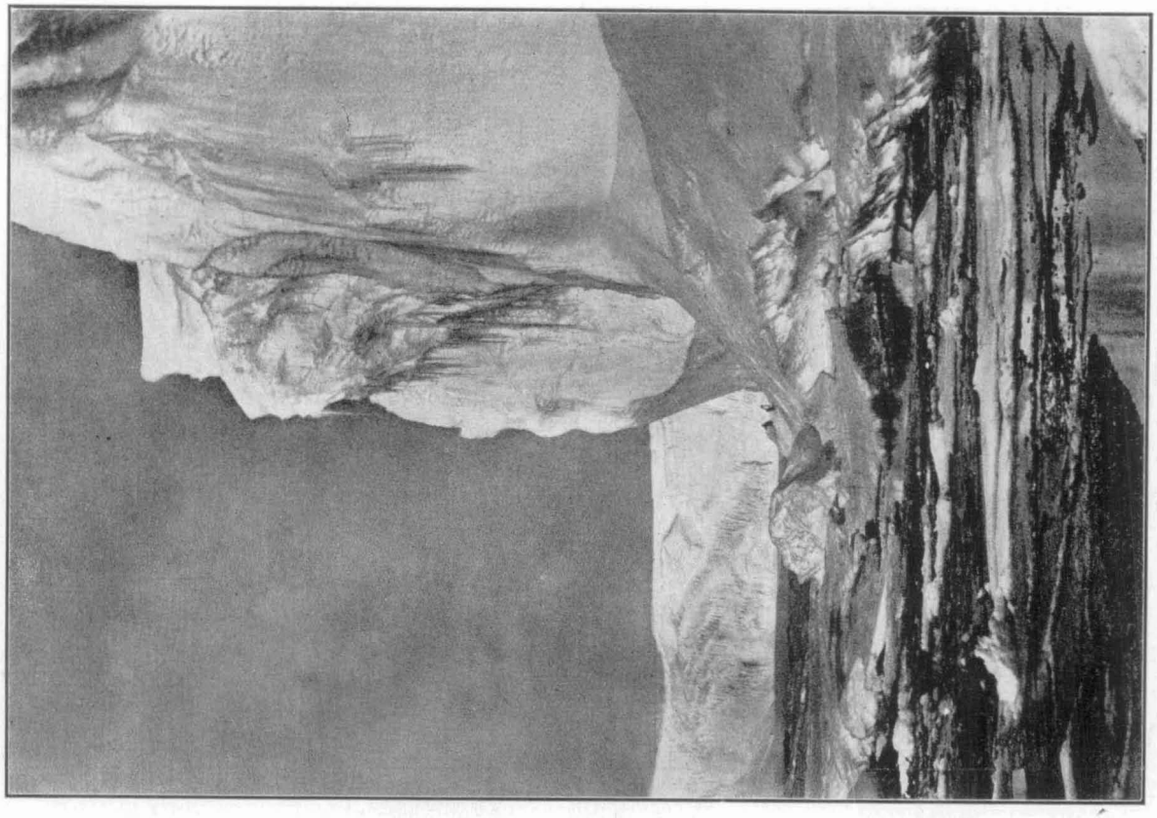


FIG. 2. Beneath the brink of the Shackleton Ice-Shelf: summer.

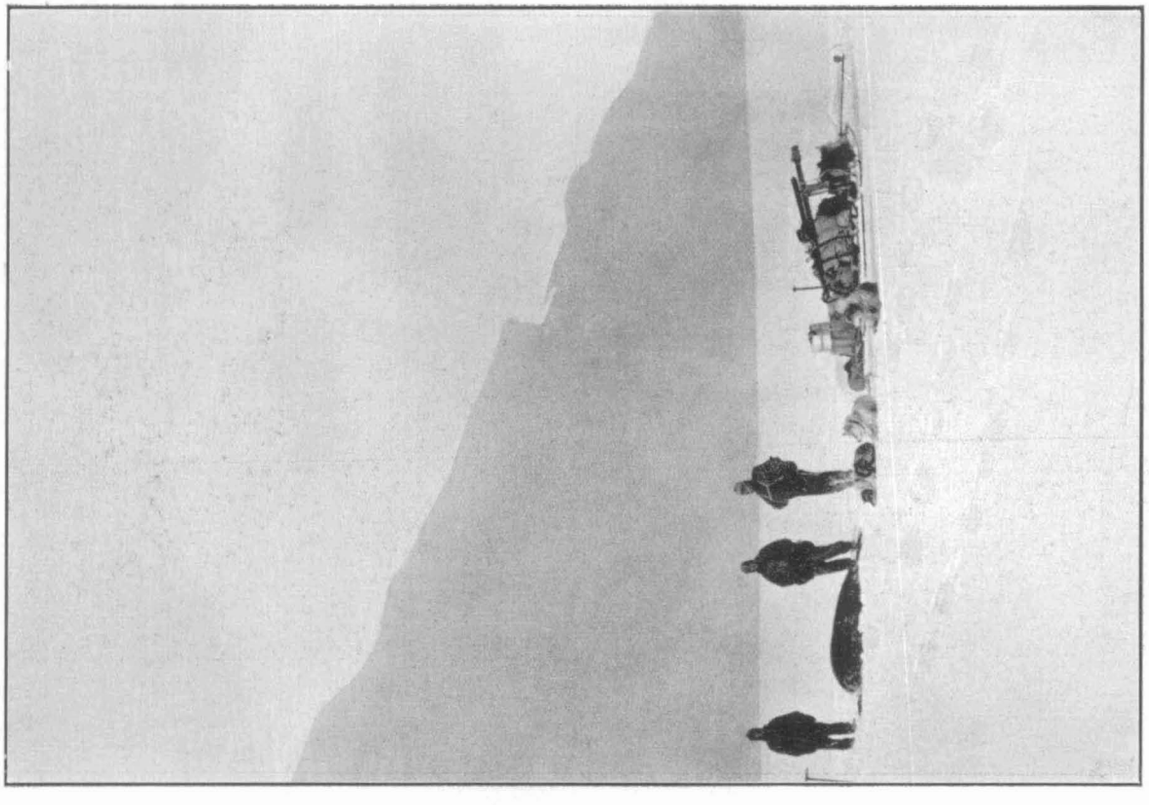


FIG. 1. Beneath the brink of the Shackleton Ice-Shelf: winter.

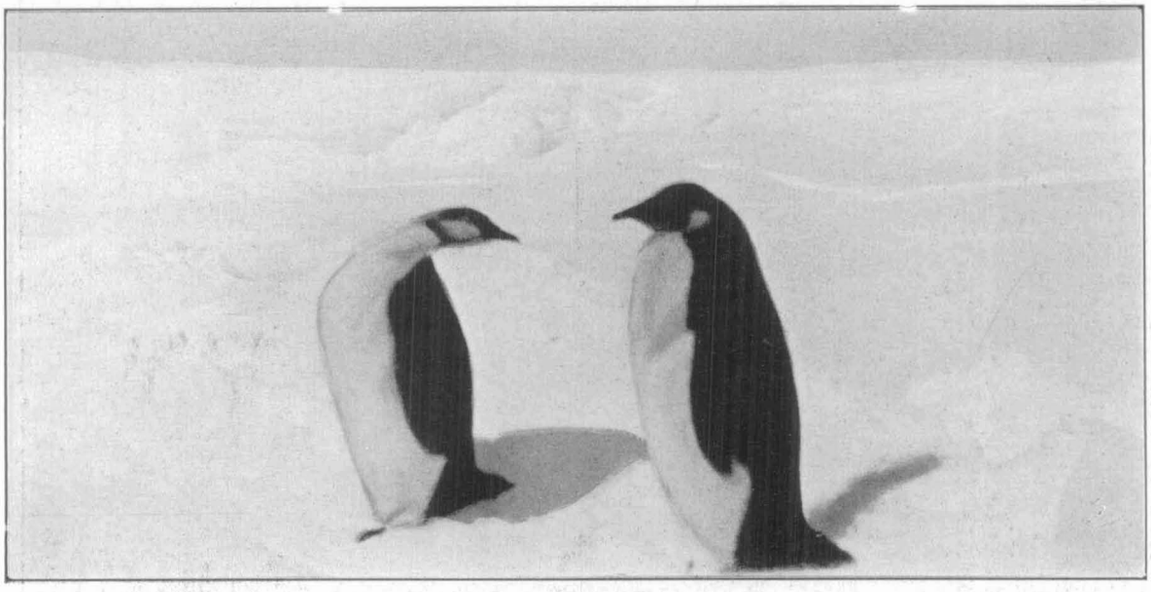


FIG. 1. Young Emperor Penguins.

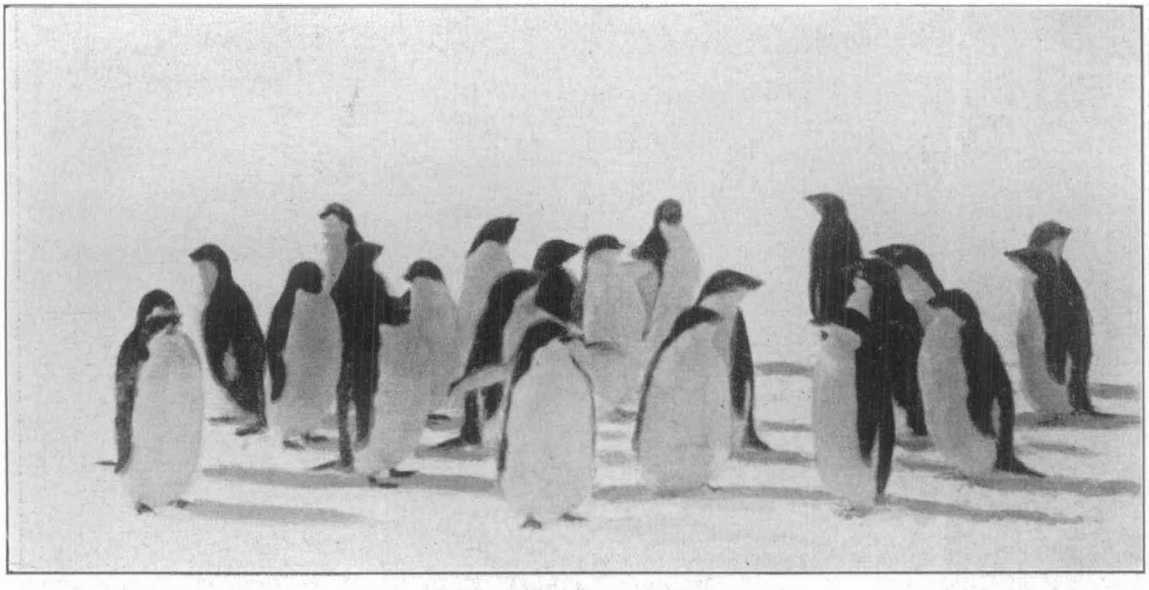


FIG. 2. Young Adelie Penguins.

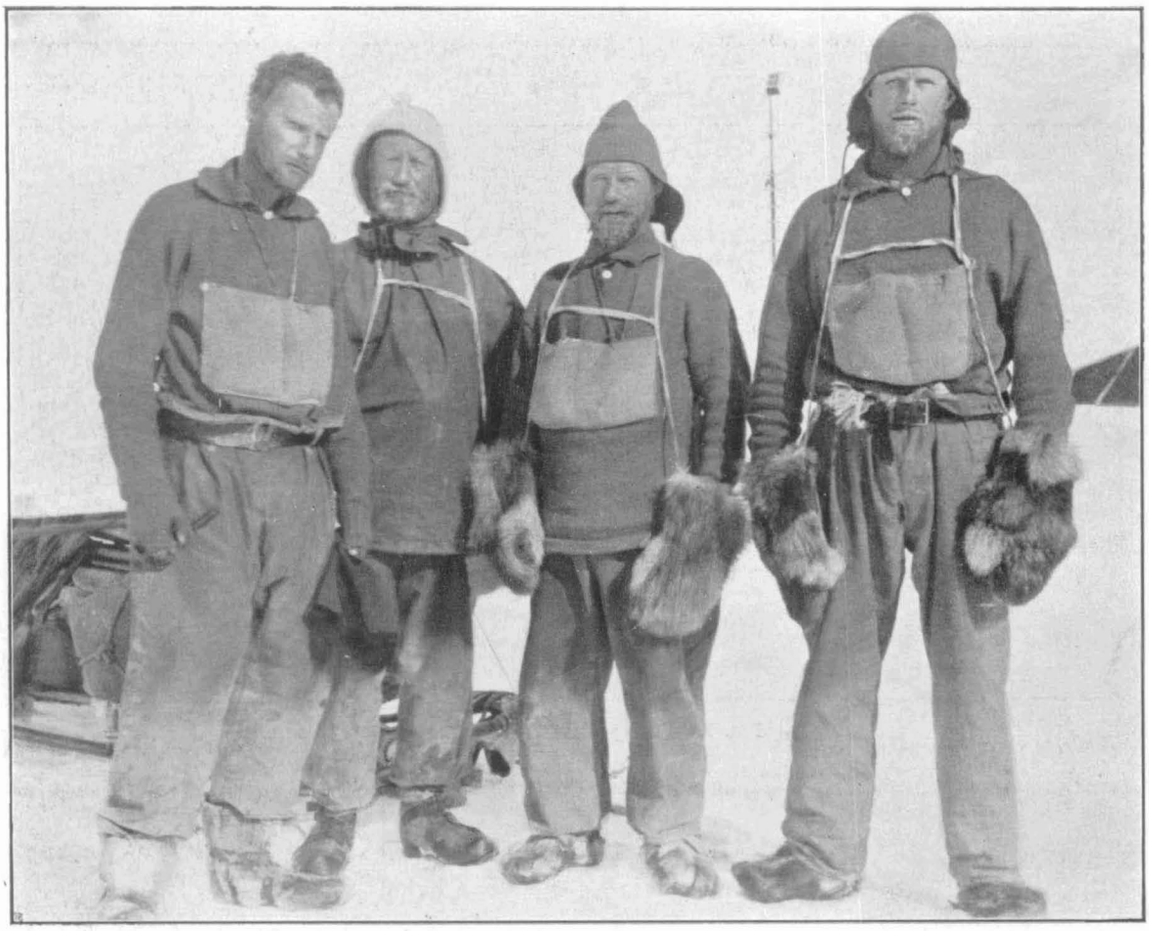


FIG. 1. Wild's Eastern Sledge Party.

FIG. 2. Eastward bound over the Shackleton Ice-Shelf.

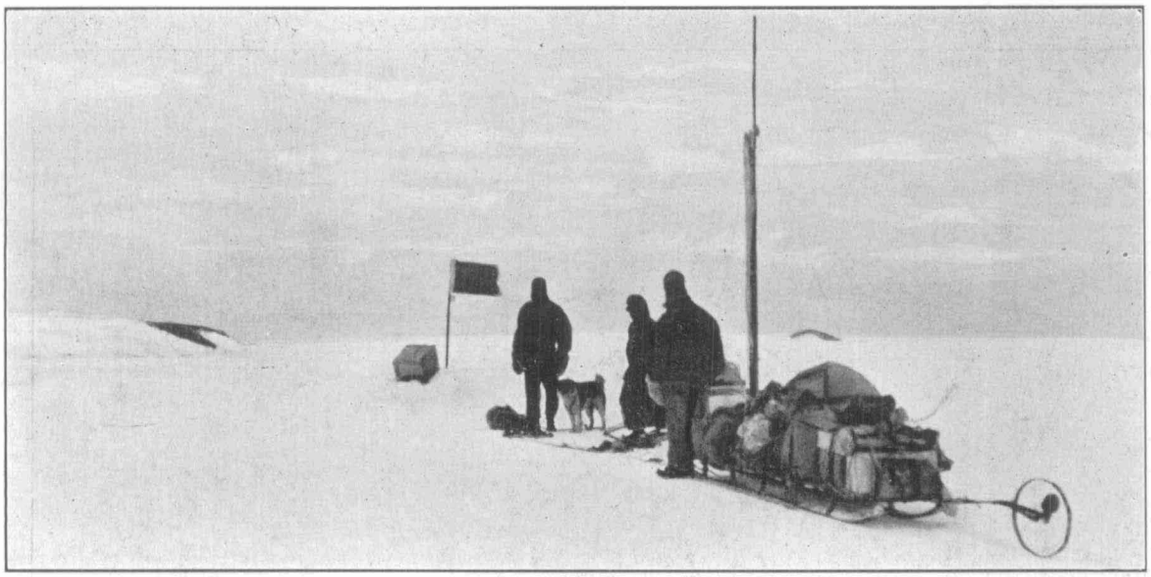


FIG. 1. Depot A.

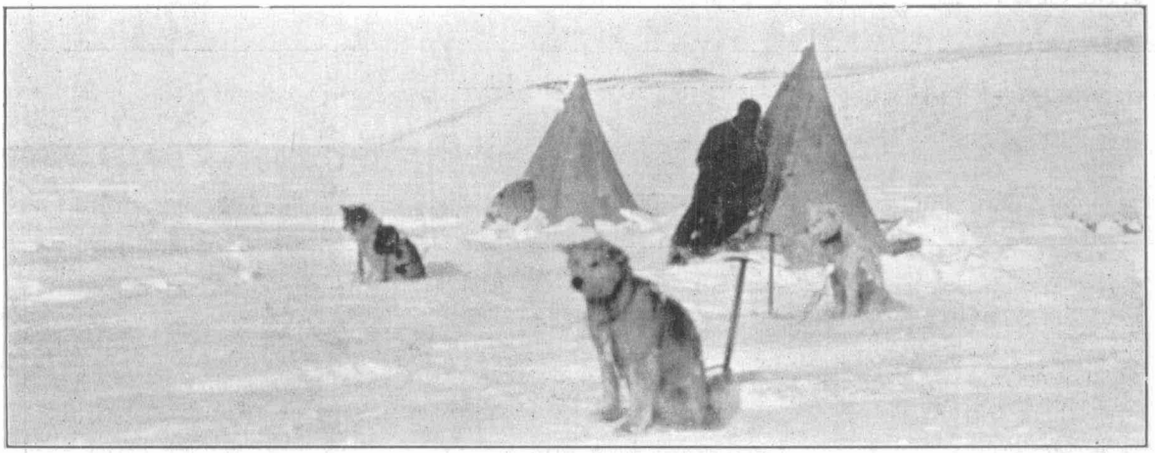


FIG. 2. Camp near Delay Point.

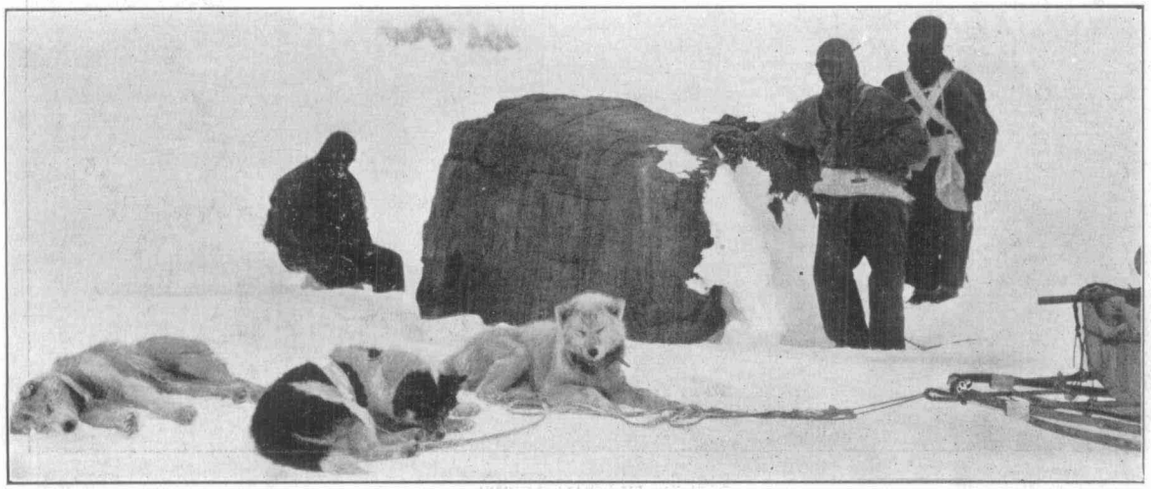


FIG. 3. Moraine boulder near Avalanche Rocks.

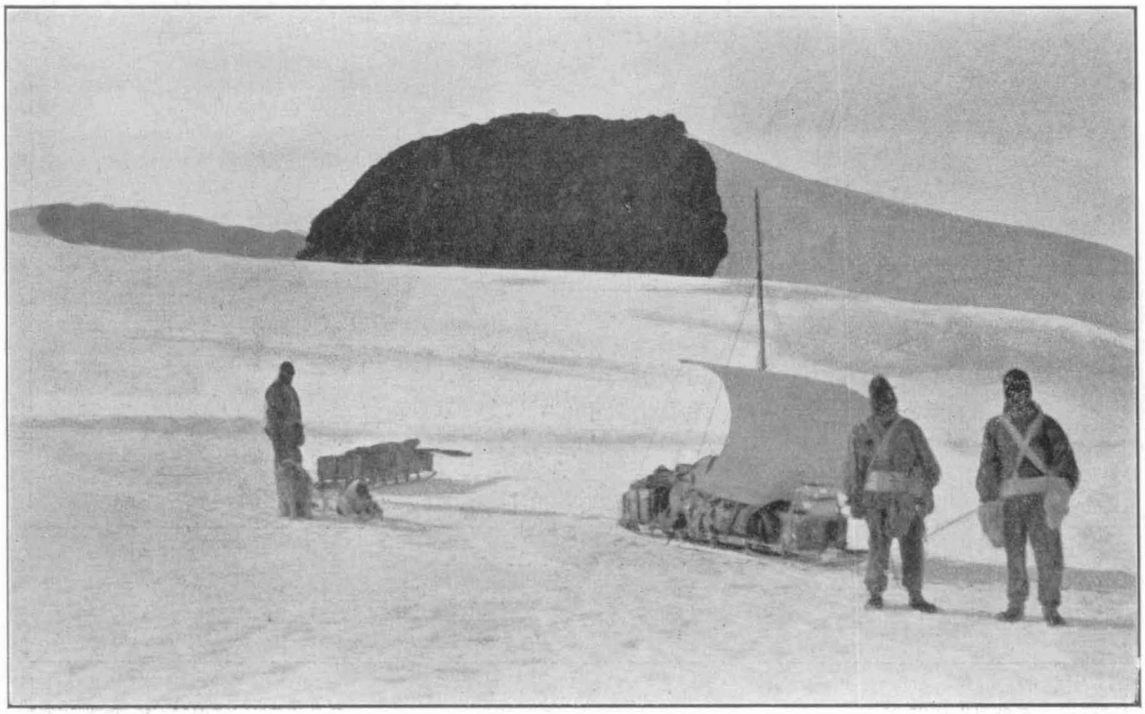


FIG. 1. At the Gillies Islets.

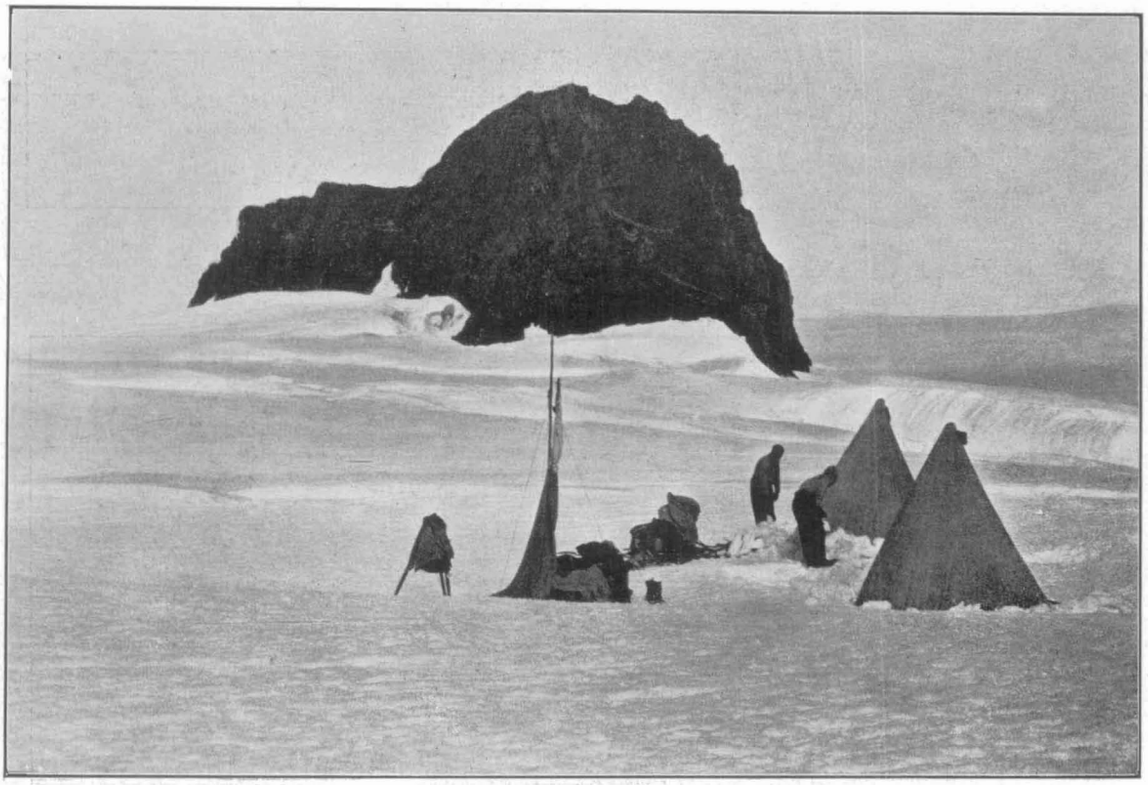


FIG. 2. Alligator Island.

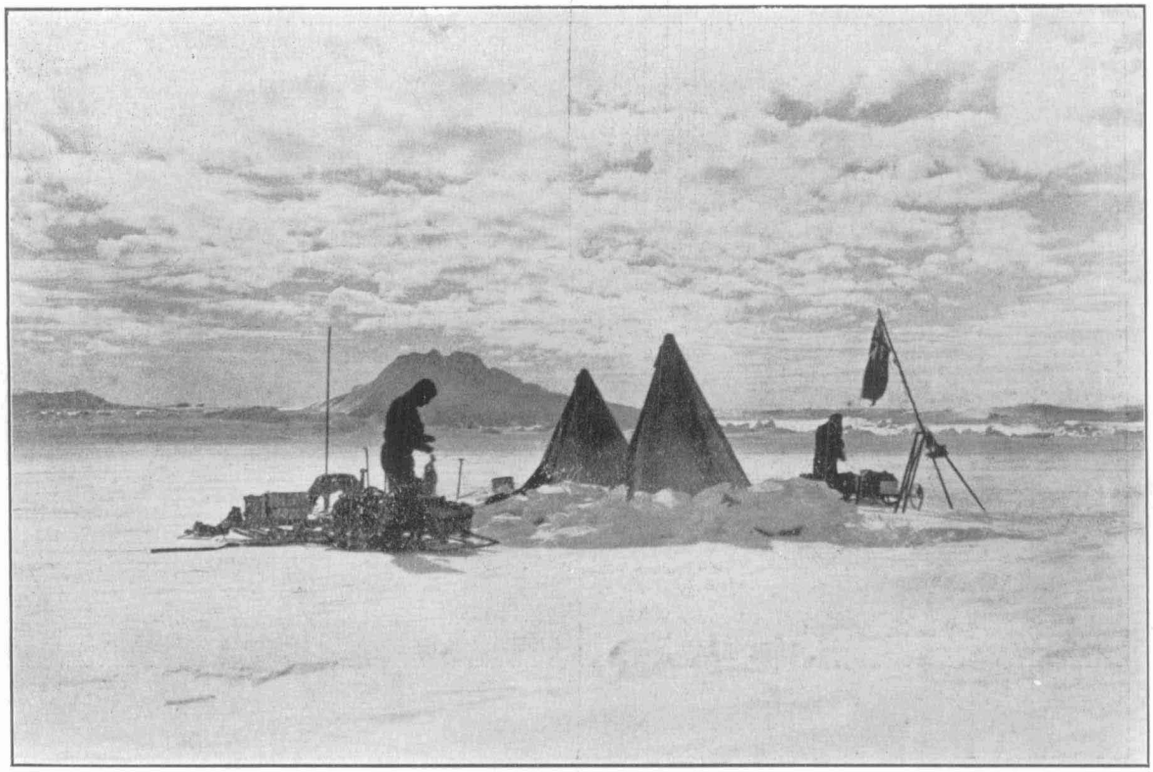


FIG. 1. Camped near Watson Bluff.

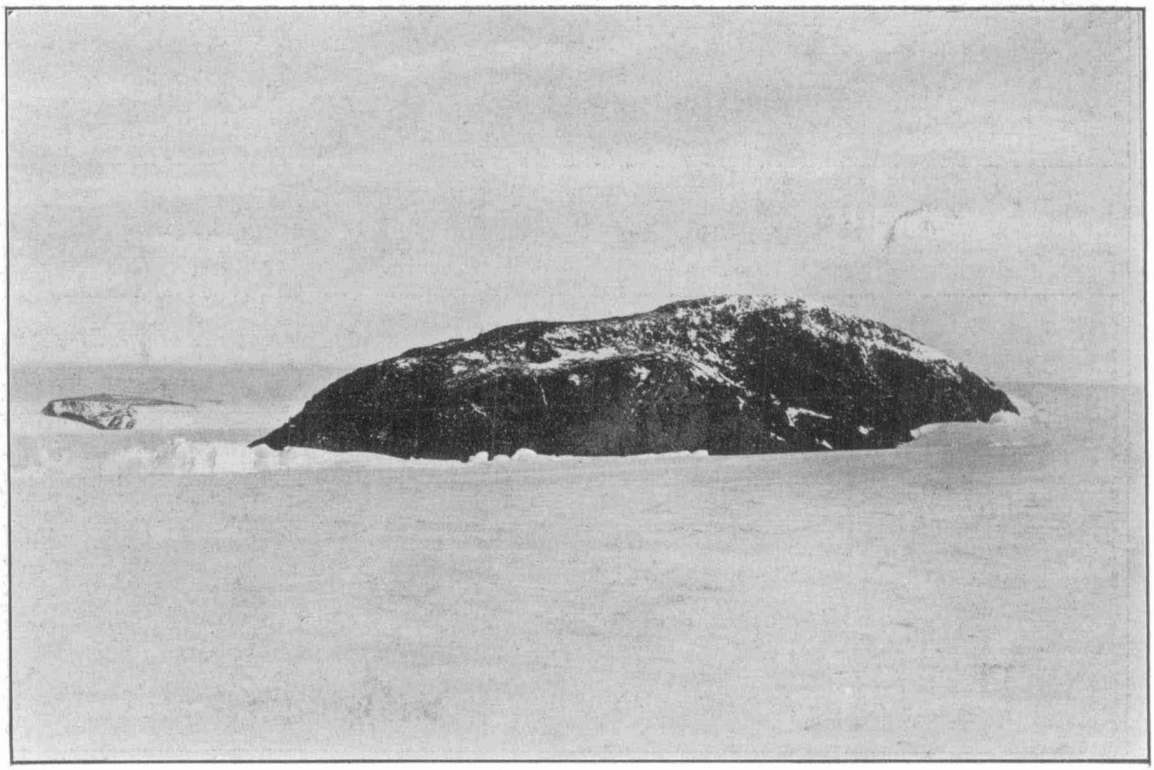


FIG. 2. Hippo Island.

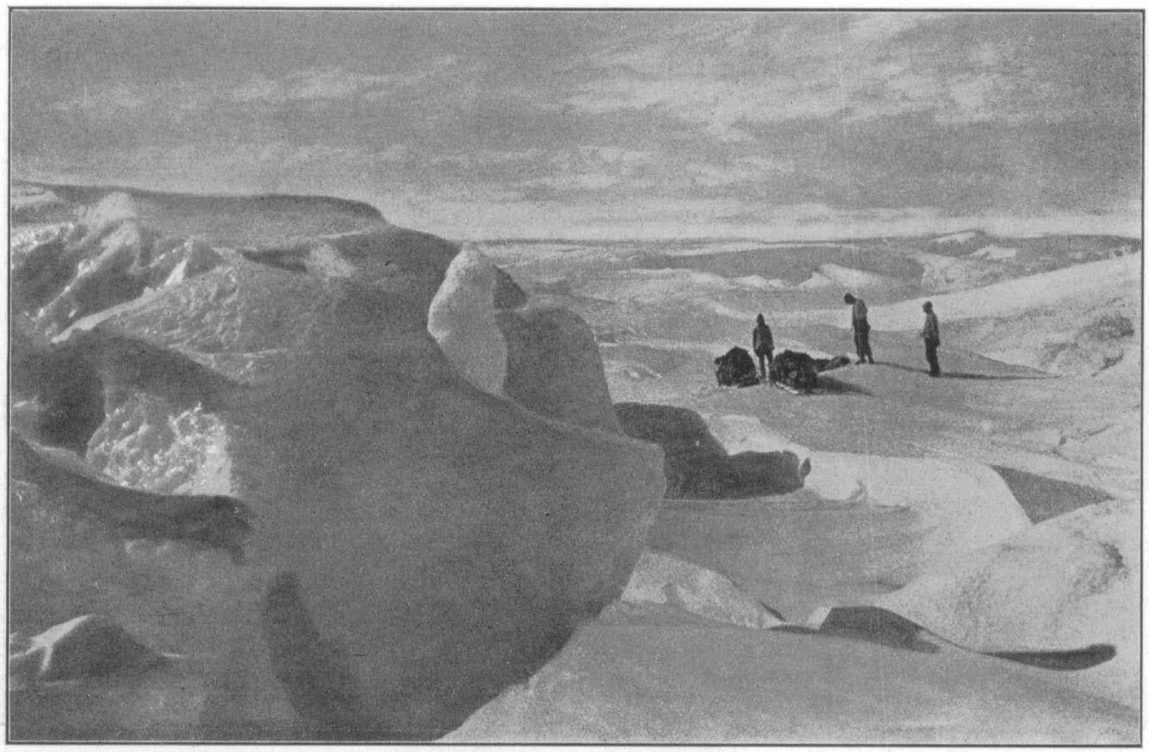


FIG. 1. In the shatter zone of the lower Denman Glacier.

FIG. 2. Amongst Serac-ice of the Denman Glacier.

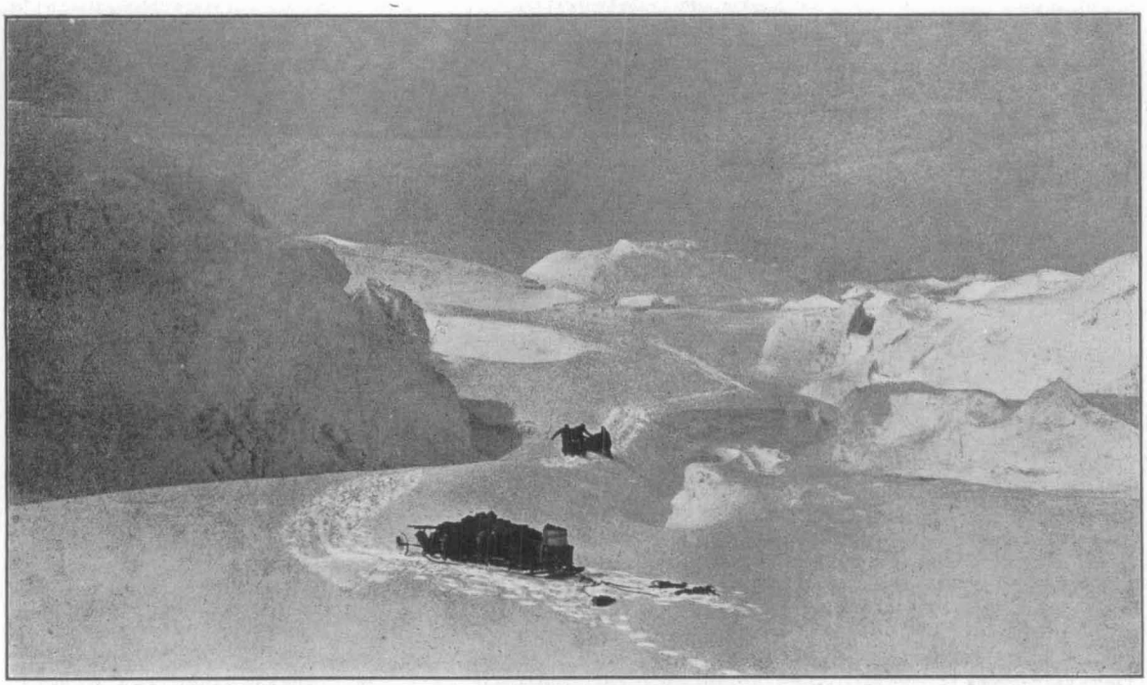


FIG. 1. In the fracture zone of the lower Denman Glacier.

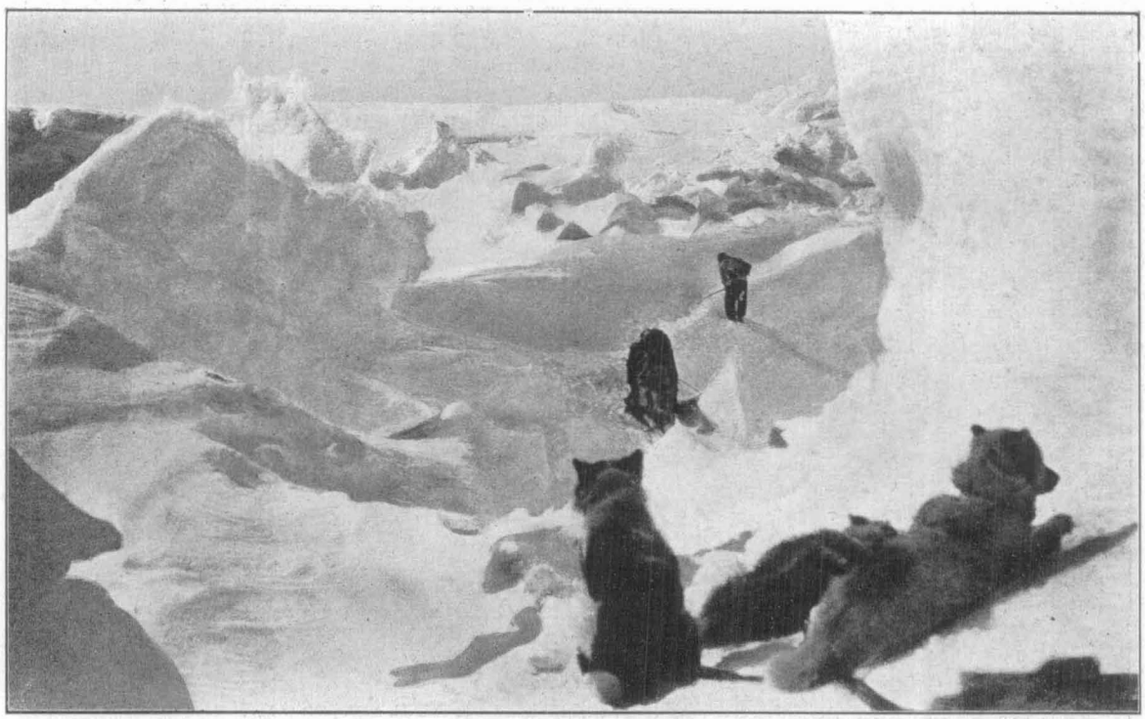


FIG. 2. Traversing the rough ice of the lower Denman Glacier.

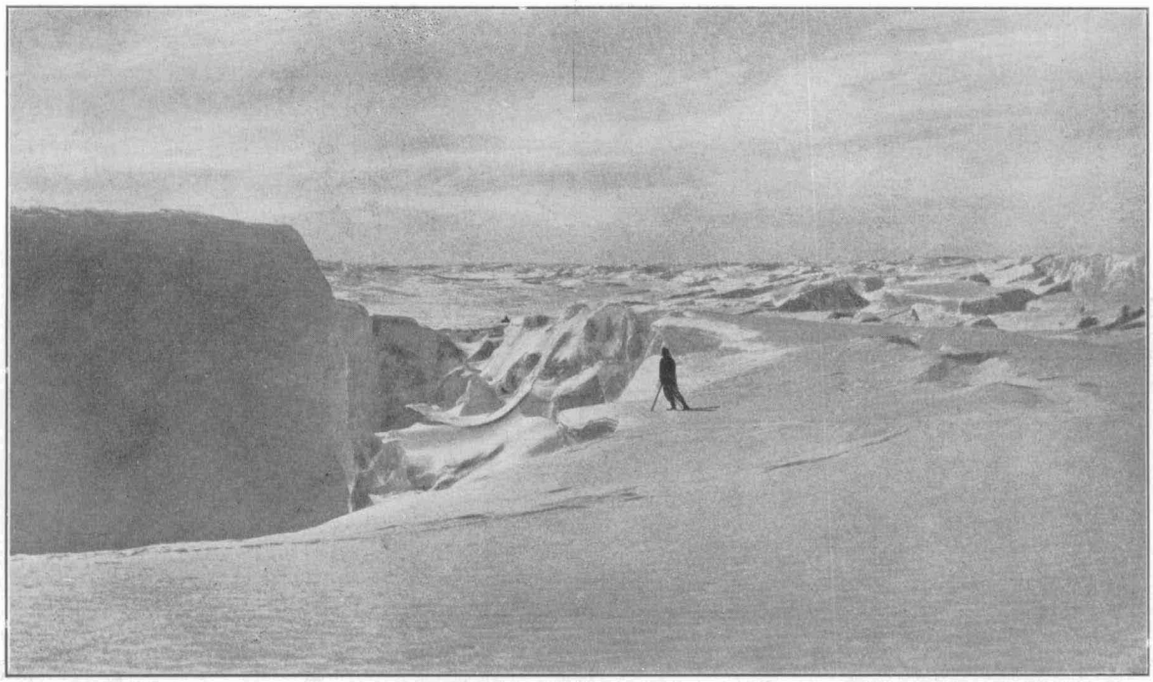


FIG. 1. End of the trail into the lower Denman Glacier.

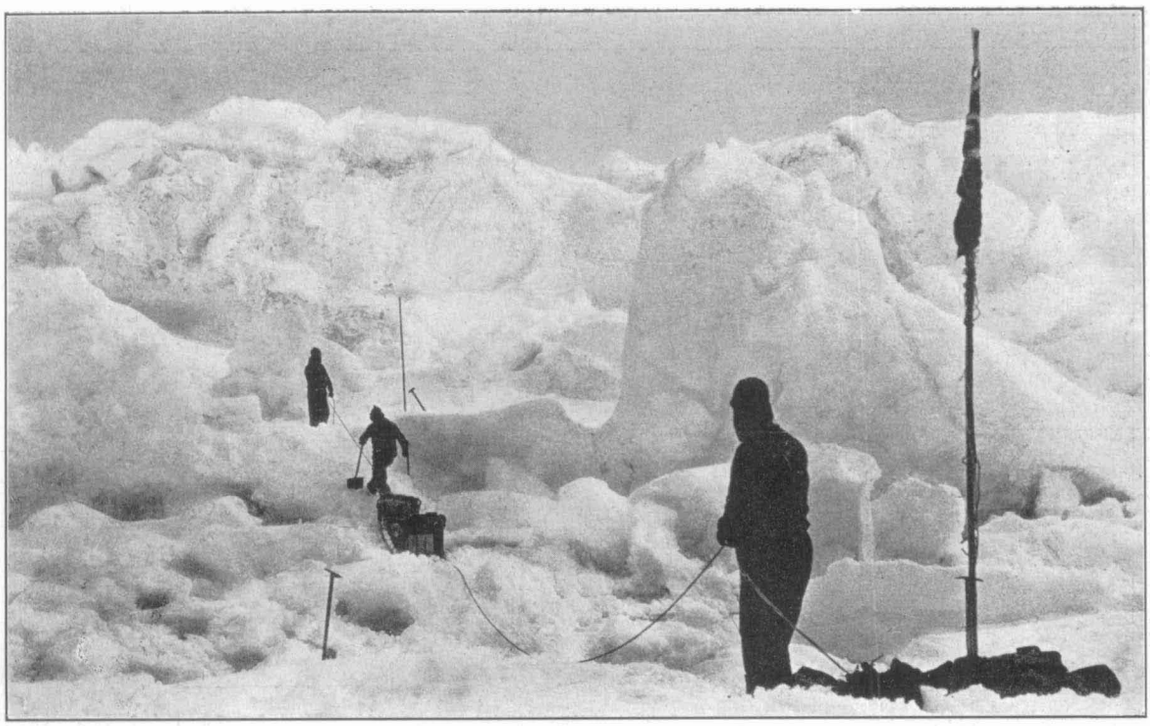


FIG. 2. In the bergschrund zone near Cape Gerlache.

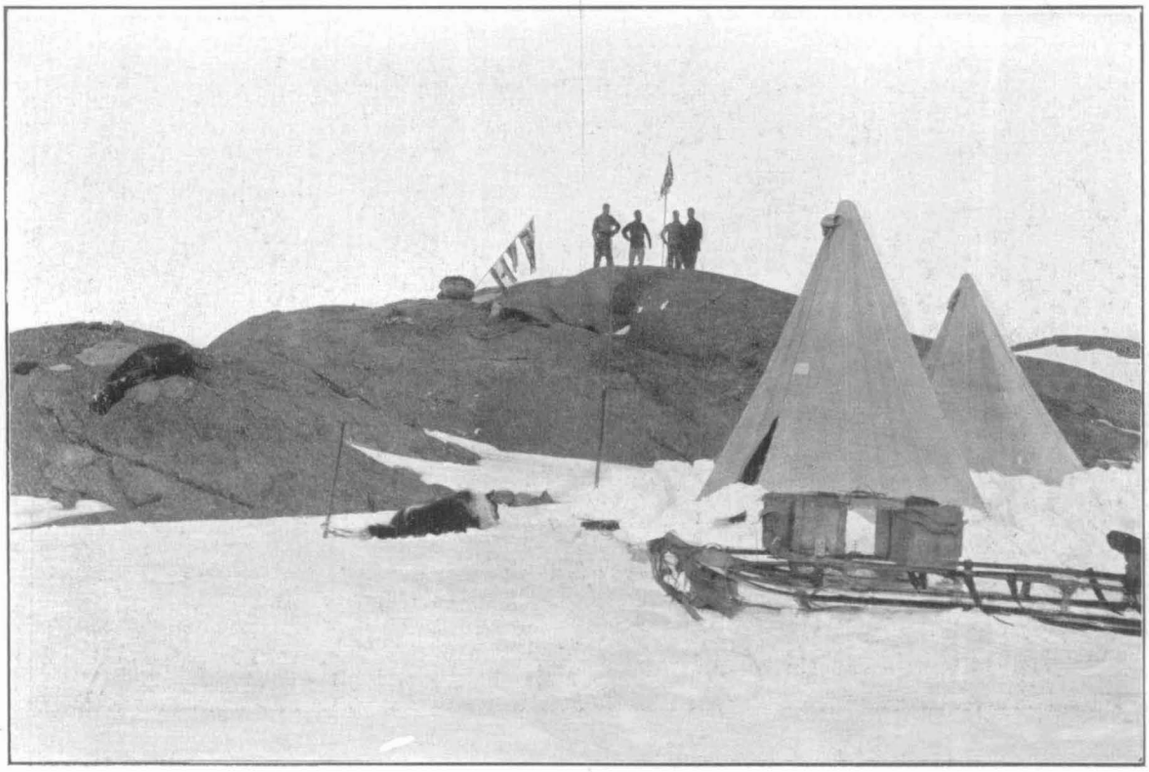


FIG. 1. Camped at Possession Rocks.

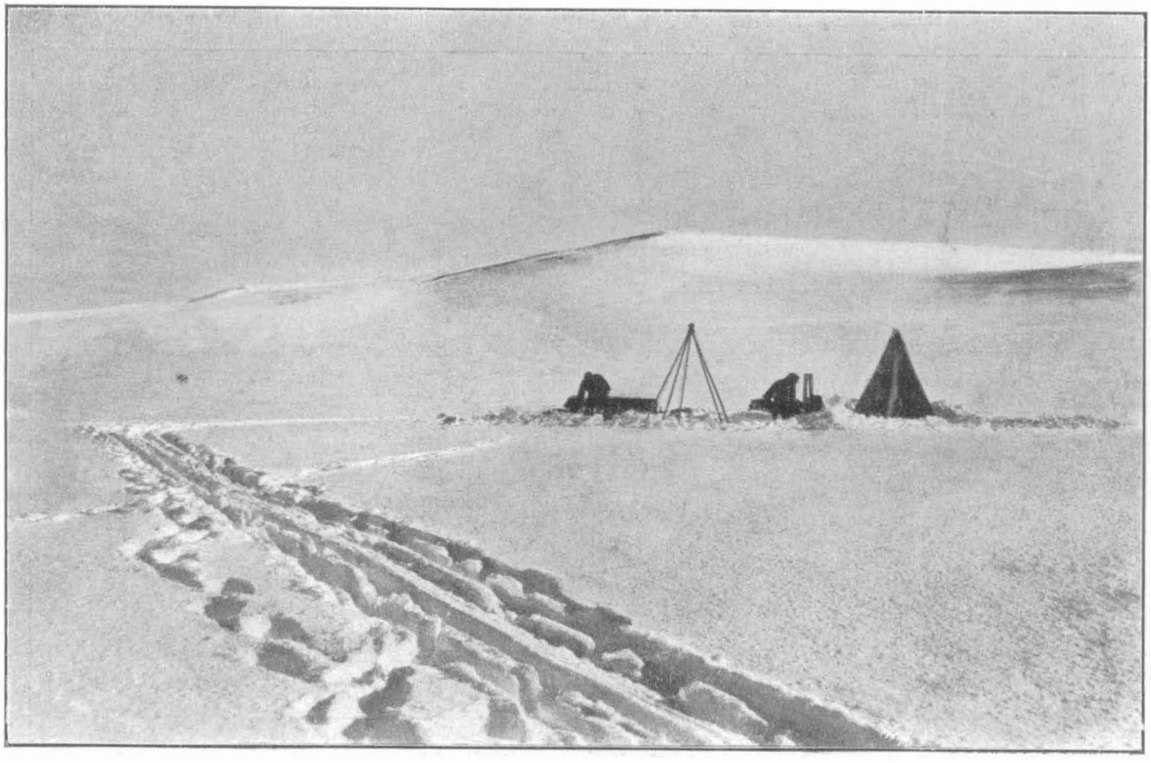


FIG. 2. Camped near Mt. Barr Smith.

FIG. 1. The Western Sledge Party from the Grottoes.

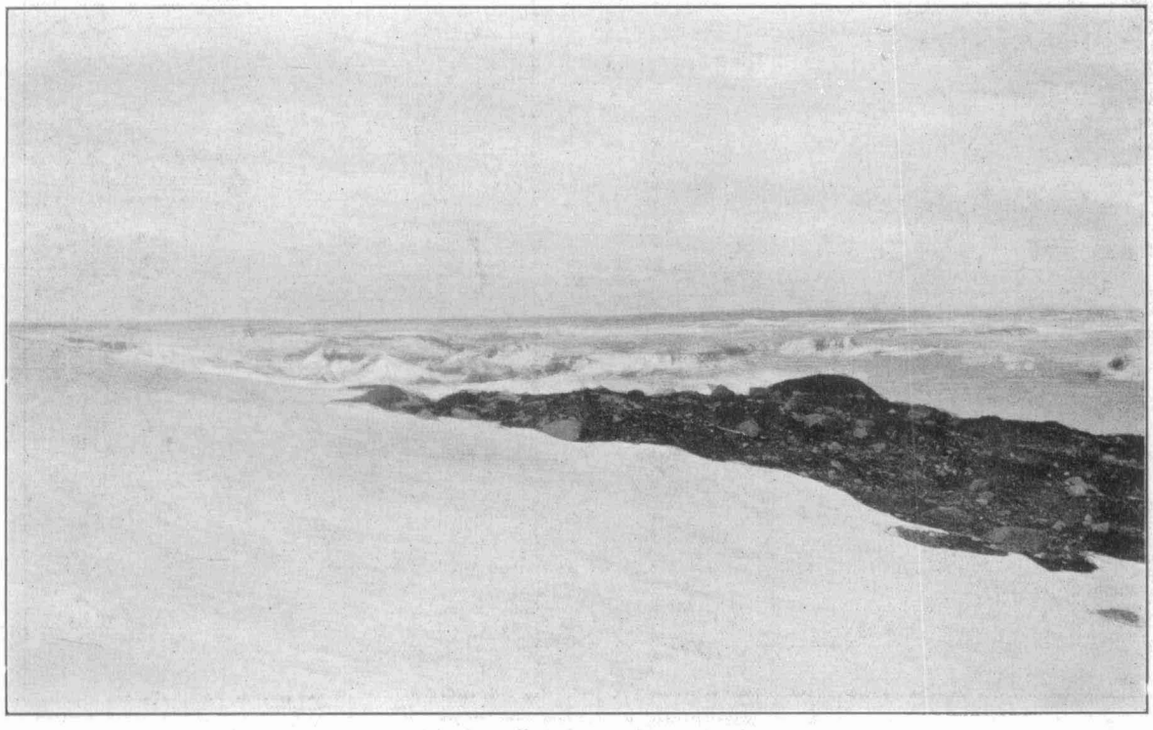


FIG. 2. Moraine on the mainland near Rookery Islands.

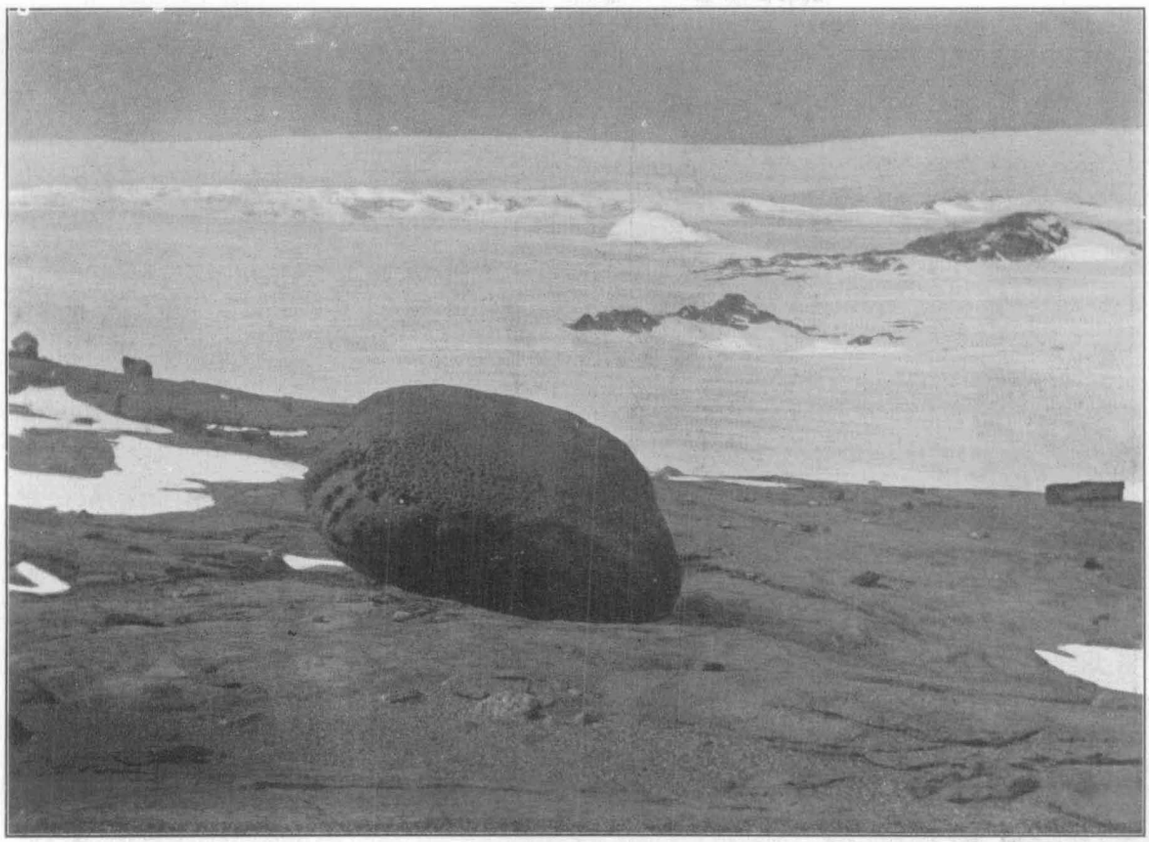


FIG. 1. A large erratic on the surface of Haswell Island.

FIG. 2. The ice-eroded surface of Haswell Island.

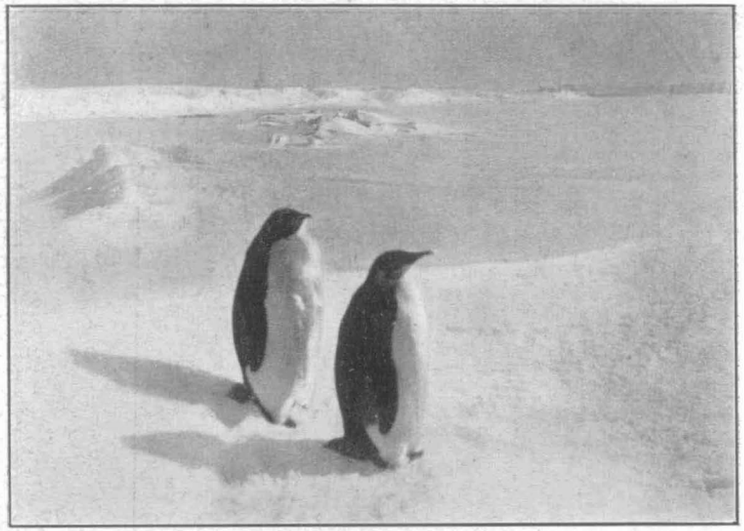


FIG. 1. Young Emperor Penguins on the sea-ice.

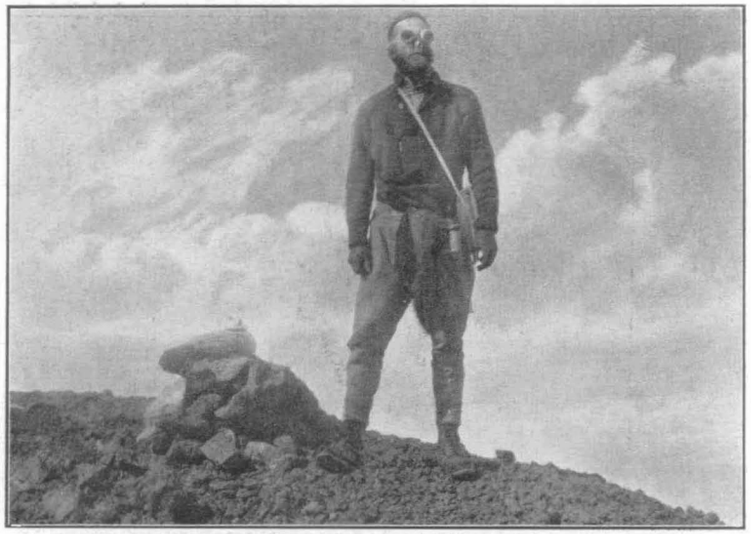


FIG. 2. The summit of Gaussberg.

FIG. 3. Emperor Penguin chicks: Haswell Id. Rookery.

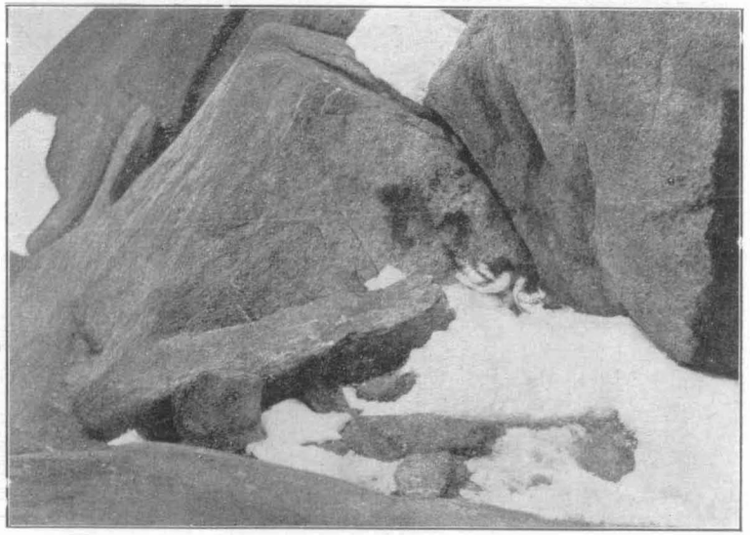


FIG. 4. Cape Pigeons, Haswell Island.

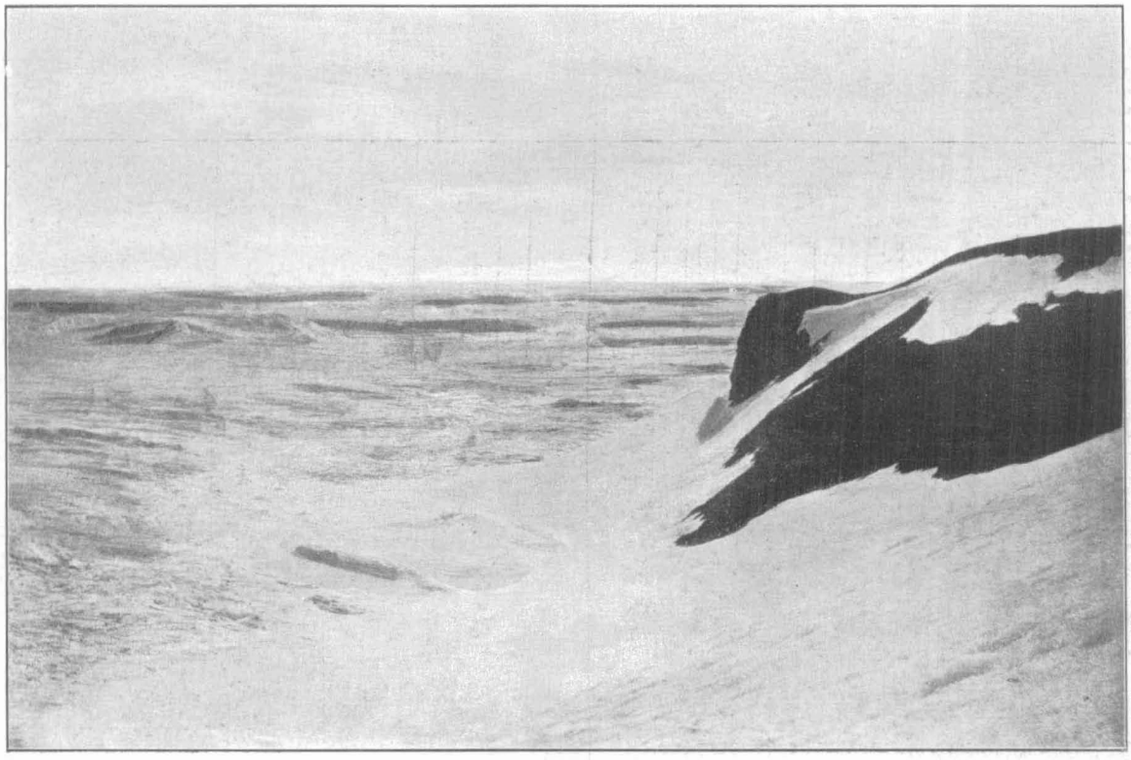


FIG. 1. View from the summit of Gaussberg.

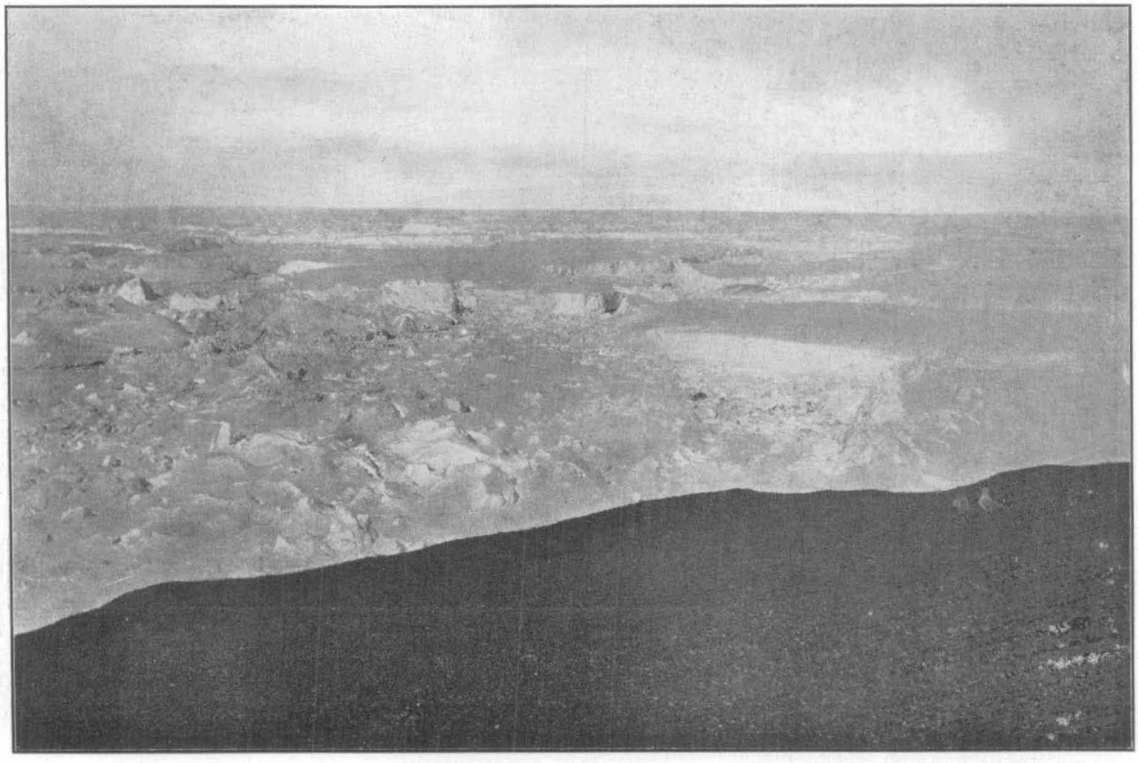
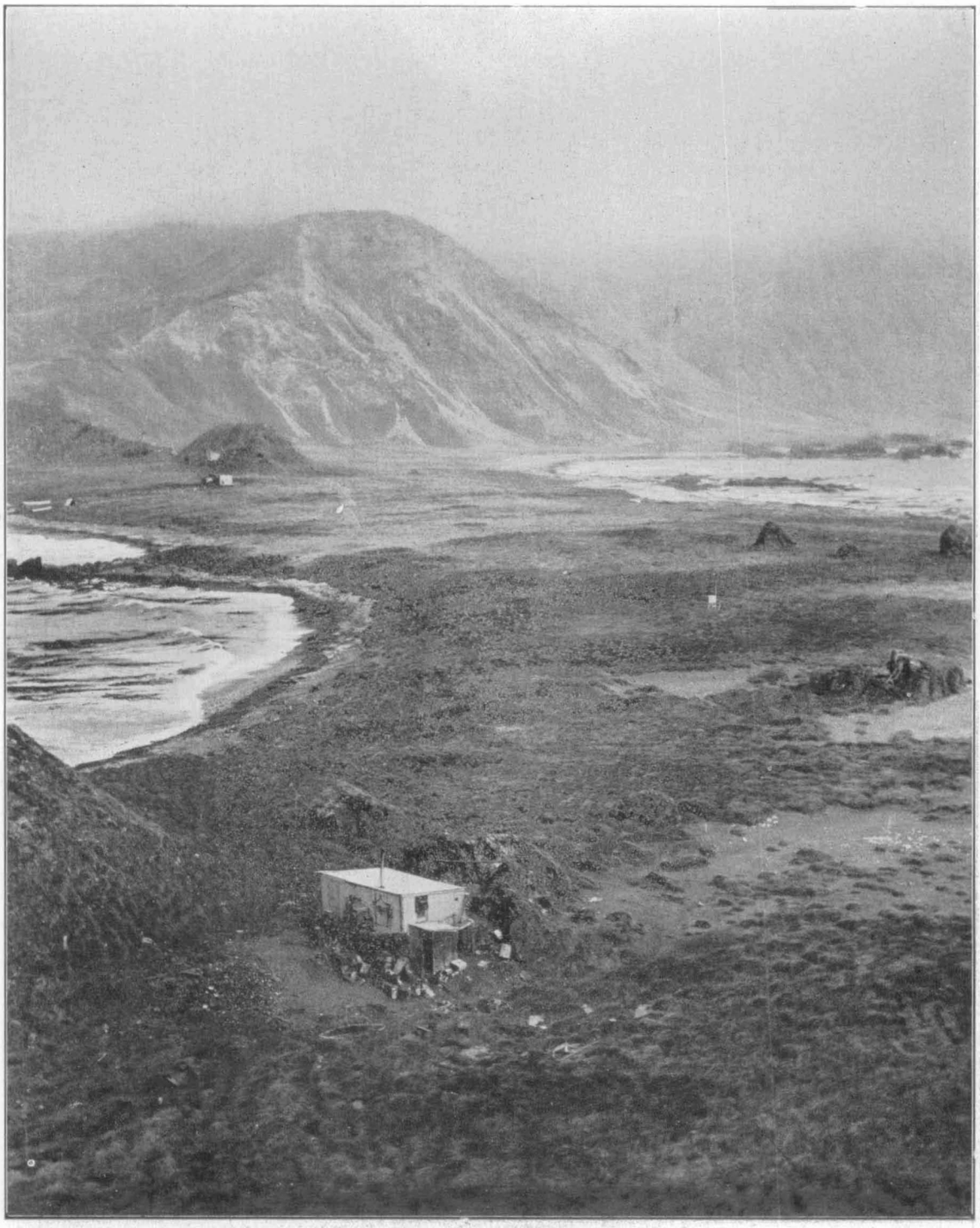


FIG. 2. The shattered land-ice margin east of Gaussberg.



The Expedition Hut on the North End Spit, Macquarie Island.

FIG. 1. The North End Spit and Wireless Hill.

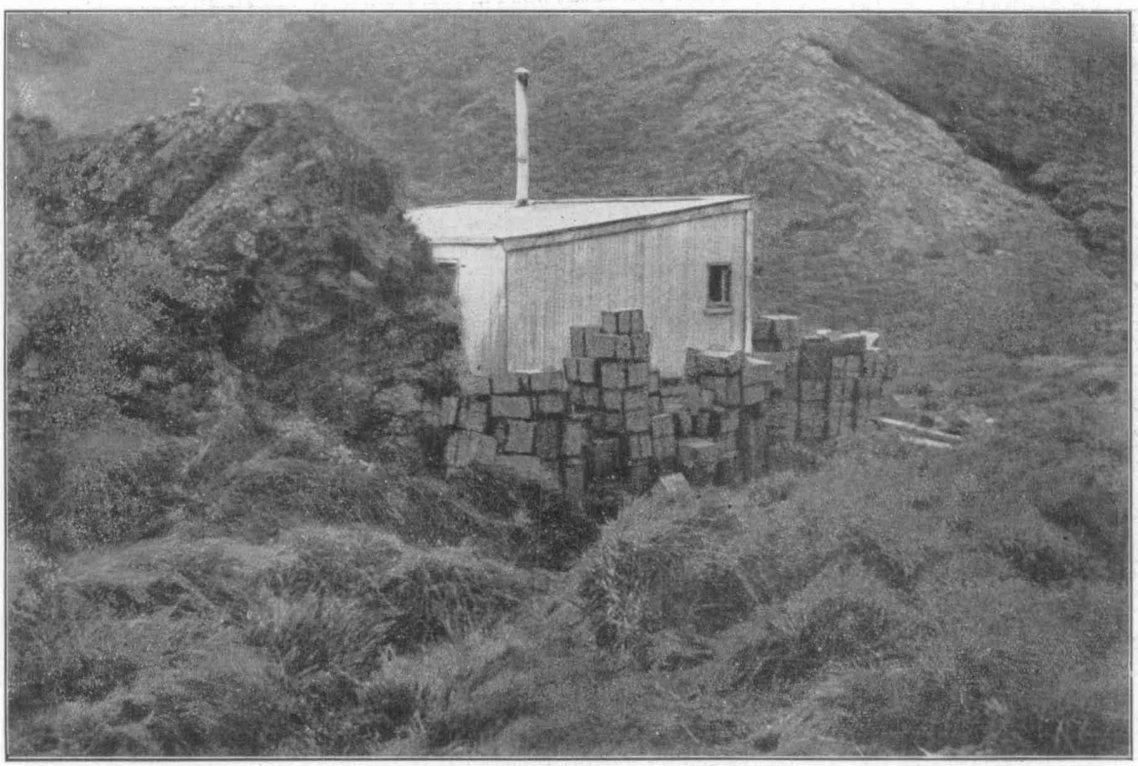


FIG. 2. The Expedition Hut in the lee of protecting rock.

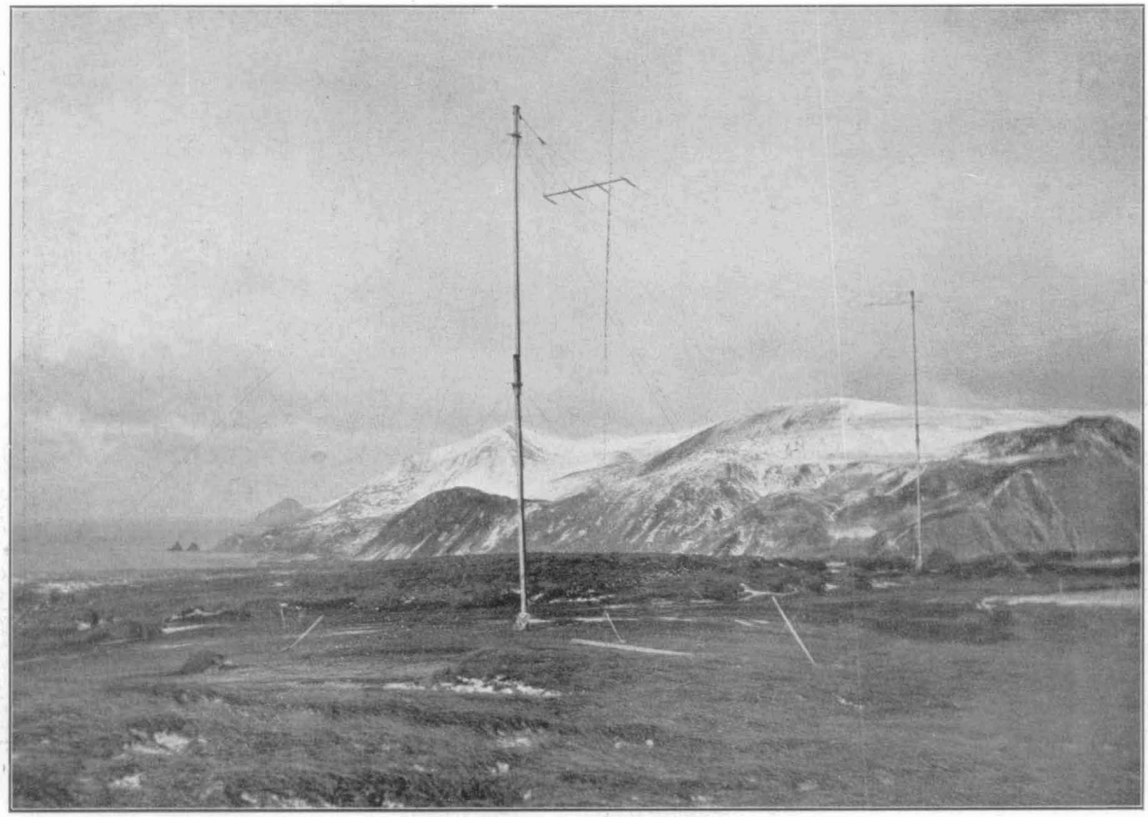


FIG. 1. The Wireless Station.

FIG. 2. The Macquarie Island Party.

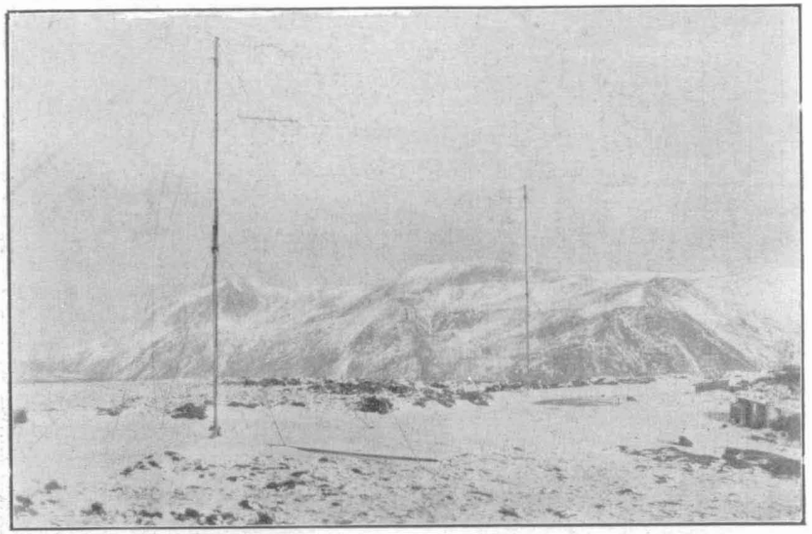


FIG. 1. The Wireless Station in winter.

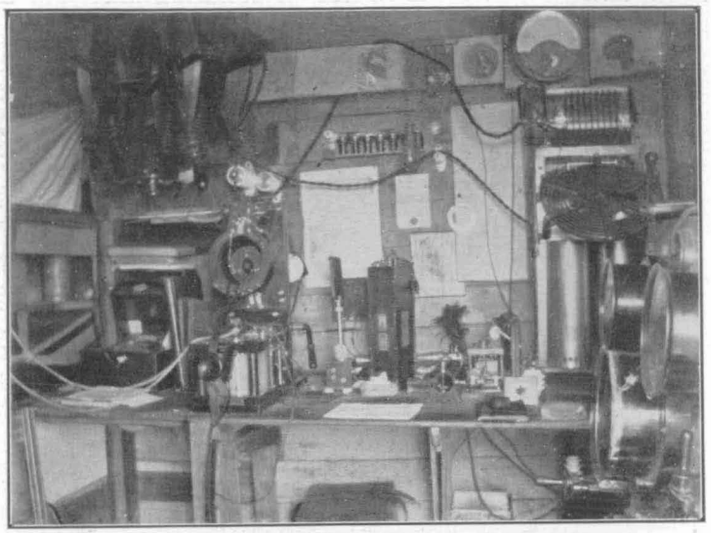


FIG. 2. The sending and receiving set.

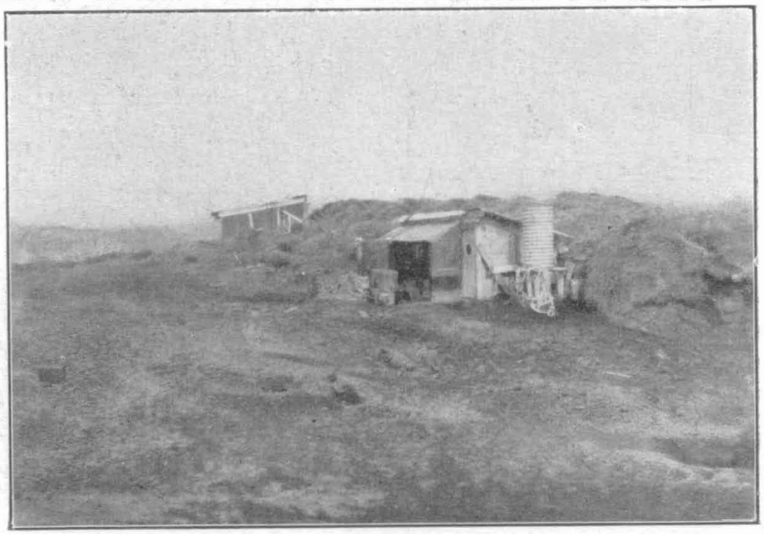


FIG. 3. The Wireless Huts.

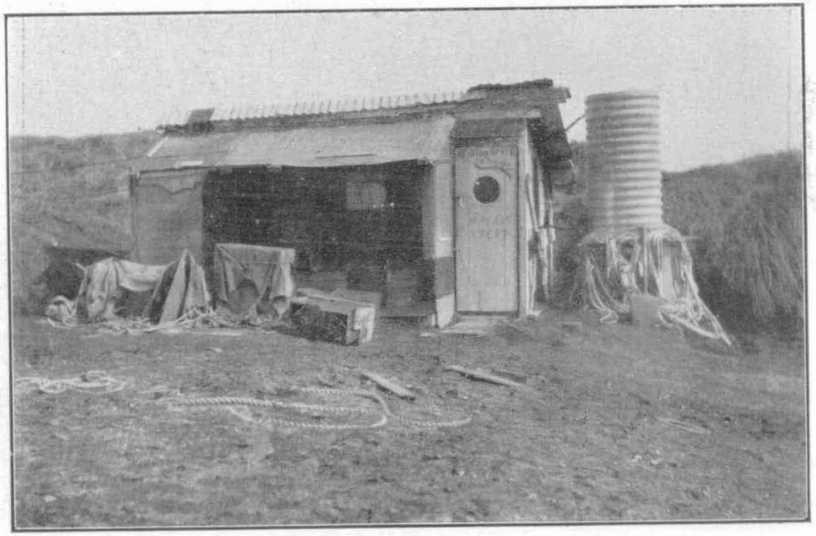


FIG. 4. The Engine-house.

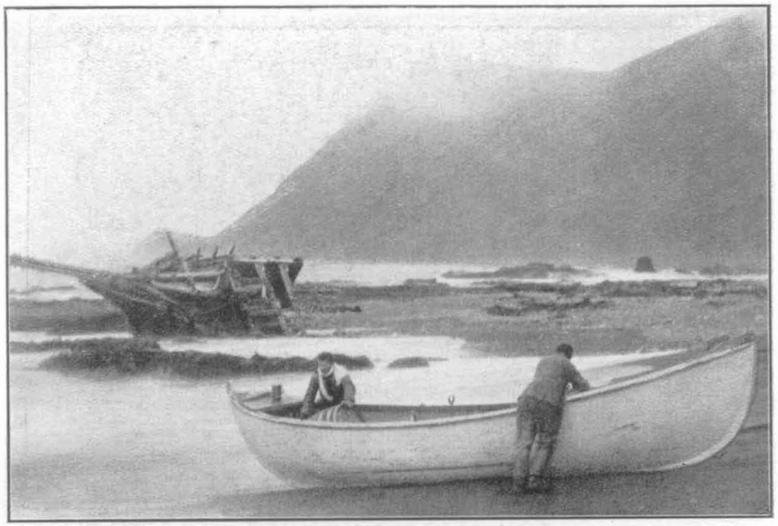


FIG. 1. The beach at North-east Bay.

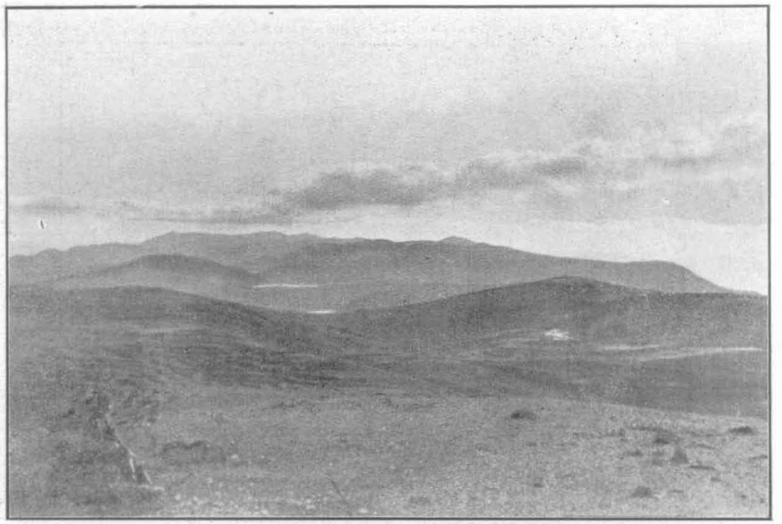


FIG. 2. The summit of Macquarie Island.

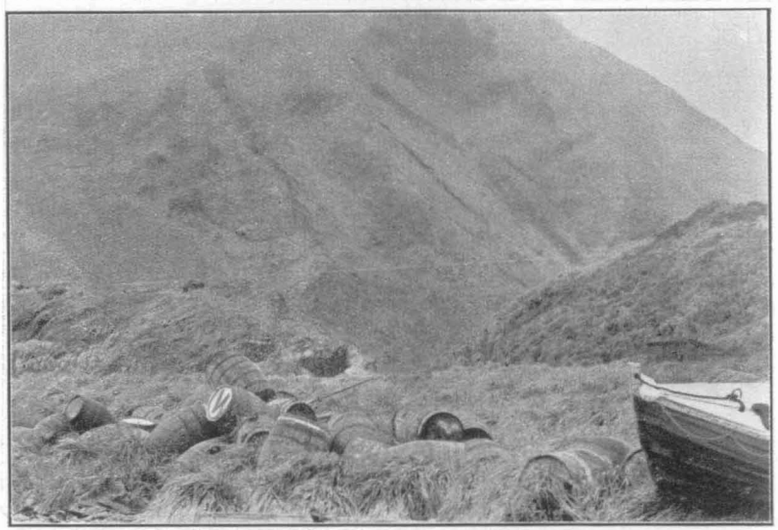


FIG. 3. The tussock-grass hill slopes.

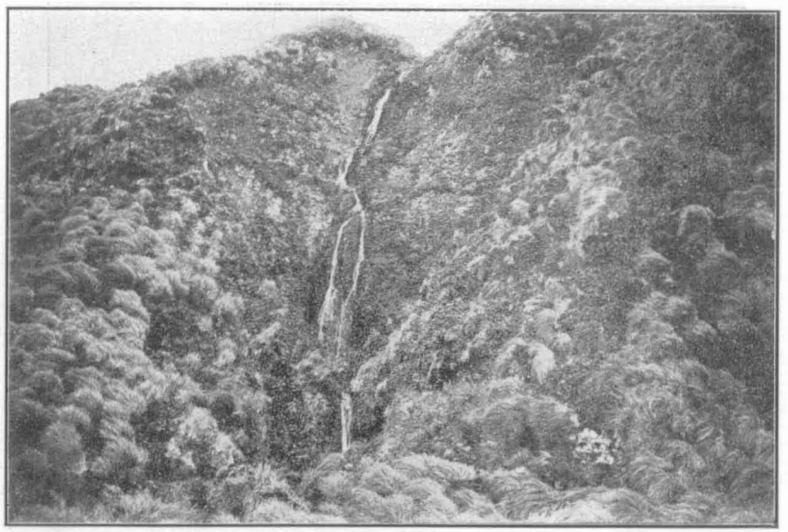


FIG. 4. Over-flow of an upland lake.

FIG. 1. G. F. Ainsworth.

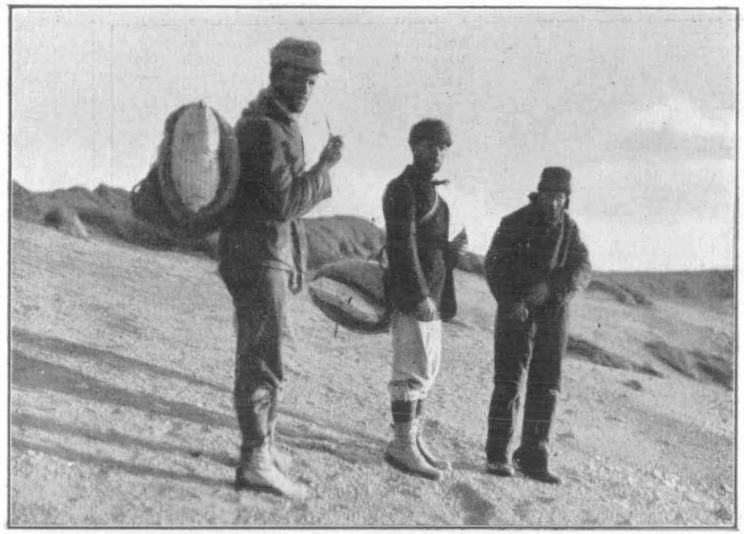


FIG. 2. Sandell, Sawyer and Hamilton.

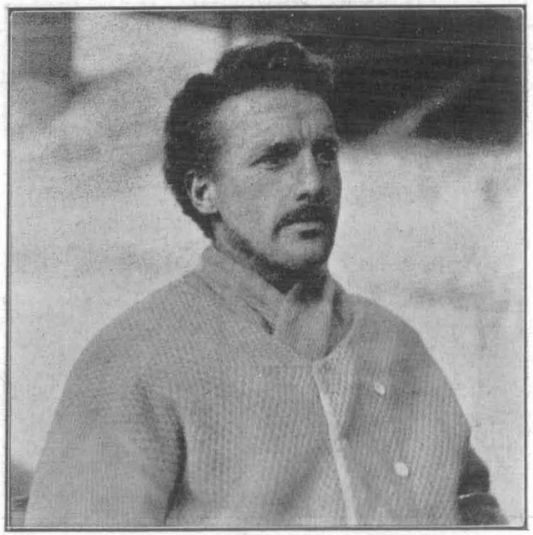


FIG. 3. L. R. Blake.

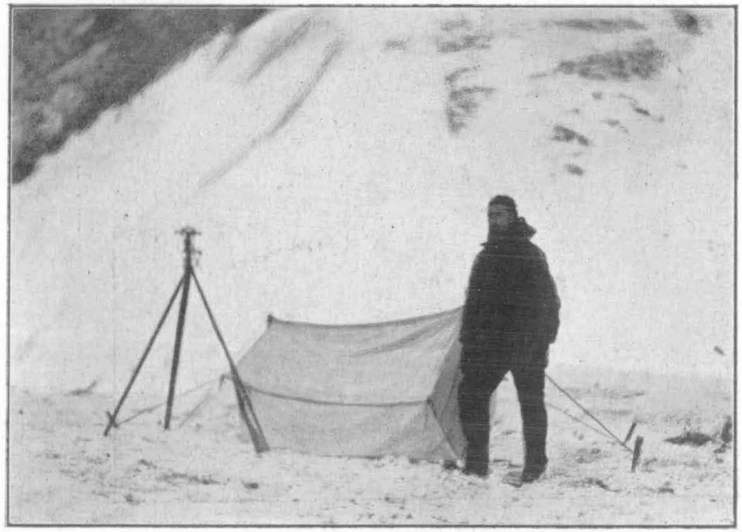


FIG. 4. Blake's small field tent.

* 82908—1 d

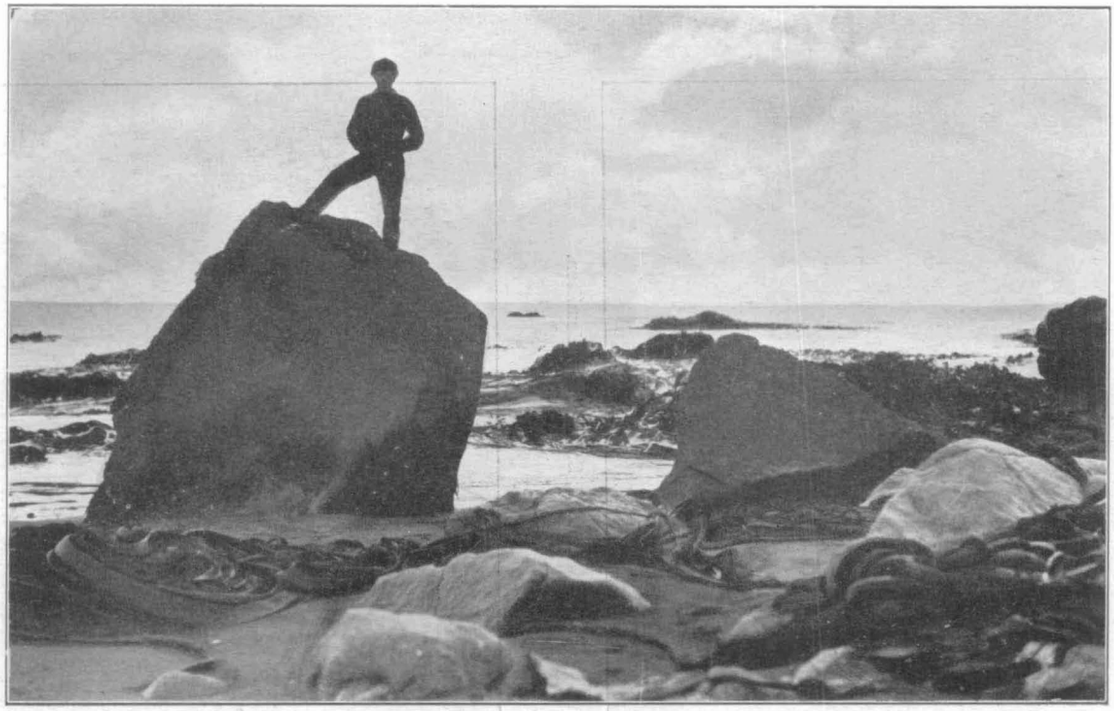
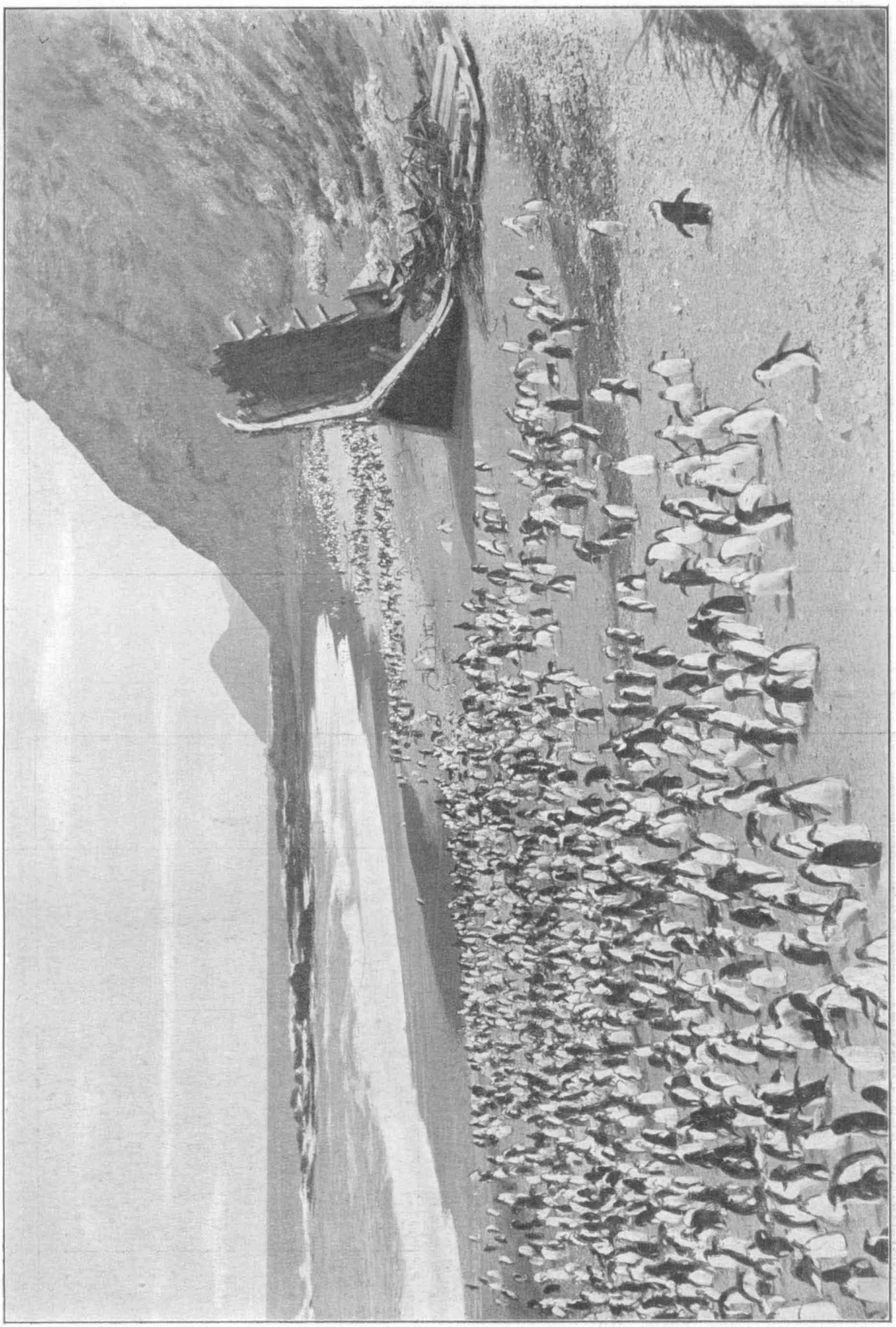


FIG. 1. Sandell standing upon a 21-ton gabbro erratic.

FIG. 2. The tussock-grass slopes at Caroline Cove.



The Nuggets Beach. Wreck of the *Gratitude*.

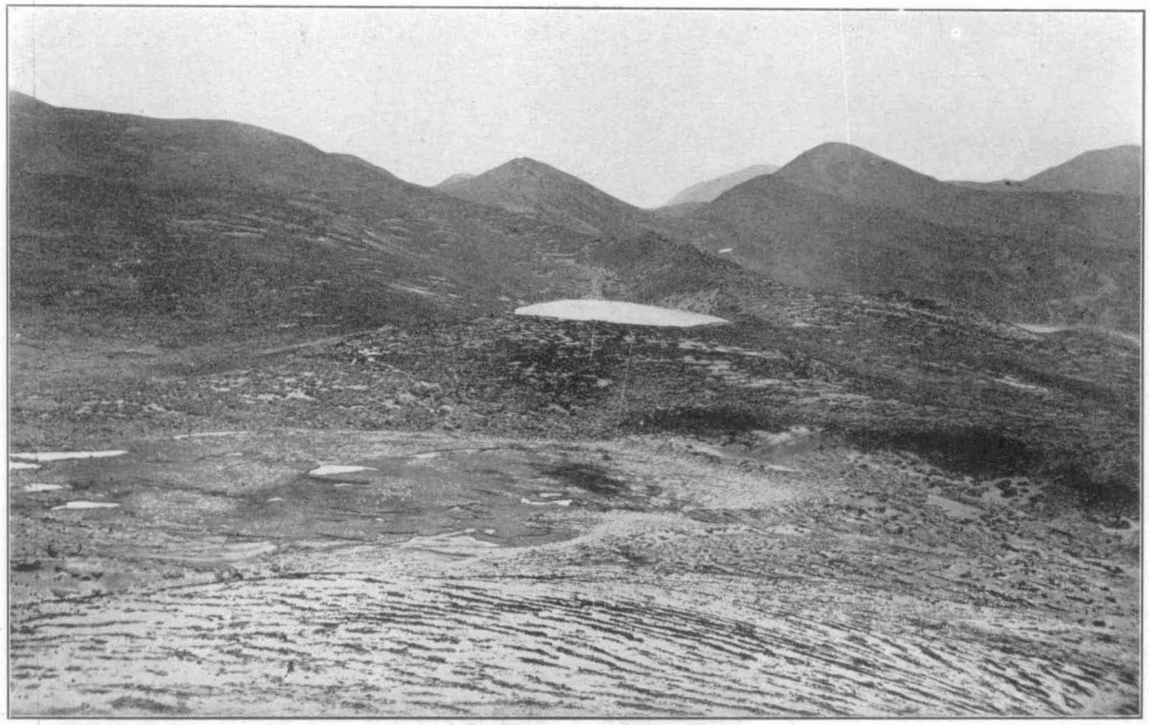


FIG. 1. The highlands of Macquarie Island.

FIG. 2. Winter on the highlands of Macquarie Island.

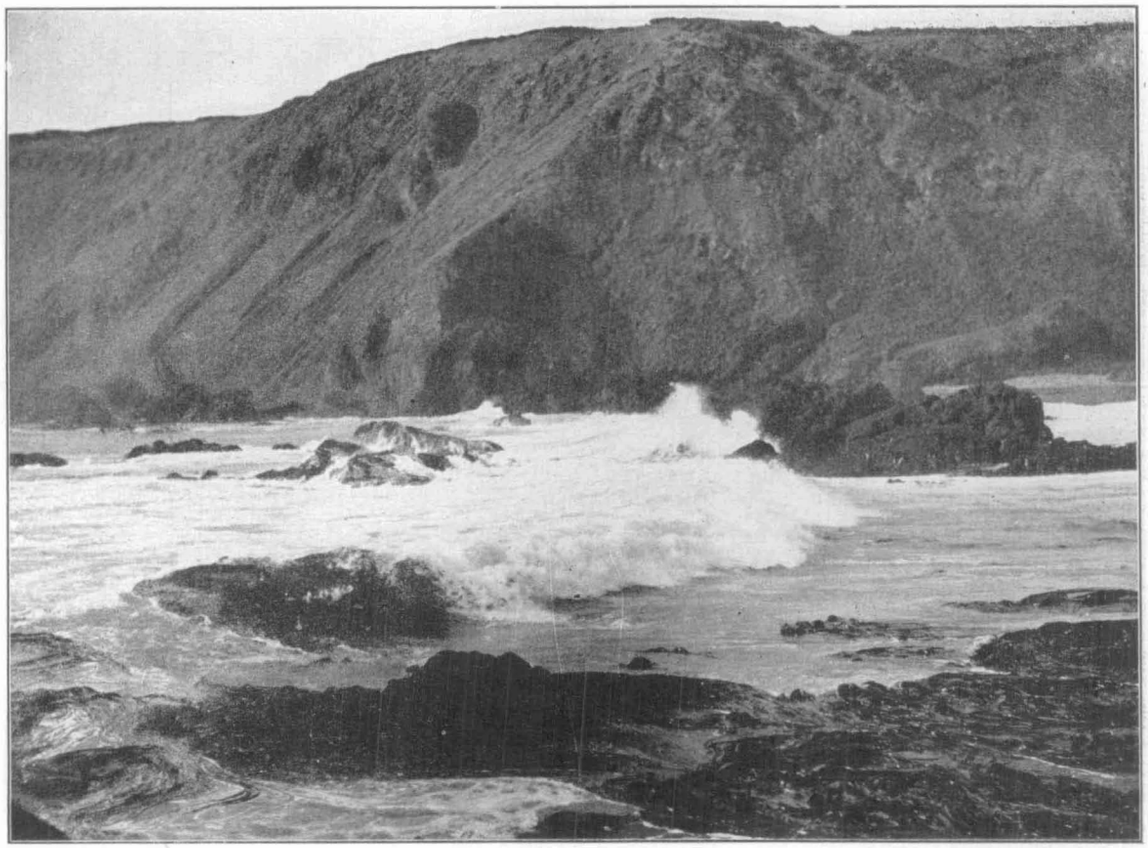


FIG. 1. Macquarie Island's stormy shores.

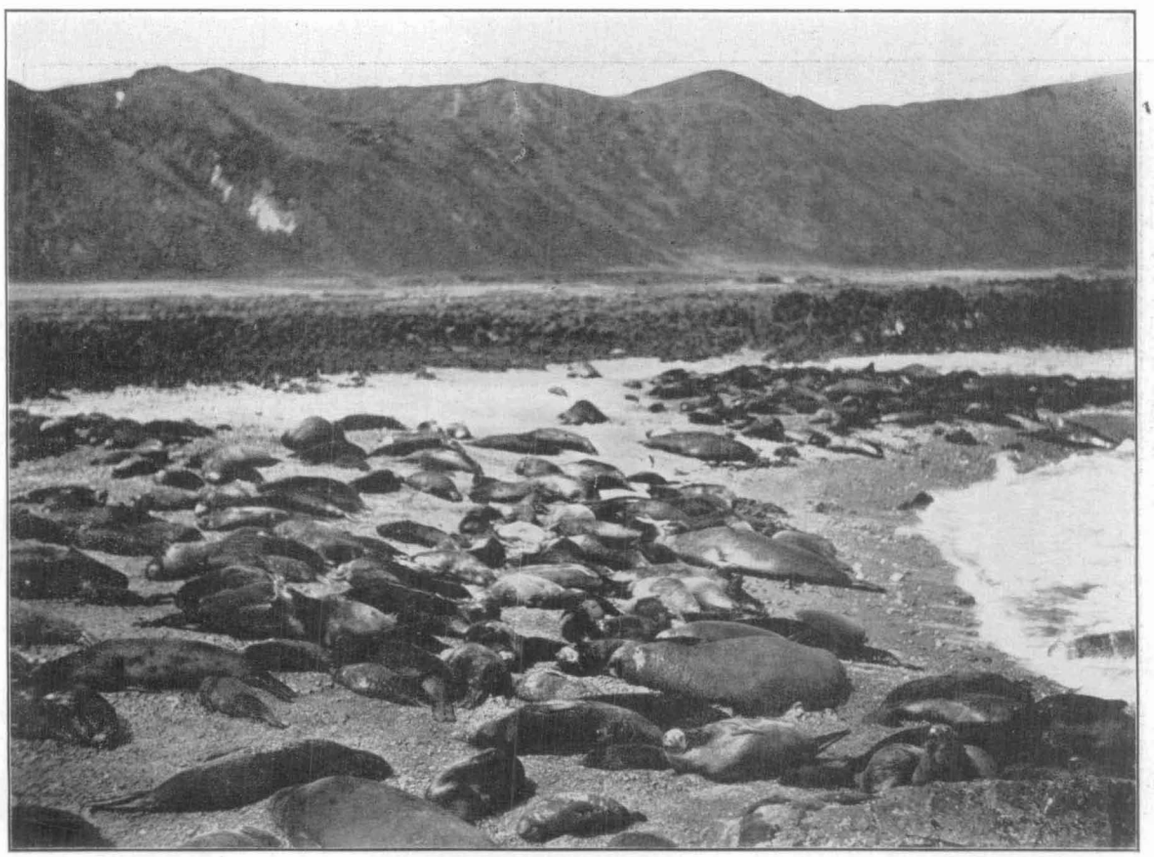


FIG. 2. A rookery of Sea-elephants.

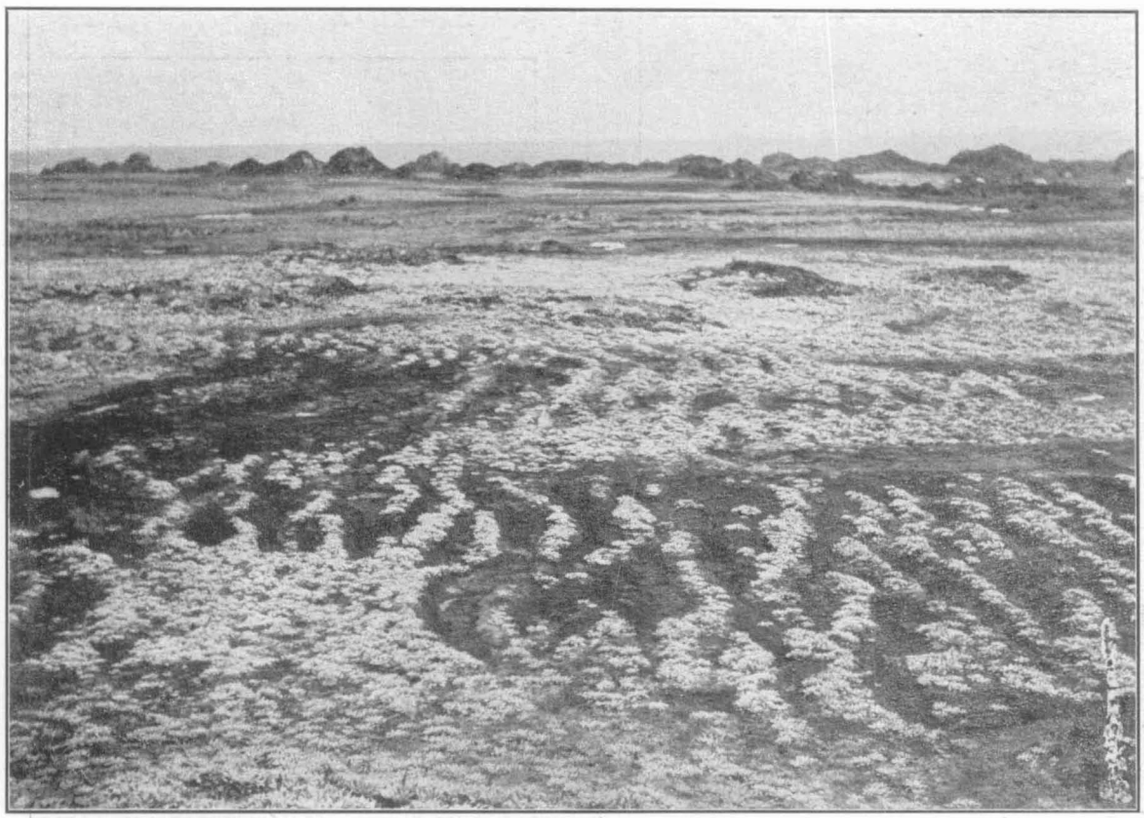


FIG. 1. A raised beach terrace near Eagle Point.

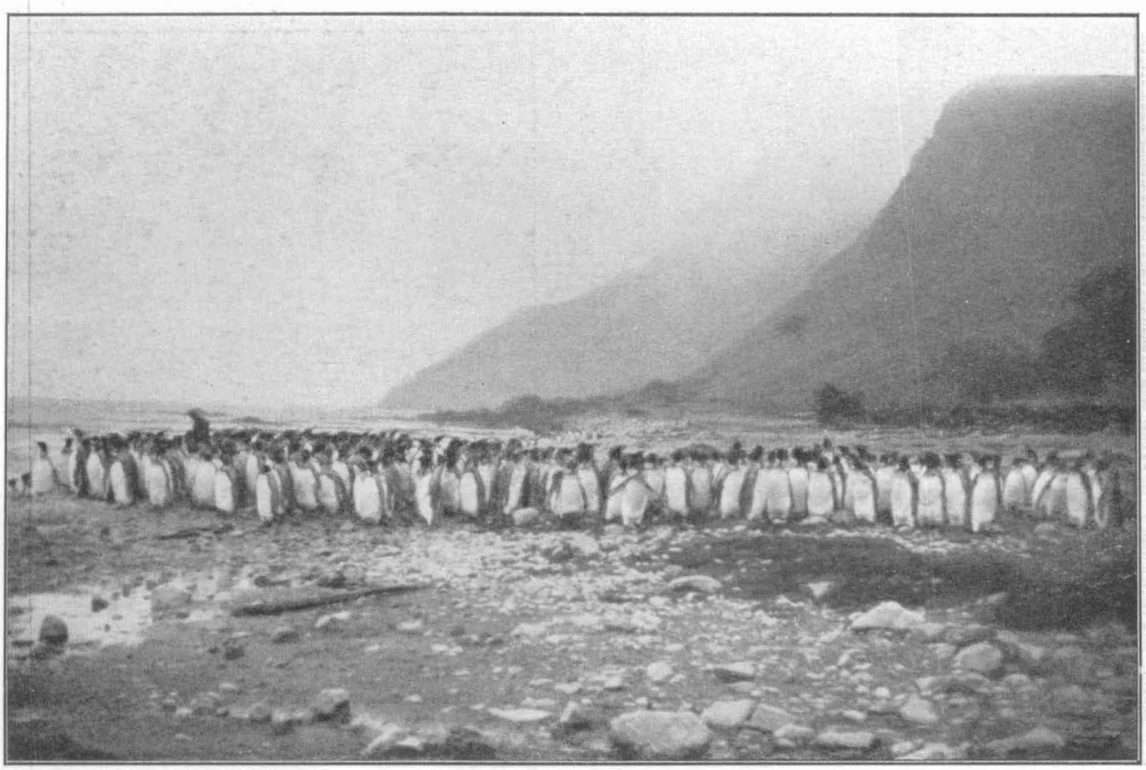


FIG. 2. The beach at Lusitania Bay.

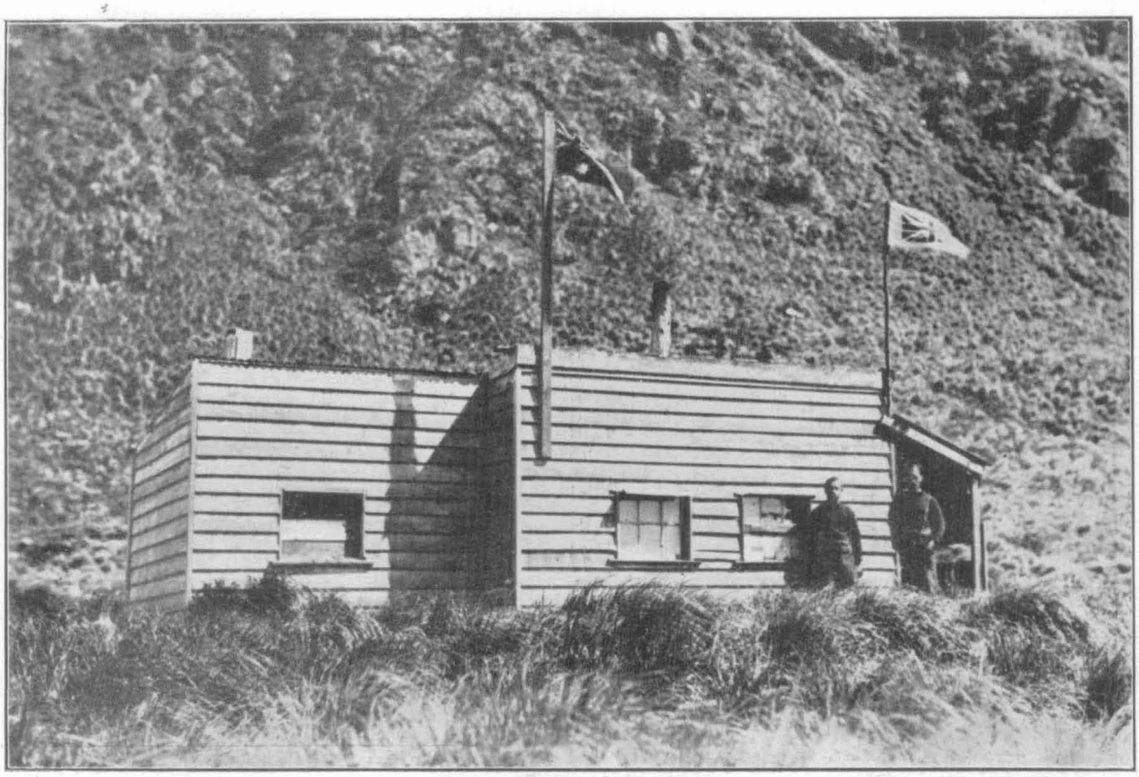


FIG. 1. The old sealers' hut at Lusitania Bay.

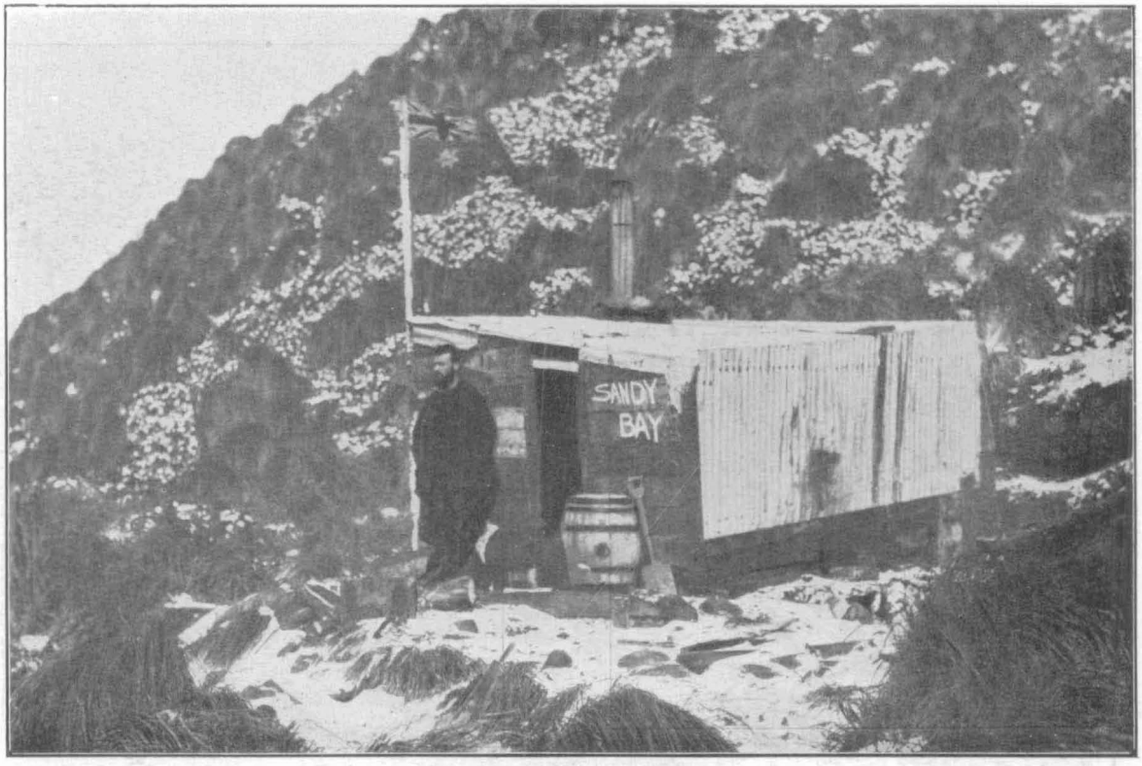


FIG. 2. The sealers' hut at Sandy Bay.

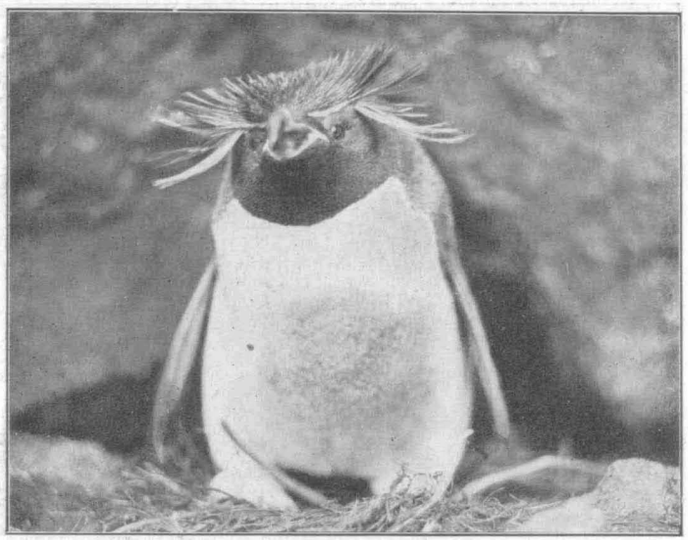


FIG. 1. A Rockhopper Penguin.

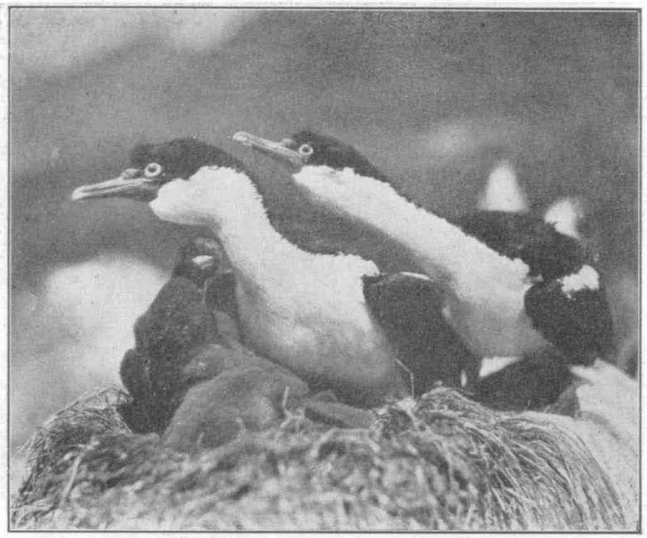


FIG. 2. Cormorants and young.

FIG. 3. A Gentoo Penguin.

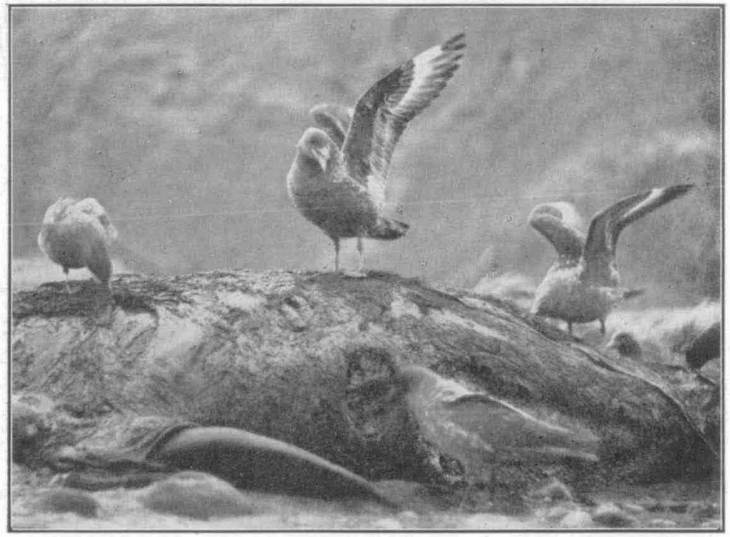


FIG. 4. Skua Gulls.

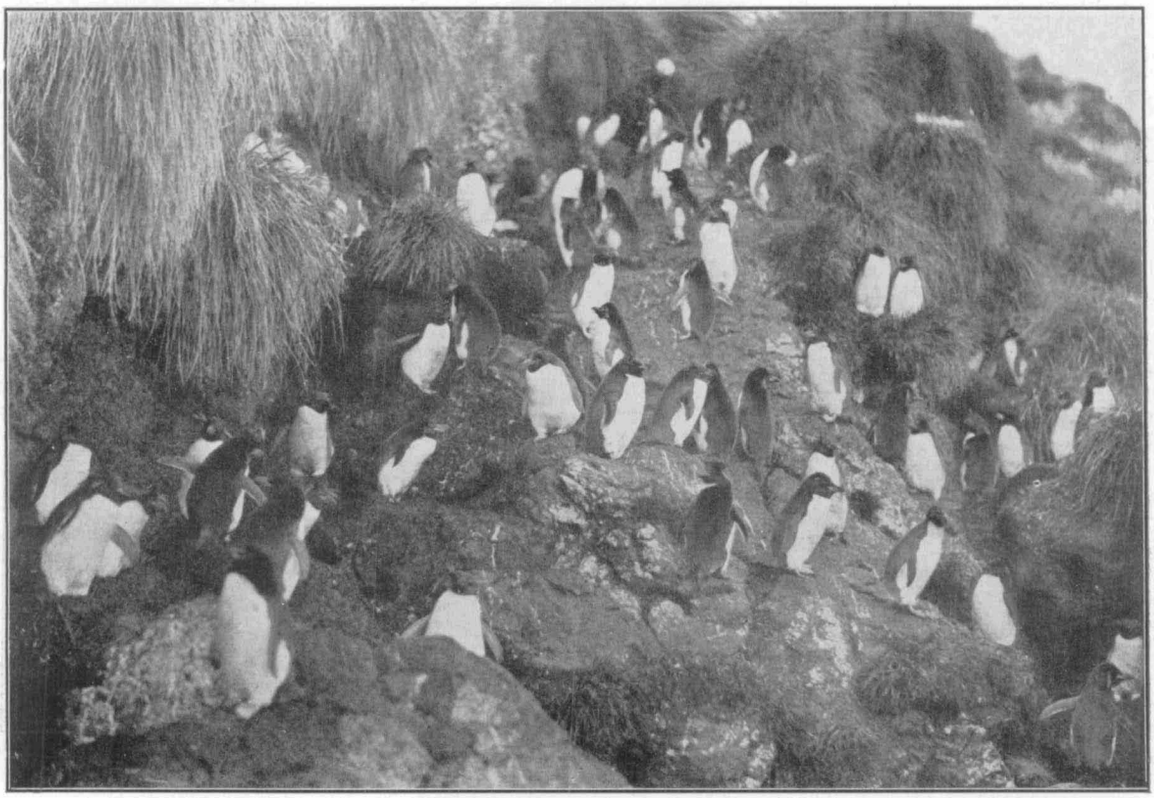


FIG. 1. A nesting haunt of Rockhopper Penguins.

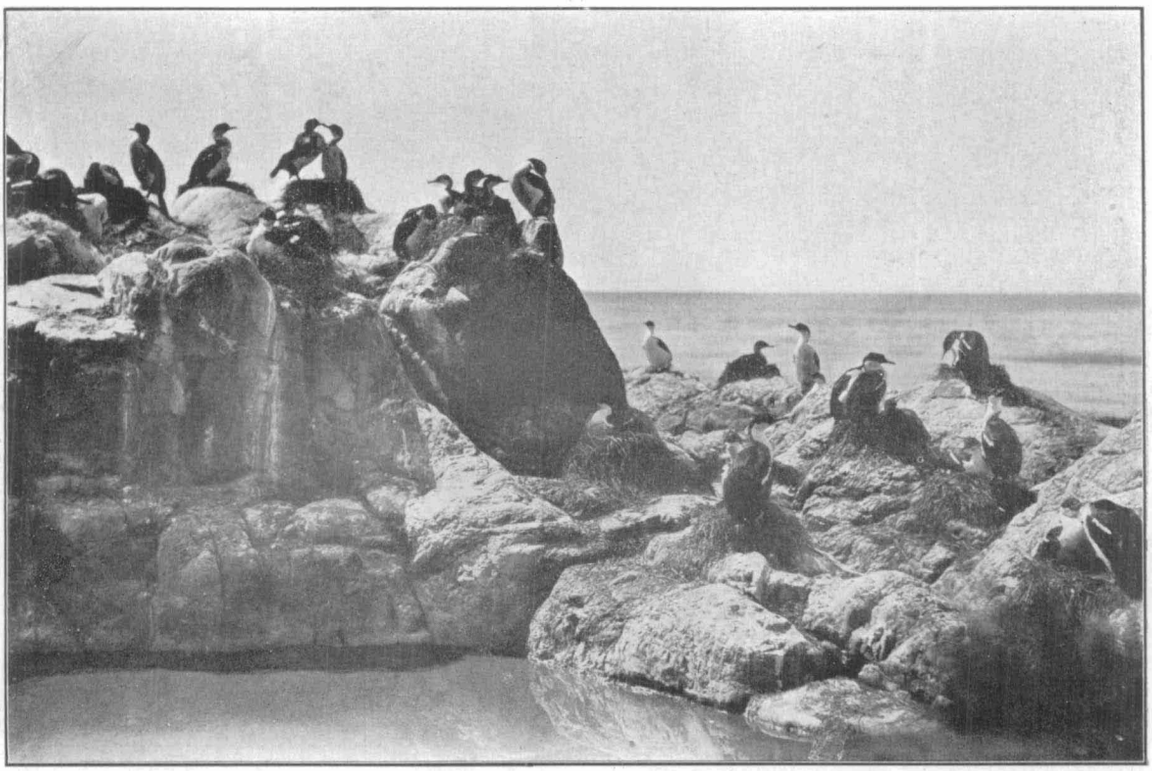


FIG. 2. A cormorant rookery.

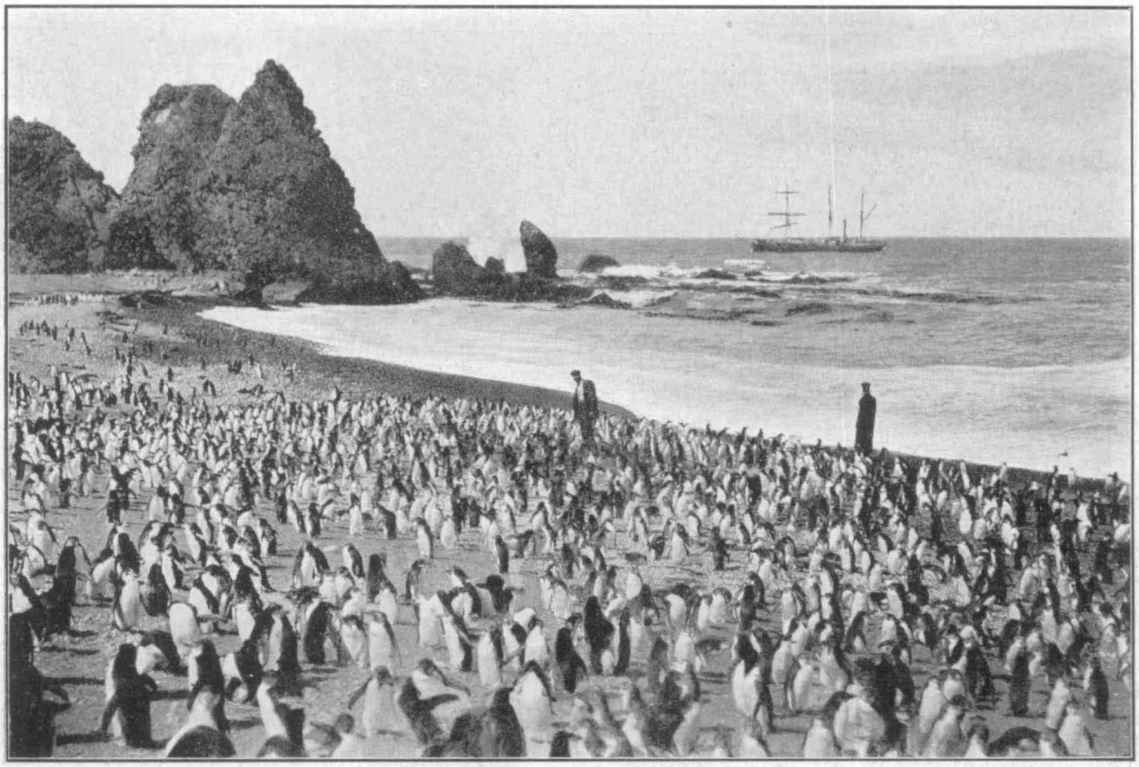


FIG. 1. Royal Penguins on the Nuggets Beach.

FIG. 2. A bull Sea-elephant and some cows.

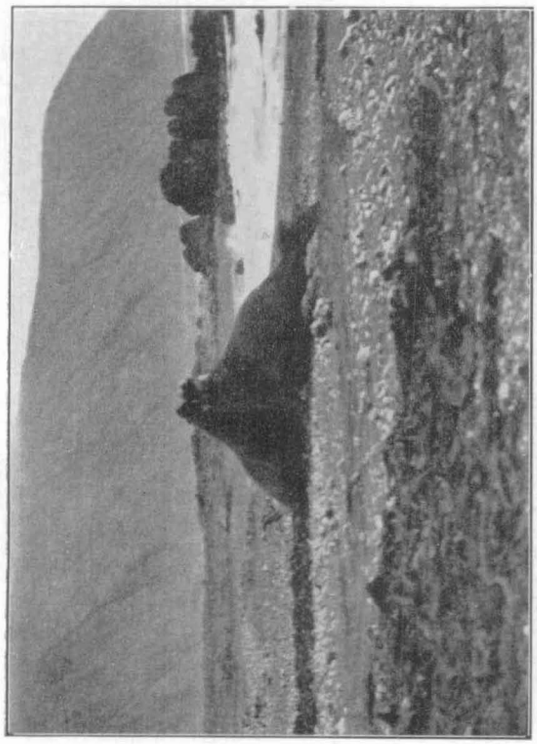


FIG. 2. Bull Sea-elephants fighting.

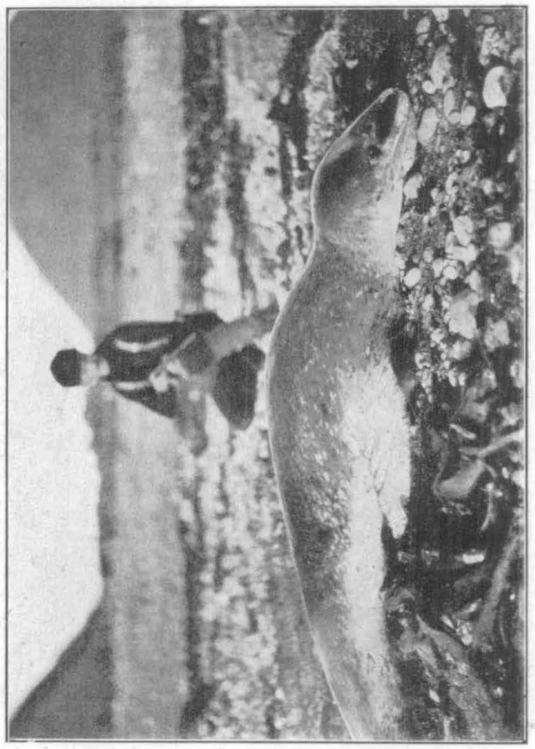


FIG. 4. A Sea-leopard.

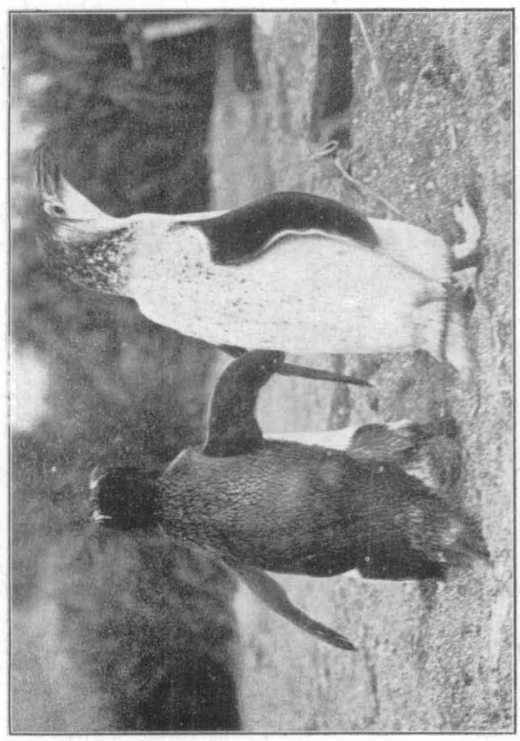


FIG. 1. A Sclater Penguin and an albino Royal Penguin.

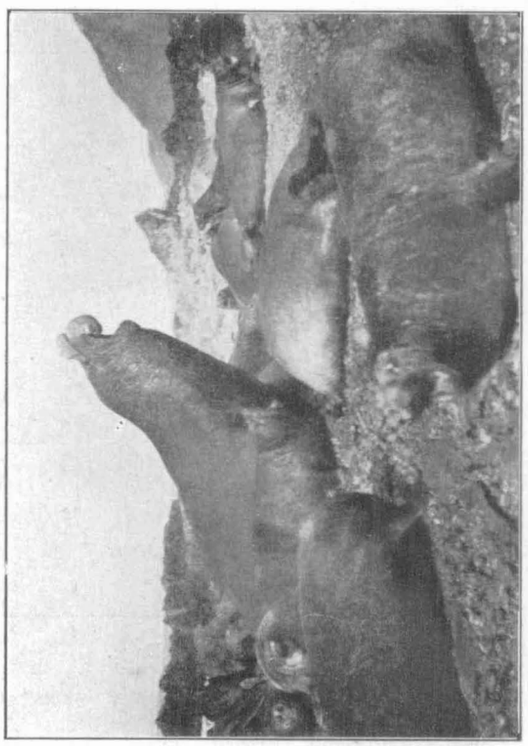


FIG. 3. Bull Sea-elephants roaring.

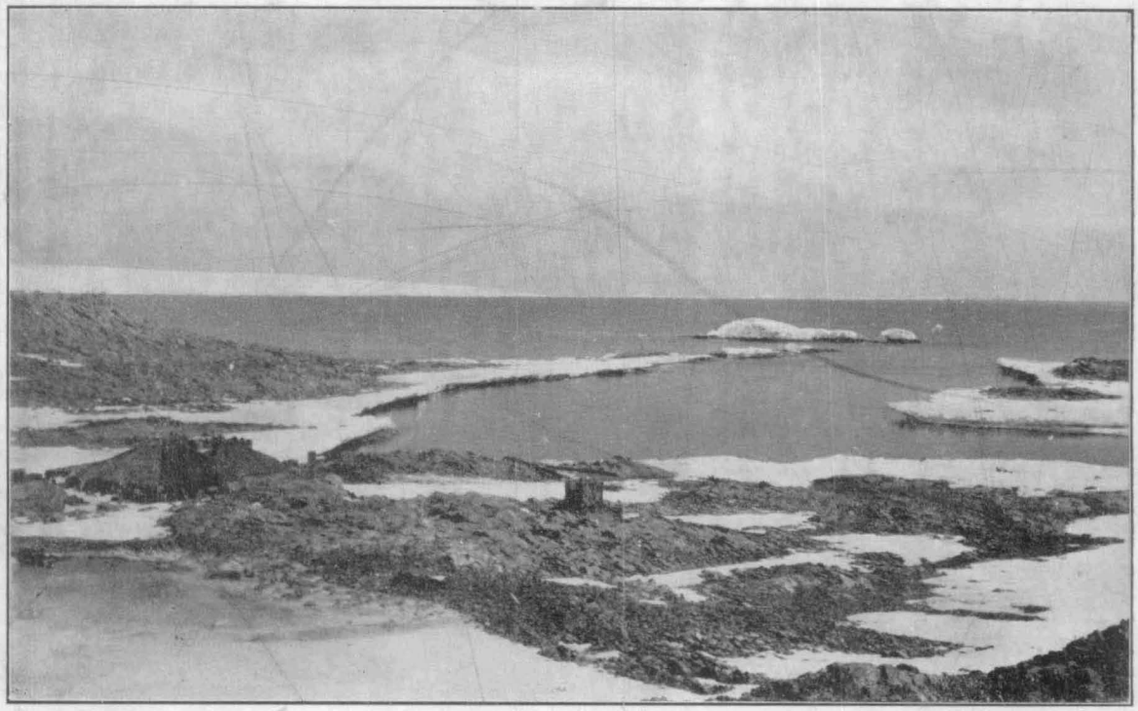


FIG. 1. The Astronomic Observatory and Hut at Cape Denison.

FIG. 2. Robert Bage.

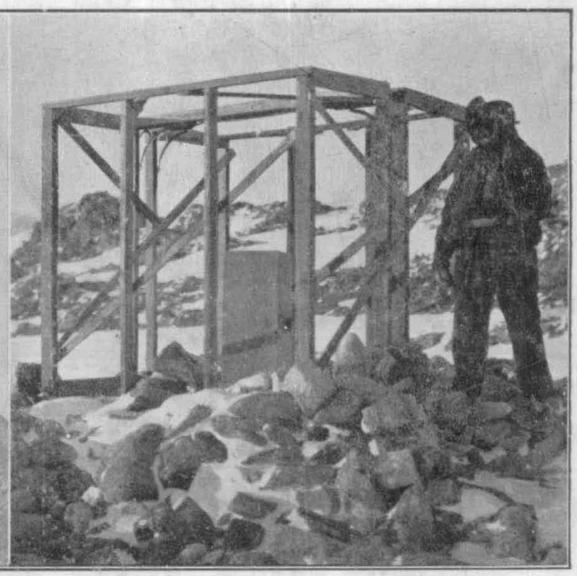


FIG. 3. Observatory under construction.

Sydney: Alfred Henry Pettifer, Acting Government Printer—1942.

INDEX.

In the compilation of this index only more important references are listed. References to the various birds and seals, for instance, represent only a skimming of actual observations noted in the text. The Roman numbers quoted have regard to the half-tone plates at the end of the volume.

* The true Victoria Penguin does not exist at Macquarie Island. That referred to as such by Hamilton and adopted in *The Home of the Blizzard* is that herein popularly referred to as the Rockhopper Penguin.

The Rockhopper Penguin of Hamilton (*The Home of the Blizzard*) is here distinguished as the Gentoo Penguin. This nomenclature is in accordance with R. A. Falla, Vol. II, Series B, B.A.N.Z.A.R. Expedition Reports.

Sydney: Alfred Henry Pettifer, Acting Government Printer—1942.

A.A.E. 1911–14

KING GEORGE LAND

Scale

10 5 0 10 20 30 Statute Miles

LEGEND OF SLEDGE TRACKS

Far-Eastern Party ———

Eastern Coastal Party —·—·—

Southern Party – – – – –

D'URVILLE SEA
(Open Water)

PACK ICE

CONSOLIDATED PACK ICE

COMMONWEALTH B.

C. DENISON

C. GRAY

STILLWELL I.

C. de la MOTTE

WATT B.

BUCHANAN B.

MERTZ GLACIER TONGUE

MERTZ GLACIER

MT HUNT 1700

MADIGAN NUNATAK

MT MURCHISON

AURORA PEAK

CORRELL NUNATAK

McLEAN NUNATAKS

FISHER B.

C. HURLEY

PENGUIN Pt.

MURPHY B.

C. BAGE

AINSWORTH B.

C. WEBB

DOOLETTE B.

C. POLLOCK

DIXSON I. 1100

NINNIS GLACIER TONGUE

NINNIS GLACIER

BUCKLEY BAY

ORGAN PIPE CLIFFS

C. SPENCER

C. BLAKE

C. WILD

HORN BLUFF

DEAKIN B.

C. FRESHFIELD

COOK B.

THE "NODULES" 4450

KING GEORGE LAND

67 68 69

142 143 144 145 146 147 148 149 150 151 152 153

AUSTRALASIAN ANTARCTIC EXPEDITION

ILLUSTRATING SLEDGING OPERATIONS
FROM THE

WESTERN BASE STATION

Scale — Statute Miles

10 5 0 10 20 30 40 50

LEGEND OF SLEDGE TRACKS

- Western Coastal Party
- Eastern Party
- Eastern Depot Party
- Southern " "
- Western " "

LEGEND OF SHIPS TRACKS

- First Cruise
- Second "
- Third "

88 89 90 91 92 93 94 95 96 97 98 99 100

64 65 66 67

PACK ICE

DAVIS SEA

SHACKLETON ICE-SHELF

TERMINATION TONGUE

PACK ICE

PACK ICE

"GAUSS" + WINTER STATION

DRYGALSKI I. 1200

MASSON I. 1500'

HENDERSON I. 800'

HASWELL I.

ADAMS I.

C. FILCHNER

C. PENCK

GAUSSBERG 1148

POSADOWSKY BAY

HELEN GLACIER

WRIGHT B.

FARR B.

Morainic Ice

Junction Corner

The Western Barrier

The Grottoes

Harrison Ice Piles

C. MOYES

GILLIES I.

C. DOVERS

HIPPO I.

ALLIGATOR I.

BAY OF WINDS

High Grounded Shelf-Ice

Thick Bay Ice

Appearance of rock

DAVID I. 1000'

HORDERN I.

C. GERLACHE

C. HEADLEY

SCOTT GL.

Great Rock Face

Watson Bluff

Robinson Bay

Possession Rocks

Northcliffe Gl.

DENMAN GLACIER

Mt BARR SMITH 4320' approx.

Mt AMUNDSEN

Mt SANDOW abt 4000'

Mt STRATHCONA about 4000'

KAISER WILHELM LD. QUEEN MARY LAND

87 88 89 90 91 92 93 94 95 96 97 98 99 100 101